GSA news & information

VOLUME 1, NUMBER 11 NOVEMBER 1979

NEWS FROM GSA DIVISIONS

GSA has seven specialty divisions, all of which prepare and publish newsletters paid for from their division dues. Much of the information contained in the newsletters is of interest to division members only, but, with the thought that some of the items are of general interest, here are a few excerpts from several recent issues.

John C. Frye, Executive Director

from the Geophysics Division

JOINT ASSOCIATION OF GEOPHYSICS

D. H. Griffiths (Birmingham Univ., U.K.) reports that the Royal Astronomical Society and the Geological Society of London are at present involved in the formation of a Joint Association for Geophysics. Though both societies have geophysical members there is no geophysical society as such in Great Britain. The new association therefore will be taking on an important role and as well as promoting the subject of geophysics will greatly strengthen the relationship between geophysicists and geologists. The Association will elect its own committee of officers from the joint membership but will still be responsible to the parent societies. It held its first Annual Meeting during the 3rd United Kingdom Geophysical Assembly in Southampton in April, 1979.

STANFORD ROCK PHYSICS PROJECT

The Stanford Rock Physics (SRP) project has been initiated by Amos Nur in the Department of Geophysics at Stanford University. It is a program of basic research into the physical properties of sedimentary rocks, and the relation between these properties and the state of the rock, e.g. porosity, fluid and clay content; pore pressure, and permeability. The overall goals of SRP are to significantly improve (a) geological and geophysical exploration for energy resources; and (b) reservoir evaluation and well logging.

Results of the project to date have been distributed in 5 volumes, of about 200–300 pages each, including new findings in the physics of seismic attenuation, velocities in rock, the factors which control porosity in rocks, wave propagation in geothermal reservoirs, and permeability. Future plans are to continue and expand rock physics research related to resources, over a period of 3–5 years, with support from an increasing number of industrial sponsors.

from the Quaternary Geologist and Geomorphologist

MACKIN GRANT

Winner of the 1979 J. Hoover Mackin Grant is Donna Marron, University of California, Berkeley, for her proposed research on past and present processes of hillslope evolution in the drainage basin of Redwood Creek in northwestern California.

Ms. Marron was a summa cum laude graduate of Tufts University and a member of Phi Beta Kappa and Sigma Xi Societies. Work on the project will be supervised by Professor Clyde Wahrhaftig.

Previous winners of the Mackin Grant include:

1974 Louis D. Carter—Quaternary geology in Baja California
1975 Phillip Davis—Cirque glacier fluctuations and lacustrine chronologies
1976 Award date changed
1977 David Muhs—Marine terraces—Soil development, San Clemente Island, California
1978 Lisa Osterman—Quaternary geology of Frobisher Bay, Baffin Island

DIVISION MEMBERSHIP

After the initiation of dues several years ago, Division membership declined to a "hard-core" number of Quaternary geologists. Since then, the number of members has risen 25% and now stands at 1,045.

Dues are used to cover costs of the newsletter, ballots for election of officers and panel, and other mailing expenses.

(continued on following page)

from the Hydrogeologist

DAVE STEPHENSON, BIRDSALL DISTINGUISHED LECTURER

The third Birdsall Distinguished Lecturer is Dave Stephenson of Woodward-Clyde Consultants, San Francisco, California. Prior to his new position, Dr. Stephenson was with the University of Wisconsin, Madison. During the tour he will present talks and seminars on "Hydrogeologic Aspects of Energy Development" and "The Challenge for Earth Scientists in Water Resources."

A firm itinerary has not been established at this time, but it will coincide with the 1979–1980 academic year. If you would like your institution to be considered a part of Dr. Stephenson's Distinguished Lecture Tour, please contact William Back, Coordinator, Birdsall Lecture Tour, U.S. Geological Survey, WRD, 432 National Center, Reston, VA 22092 (703-860-6951).

GEORGE BURKE MAXEY MEMORIAL VOLUME

A prominent hydrogeologist, a founder of the Hydrogeology Division, and 1971 Meinzer Award recipient, Dr. Maxey was Director of the Water Resources Center, Desert Research Institute, University of Nevada, Reno, Nevada, at the time of his sudden death in 1977.

The Memorial Volume consists of papers prepared by Dr. Maxey's students and close colleagues and is being published by the *Journal of Hydrology*. A specially bound copy of the volume will be presented to Jane Maxey at the Division's annual luncheon-business meeting, Tuesday, November 6, San Diego, California.

from the Engineering Geologist

NEW TRP LANDSLIDE MANUAL AVAILABLE

We all regretted the out-of-print status into which Highway Research Board Special Paper 29 *Landslides and Engineering Practice* (1958) slipped in 1961, after having been in print only three years. Under the editorship of EGD member Robert L. Schuster (USGS, Denver) and Professor Raymond J. Krizek (Northwestern University), a second volume is now available through the Transportation Research Board of the National Academy of Sciences. *Landslides; Analysis and Control,* published late in 1978, is selling for $14 in hard copy and $12 in paper cover. Dave Varnes has revised the very useful landslide classification poster (in a pocket) and additional copies of this Figure (2.1) are also available for wall or classroom use at $2 each. The book contains nine chapters by well-known practitioners and is 234 pages long. We have it that 1,500 copies were printed—it may not even last long! The address for ordering is Publications Office, Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue NW, Washington, DC 20418.

PROGRESS TOWARD ESTABLISHMENT OF A U.S. NATIONAL GROUP OF IAEG

Former EGD Chairman David J. Varnes, U.S. Geological Survey, Denver, has worked diligently for two years now in spearheading a movement to gain U.S. participation in the International Association of Engineering Geologists. The IAEG bulletin *Engineering Geology* (not to be confused with another of the same general title) has become an excellent source document containing, on occasion, color illustrations. For instance, no. 18 (December 1978) contains 242 large-size pages of text. Creation of a U.S. national group would make membership in IAEG available to American engineeering geologists for the grand sum of only $6 per year, in lieu of the already bargain-rate fee of $12.

Dave has succeeded, on direction of the EGD Management Board, in gaining approval of the National Academy of Sciences through its U.S. National Committee on Geology to bring the U.S. national group into existence. Dave is now working on the implementation of the U.S. national group, in cooperation with AEG President Dick Proctor and EGD Chairman Dick Jahns.

from the History of Geology Division

INTERNATIONAL COMMITTEE ON THE HISTORY OF GEOLOGICAL SCIENCES

Prof. Dr. Martin Guntau, Secretary-General of INHIGEO, issued its *Newsletter 12* (Rostock, 1978) which contains Prof. Dr. Helmut Hölder's review of the VIIIth INHIGEO Symposium (Münster-Bonn) "Regional Influences on the Origin and Development of Geological Theories" held September 12–23, 1978, INHIGEO's bylaws, and summaries of investigations in the history of geology in the United States (1977) and the Soviet Union (1976–1978). Corresponding members of USHIGEO receive this publication from Cecil J. Schneer, Vice-President for North America of INHIGEO.

MAJOR PUBLICATION IN THE HISTORY OF GEOLOGY IN THE UNITED STATES

As a special publication on the occasion of its Centennial, the U.S. Geological Survey issued on March 2, 1979 *Volume 1, Before 1879* of Mary C. Rabbitt's four-volume *Minerals, Lands, and Geology for the Common Defence and General Welfare,* an analysis of the relation of geology to public land, federal science and mapping policies, and the development of mineral resources in the United States. *Volume 1,* in 8½ × 11-inch format, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock No. 024-001-03151-5), USGS Branch of Distribution, 1200 S. Eads St., Arlington, VA 22202, and USGS Public Inquiries Offices for $6.00 (paper covers). Volume 2 (1879–1904) is in review and Volumes 3 (1904–1939) and 4 (1939–1977) are in preparation.

▪ NOTICE ▪

February 1, 1980, has been set as the deadline for receipt at headquarters of nominations for the Penrose Medal, Day Medal, Honorary Fellowship, and National Medal of Science.

To ensure thorough consideration by the particular subcommittee, please back up each suggested nomination with a brief biographical sketch and a summary of the nominee's chief contributions to geology. In the case of the Penrose and Day Medals and the National Medal of Science, a *selected* bibliography (limit to 20) must accompany the nomination.

In choosing nominees, scientific achievements, rather than contributions in administration and service, should be considered. Nominations received at headquarters will be forwarded to the appropriate subcommittee chairmen.

Memorial preprints are available without charge

The following memorial preprints are now available:

Carl Calvin Addison, by Ira H. Cram
Julius Benjamin Garrett, Jr., by Albert D. Ellis
John William James, by Neil P. Carroll
Gordon Andrew Macdonald, by Ralph Moberly
Robert M. Moxham, by William A. Fischer and Frank E. Senftle
James Morton Schopf, by Robert M. Kosanke
Clyde Graham Strachan, by J. M. Wanenmacher

Free copies of the above may be obtained by writing to the Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301.

Memoir 152 errata prepared

Errata for Memoir 152, *Cenozoic Tectonics and Regional Geophysics of the Western Cordillera*, are available to anyone who has purchased the book. (Those who have standing orders for GSA books already will have received the errata.) Address your request to Orders Department, Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301. The errata include Plates 3-1 and 4-1 and a sheet listing four corrections to text matter.

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Prepared from contributions from the staff and membership by John C. Frye, Executive Director; Jo Fogelberg, Publications Manager; and June Thomas, Judy Hall, Barbara Patterson, and Ann Fogel, Production Assistants.

Articles in *Bulletin, Part II*, November 1979

Articles in *Bulletin, Part II* are listed below. (Summaries only of these articles are in *Bulletin, Part I.*) Articles in *Part II* are not on the separates subscription.

Paper copies of *Part II* in its entirety are available at cost ($6/month) as a special service to those users (members and nonmember subscribers) who request them. Any such order should be addressed to the Publication Sales Department and be accompanied by advance payment, and no discount can be offered for multiple orders or orders for a sequence of months.

1. Petrography of sand tempers in Pacific Islands potsherds, by William R. Dickinson and Richard Shutler, Jr. Doc. no. M91101. (On microfiche: 58 p., 10 figs., 1 table)
2. Geologic history and stratigraphy of the Triassic-Jurassic Culpeper Basin, Virginia, by R. C. Lindholm. Doc. no. M91102. (On microfiche: 35 p., 9 figs., 1 table)

In November *Geology*

(separates not available)

1. Migrating sediment waves created by turbidity currents in the northern South China Basin, by J. E. Damuth
2. Biomineralization, paleoceanography, and the evolution of calcareous marine organisms, by B. H. Wilkinson
3. West African cratonic stratigraphic sequences, by S. W. Petters
4. Nomenclature of alpine glacial deposits, or, What's in a name?, by P. W. Birkeland, S. M. Colman, R. M. Burke, R. R. Shroba, T. C. Meierding
5. Keewatin Ice Sheet—Re-evaluation of the traditional concept of the Laurentide Ice Sheet, by W. W. Shilts, C. M. Cunningham, C. A. Kaszycki
6. A conceptual hypothesis for the relation of differing tectonic terranes to plutonic emplacement, by R. G. Gastil
7. A Mesozoic alkaline province in eastern Bolivia, by D.P.F. Darbyshire, C.J.N. Fletcher
8. Granitic pegmatites as estimators of crustal pressures—A test in the eastern Adirondacks, New York, by G. W. Putman, J. W. Sullivan
9. Tosco-Abreojos fault zone: A Neogene transform plate boundary within the Pacific margin of southern Baja California, Mexico, by J. E. Spencer, W. R. Normark
10. Research Note: Critical tables for conversion of K-Ar ages from old to new constants, by G. B. Dalrymple

UPDATE

Smithsonian programs of higher education and research training announced

The Smithsonian Institution announces its programs of higher education and research training for 1980–1981 in the fields of anthropology, biological sciences, earth sciences, and the history of technology and science.

Smithsonian Fellowships are awarded to support independent research in residence at the Smithsonian Institution using the collections, facilities, and laboratories and pertaining to research interests of the Smithsonian research staff. Proposals for research may be offered in the fields in which the Institution has research strength. Research areas include the following:

Anthropology: Archeology, ethno-history, ethnology, linguistics, physical anthropology, and carbon-14 dating.

Biological Sciences: Systematics of fossil and Recent vertebrates, invertebrates, and plants, radiation biology, animal behavior, plant and animal physiology, animal pathology, tropical biology, ecology, and field biology.

Earth Sciences: Sedimentology and paleobiology; mineralogy, petrology, meteoritics, and volcanology.

History of Technology and Science: History of mathematics, physical sciences, medicine and pharmacy, engineering, transportation, agriculture, air and space, and electrical technology, and the history of science in America.

Smithsonian Fellowships may be granted to postdoctoral and predoctoral scholars to pursue further training in research. Applications are due by January 15, 1980.

Awards are based on merit. Smithsonian Fellowships are open to all qualified individuals, without reference to race, color, religion, sex, national origin, or age of any applicant. For more information and application forms please write to Office of Fellowships and Grants, 3300 L'Enfant Plaza, Smithsonian Institution, Washington, D.C. 20560. Please indicate the particular area in which you propose to conduct research and give the dates of degrees received or expected.

1979–1980 Chautauqua-type short courses

A series of 54 Chautauqua-type short courses will be held during the 1979–80 academic year at regional field centers throughout the United States. Topics include

- evolution and future of the universe
- community power studies
- aging, the family, and bureaucracy
- risk-benefit analysis

These refresher courses provide the opportunity for scholars to meet with groups of 25 college teachers and communicate recent advances in their fields. The primary aim is to help undergraduate faculty keep their course material current.

Announcement brochures with details about the courses and application forms are available from the Office of Science Education, American Association for the Advancement of Science, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036.

NRC programs for postdoctoral research in 1980

The National Research Council announces its 1980 Research Associateship Programs which provide postdoctoral opportunities for scientists and engineers in the fields of atmospheric and earth sciences, engineering, life sciences, physics, chemistry, environmental sciences, mathematics, and space sciences.

NRC Research Associates will conduct research on problems largely of their own choice in selected federal research laboratories at various geographic locations in the United States. The programs are open to recent recipients of the doctorate and, in many cases, to senior investigators also. Some programs are open to non–United States nationals.

Over 200 new awards will be offered on a competitive basis in 1980. The basic annual stipend (subject to income tax) will be $18,000 for recent recipients of the doctorate. Higher stipends will be determined for senior awardees. Awards will include relocation allowances and limited support for professional travel during tenure. Awards generally will be for one-year periods. Senior applicants may request shorter tenures.

Applications to the NRC must be postmarked by January 15, 1980. Awards will be announced in April.

Application materials and detailed information about specific opportunities for research and the federal laboratories that participate should be requested promptly from the Associateship Office, JH 608-D3, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Telephone (202) 389-6554.

AGI scholarships for minority geoscience majors

The American Geological Institute will again offer scholarships for geoscience majors who are United States citizens and members of the following ethnic minority groups: Black, Hispanic, or Native American. More than 50 such scholarships were awarded for the 1979–1980 school year, and approximately the same number will be awarded for 1980–1981. Geoscience majors currently enrolled in accredited institutions as either undergraduate or graduate students are eligible to apply for the scholarships.

The term "geoscience" is used broadly to include major study in the fields of geology, geochemistry, geophysics, hydrology, meteorology, oceanography, and space and planetary sciences.

Monies for support/funding of this program are administered by the AGI Minority Participation Program Advisory Committee and have come from six member societies; more than 16 mining, petroleum, geological supply, and geophysical companies; and from many individuals.

Requests for application materials or nominations for scholarships should be addressed to William H. Matthews III, Director of Education, American Geological Institute, Box 10031, Lamar University Station, Beaumont, Texas 77710. The deadline for filing the completed application is February 1, 1980.

ABSTRACTS DUE NOVEMBER 30 FOR U.S. SYMPOSIUM ON ROCK MECHANICS

The 21st U.S. Symposium on Rock Mechanics will be held at the University of Missouri-Rolla in May 1980.

Those interested in submitting a paper to this meeting are requested to submit a brief (less than 200-word) abstract for the printed program and an extended (1,000-1,500 word) abstract including, if possible, one or two graphs, for the use of the reviewers compiling the sessions.

This symposium is intended to cover the broad interests of the rock mechanics community, and papers are solicited in, but not restricted to, the areas of rock fragmentation; ground support, both artificial and by design; coal mining; in-situ methods; rock property measurements; rock instrumentation; rock modeling and analysis; explosives; geothermal conditions; oil field conditions; tunneling; drilling; earthquake prediction; underground storage; subsidence; and general rock mechanics.

Papers are encouraged in the area of rock mechanics related to ground control and the implications of state and federal regulations on the associated technology. We would also encourage submission of papers oriented toward industrial applications.

We are interested in developing a review session on education in rock mechanics; papers are particularly solicited in this area also.

Dates

The following dates have tentatively been set:

Symposium	May 27-30, 1980
Abstracts due	November 30, 1979
Selection of papers	December 31, 1979
Papers due	February 28, 1980

For further information contact

David A. Summers
University of Missouri-Rolla
Rock Mechanics & Explosives Research Center
Rolla, Missouri 65401
(314) 341-4365

Third Maurice Ewing Symposium on Earthquake Prediction to be held May 12-16, 1980

The Third Maurice Ewing Symposium on Earthquake Prediction will be held May 12-16, 1980, at Mohonk Mountain House, New Paltz, New York. Inquiries should be addressed to Professor Lynn R. Sykes, Lamont-Doherty Geological Observatory of Columbia University, Palisades, New York 10964.

AGU Fall Meeting San Francisco December 3-7, 1979

Special sessions of interest to geologists include:

Geomagnetism and Paleomagnetism
Polarity Transitions and Related Phenomena

Hydrology
Organic Contaminants in Groundwater
Poly-Phase Flow in the Unsaturated Zone
Physical Basis of Hydrology
Stochastic Hydrology: Is it Worth a Dam?

Meteorology
Eruption of Soufrière of St. Vincent: Geologic and Atmospheric Observations

Oceanography
Hydrothermal Systems in the Sea Floor
Major Paleoceanography Events
Estuaries: Sediments
Oceanic Plateaus: Origin and Evolution

Seismology
Seismic Profiling and Tectonics of the Snake River Plain
Precursory Seismicity and Earthquake Prediction

Tectonophysics
Snake River Plain-Yellowstone Symposium
Strain Weakening in Faults
Temperatures in the Earth

Volcanology, Geochemistry and Petrology
Geologic, Geochemical and Geophysical Studies of Samile Ophiolite Oman
Igneous Petrology
Metamorphic Petrology

For information on registration, the program, and hotel reservations, write to:

Meetings
American Geophysical Union
2000 Florida Ave. N.W.
Washington, D.C. 20009

GSA Committee on Research Grants reports disbursement of funds

This year the Committee on Research Grants had at its disposal $84,692, which included industrial donations, donations by past recipients and from dues statements check-offs, funds provided from the Society's endowment income, and $950 from the Harold T. Stearns Fund.

The total number of applications (254) was approximately the same as last year (263) and the overall quality remained high. Support was recommended for 154, or 60 percent of the total, with an average grant of $551. The distribution of supported projects among generalized fields is shown in Table I.

TABLE I

	Funded	Requests
1. Paleontology	24	36
2. Sedimentology & Stratigraphy	27	33
3. Structure & Tectonics	30	50
4. Igneous & Metamorphic Petrology	41	54
5. Economic Geology	9	19
6. Quaternary Geology	21	35
7. Other	3	7

The committee expressed concern over the fact that not only has the value of an average grant decreased significantly over the past few years on account of inflation, but also this year more proposals were funded compared to last year, so that there has been a significant decline in the dollar value of the average grant compared with last year's grants. (See Table II.)

This year the standards required for funding did not change compared to those of previous years, but the number of deserving applications was high. Offsetting this increased demand for funds, the committee was loath to provide funds for costs such as laboratory equipment (for example, microprobe) rental.

The GSA research grant program represents one of the most effective scientific funding mechanisms in the country, yielding an enormous return for the relatively small amount of money expended. If the impact of the program is not to decline further with inflation, the level of funding must increase. This year the committee could easily have awarded to worthy projects at least $20,000 more than was available.

In the event that some of the grantees elect to return part or all of their funds, GSA headquarters awards these funds to some or all of the alternate applicants selected and ranked by the committee, as funds become available.

The following table presents details of the committee's actions. Numbers are subject to modest final adjustment, depending on the return of funds by a small number of awardees.

1979 RESEARCH GRANTS SUMMARY OF COMMITTEE RECOMMENDATIONS

	Number of Applicants	Requested by Applicants	Recommended for Support
CATEGORY I (Recommended for support)			
M.S. Student applicants	53	$ 51,658	$24,975
Ph.D. Student applicants	101	108,038	59,893
Subtotal	154	$159,699	$84,868
CATEGORY II (Alternates)			
M.S. Student applicants	6	$ 4,814	
Ph.D. Student applicants	2	1,867	
Subtotal	8	$ 6,681	
CATEGORY III (Not recommended for support)			
M.S. Student applicants	44	$ 38,584	
Ph.D. Student applicants	40	40,956	
Post Ph.D. applicants	8	9,851	
Subtotal	92	$ 89,391	
GRAND TOTAL	254	$255,771	$84,868

TABLE II

Summary of Performance of Penrose Research Grants

	1960	1965	1970	1975	1977	1978	1979
Number of applicants	40	86	256	320	269	263	254
Applicants supported	13	53	128	95	119	124	154
Percent supported	32%	62%	50%	30%	44%	47%	60%
Total requested	$17,709	$116,036	$302,606	$296,382	$243,912	$264,589	$255,771
Total granted	$10,763	$ 37,200	$ 76,846	$ 62,430	$ 85,495	$ 85,000	$ 84,868
Average grant	$827	$702	$600	$657	$718	$686	$551
Percent of funding	61%	32%	25%	21%	35%	30%	30%

THE GEOLOGICAL SOCIETY OF AMERICA

Annual research awards program 1980

The Geological Society of America will continue its annual research awards program in 1980. Eligibility is not restricted to GSA members. New application forms for 1980 and detailed requirements are available in the geology departments of most colleges and universities in the United States or upon request from the Executive Director, the Geological Society of America, P.O. Box 9140, Boulder, Colorado, 80301. Please use the 1980 forms.

The grants are intended to aid in research projects, not to sustain their entire cost. Applications by graduate students who will use the grants in support of research for advanced degrees will be considered.

The Geological Society of America awarded $85,000 for grants in 1979. The grants went to 154 students doing research for advanced degrees. The average amount granted was $551.00. The highest grant was $1,200, but there is no predetermined maximum amount.

February 15 is the deadline for the receipt of applications. Letters of support from two sponsors are required for M.S. and Ph.D. candidates. **These two letters must accompany applications.**

Applications will also be accepted for the Harold T. Stearns Fellowship(s). These grants are awarded periodically in support of research on one or more aspects of the geology of the circum-Pacific region. They are distinct from the GSA Penrose research grants and are restricted in their use to the particular region. The awardee(s) will be selected by the Research Grants Committee. The deadline date for filing applications is **February 15.** Application forms are the same as those used for the Penrose research grants.

The Committee on Research Grants will meet soon after February 15 to evaluate applications and to award grants. All applicants for grants will be informed promptly of the committee's actions by the Executive Director of the Geological Society of America.

DEADLINE FOR RECEIPT OF APPLICATIONS IS FEBRUARY 15, 1980.
PLEASE WRITE FOR NEW FORMS. THE GUIDELINES HAVE BEEN REVISED.

[PLEASE POST]

FROM THE SCIENCE EDITOR

GSA MAP AND CHART SERIES

Preparation of material and submittal of copy

General Instructions

Material intended for publication in the Map and Chart Series must undergo the same critical review process as all other GSA publications. Two copies of the map and of any accompanying text should be mailed to the GSA Science Editor as a complete package. For details on style and format for all GSA manuscripts, see *Information for Contributors to Publications of the Geological Society of America.*

Map Preparation

Maps should be prepared in as near final form as possible, with explanation, index map, and subordinate material in proper position and with title, scale, and authors shown as anticipated for final printed product. Maximum dimensions of paper stock are 42 x 58 in. (107 x 147 cm), with the map image no larger than 40 x 56 in. (102 x 142 cm). Note: Only the *form* need be near final; the drafting may be preliminary. Two copies of this product, one hand-colored if appropriate, should be submitted for review.

After review and acceptance, a copy of the map will be returned to the author for changes and corrections necessitated by review and for preparation of final copy suitable for reproduction. This work may be done by the author or by the author's institution; or, if desired, the work may be done at the author's expense by our map printer, Williams & Heintz Map Corporation in Washington, D.C. By Council ruling, authors must bear the total cost of artwork through color separations. The Society will pay the cost of plates and printing.

At an advanced stage in preparation, a final proof of the map is sent to GSA, at which time necessary marginal lines are inserted identifying the map as a GSA publication. The proof is then forwarded to the author for final proofreading and checking and he sends the map directly to the printer for printing.

Also, following acceptance, the author should prepare and submit to GSA a suggested layout for the front of the map envelope, including a reproducible generalized map or a photograph to identify or illustrate the map contained in the envelope.

Text Preparation

A publication in the Map and Chart Series may be accompanied by a text. The author may choose one of the following options:

A. As many as 32 printed pages of text may be included in the envelope with the map. (Commonly, an expanded explanation of only three or four printed pages is necessary to present details on correlations, contacts, structures, and the color, grain size, bedding, and fossils of mapped rock units).

B. The text may be published on microfiche from author-prepared, camera-ready copy of 32 to 98 pages and may be included in the envelope with the map.

C. A Map Summary article may be published simultaneously in *Bulletin, Part I* (maximum of 2,000 words). This short article should outline the major contributions of the map as well as important interpretations and conclusions. It should not duplicate the map text. An index map or page-size generalized geologic map may be included.

D. The text may be published simultaneously as a Summary article in *Bulletin, Part I* with the full-length article in *Bulletin, Part II* (should not exceed 98 pages of author-prepared, camera-ready copy).

The author should request the Science Editor's guidance on which of the above options is most appropriate for publication of his material.

If option A or B is selected, the author should follow the general instructions above.

Simultaneous Publication of Map and *Bulletin* Article

If option C or D is employed, to accomplish simultaneous publication of a map in the Map and Chart Series with the text in the *Bulletin*, the author should follow these procedures:

1. If the author chooses option C, he should
   (a) submit two copies of a preliminary draft of the map to the Science Editor and (b) two copies of the Map Summary for publication in *Bulletin, Part I.*
2. If the author chooses option D, he should
   (a) submit two copies of a preliminary draft of the map and (b) two copies of the Summary for *Part I* and two copies of the complete article for *Part II.*
3. After review by GSA, all parts are returned to the author for revision as suggested by reviewers. The author then returns the revised version *or* revised manuscript to the Science Editor for final approval to publish. On notification of acceptance, the author (a) proceeds with the final preparation of the map, and (b) waits for instructions from the *Bulletin* Manager regarding article preparation.
4. The edited *Bulletin* article will be mailed to the author for final approval, and galleys of the *Part I* Summary will be mailed to him for proofreading.
5. The month of simultaneous publication of map and article will be determined when the map has been printed and when the manuscript has been edited to make sure that clear reference is made to the map in the *Bulletin* article and listed in the References Cited section. All pieces will be interrelated by citations to the Map and Chart Series number and the *Bulletin* parts.

REPORT OF THE GSA COMMITTEE ON GEOLOGY AND PUBLIC POLICY

Geological Information—Problems in Transfer from Scientist to Policy Maker

At the Society's 1978 meeting in Toronto, the Committee on Geology and Public Policy sponsored a symposium on "Geological Information—Problems in Transfer from Scientist to Policy Maker." Experts from the United States and Canada were invited to present papers on their experiences. Three categories were included: methods of presenting geological information, the role and experience of scientific advisory groups, and the decision maker's requirements for geological information. The seven papers presented showed a striking diversity of ideas on the methods and problems of data presentation and clearly demonstrated the requirement for geological information in policy formulation in a broad range of contemporary issues.

E. G. Wermund (Bureau of Economic Geology, University of Texas): "Texas Land Resources Mapping for Public Policy Transfer"
J. D. Mollard (J. D. Mollard and Associates Limited): "Examples of Different Approaches Taken When Presenting Geological Information to Different Groups of Policy Makers"
G. A. Robbins, L. A. White, and T. J. Bennett (U.S. Nuclear Regulatory Commission): "Seismic and Geologic Siting Regulations and Guidelines Formulated for Critical Structures by U.S. Federal Agencies"
W. O. Kupsch (University of Saskatchewan): "A Message Garbled"
F. A. Donath (University of Illinois): "The Role of Scientific Advisory Groups: Disposal of High-Level Nuclear Waste"
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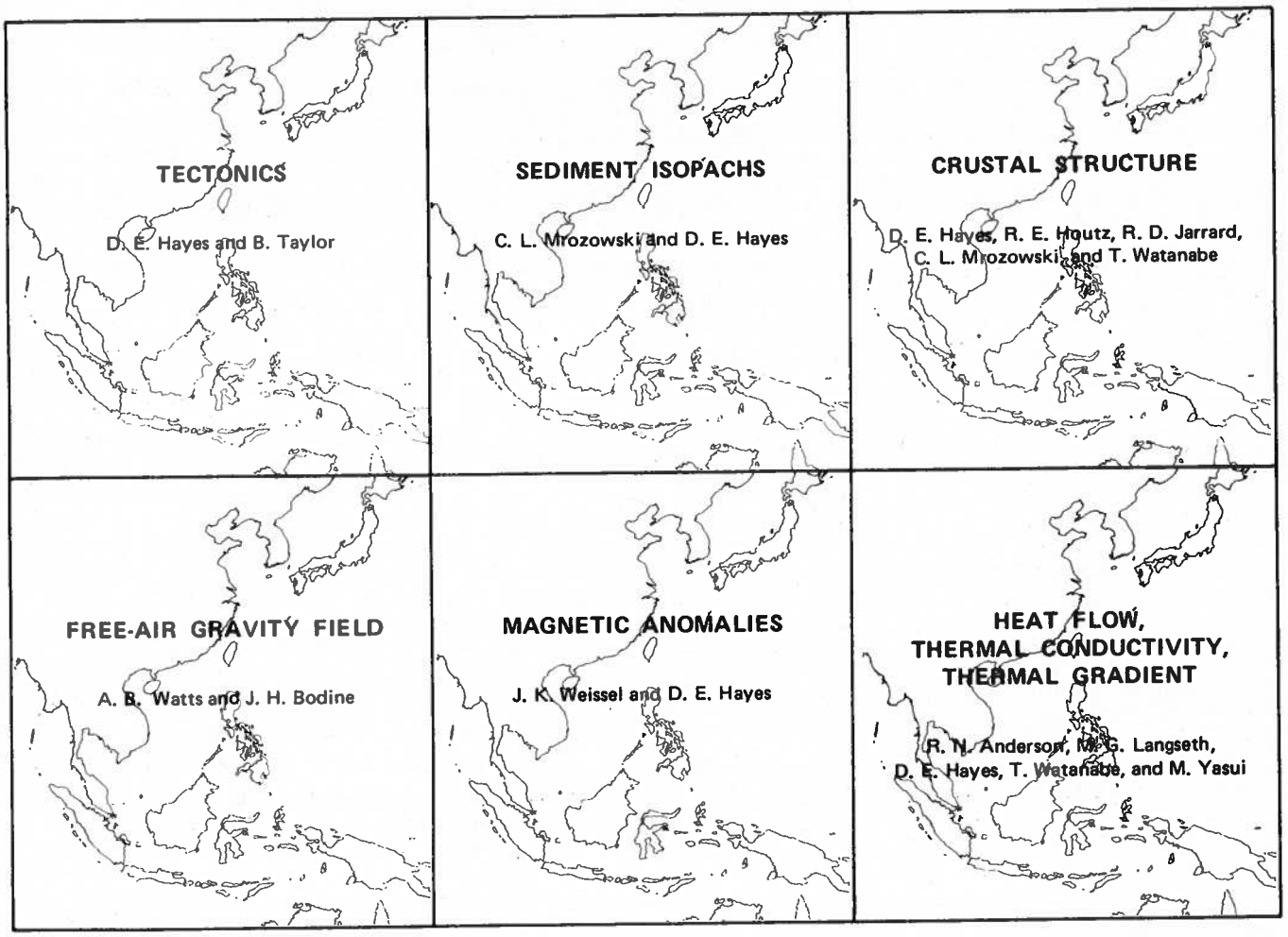

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Questions on Geologic Principles (Geologische Prinzipienfragen by Eduard Reyer, 1907)

Microform Publication 9 — Translated from the German by Allen Keller, Werner H. Will, and D. Alan Youel, 1979. xi + 124 pages, 153 figures, 5 photographs, on two 24x microfiche. ISBN 0-8137-6009-7 ..... $4.00

This first translation in English of Eduard Reyer's *Geologische Prinzipienfragen* should provide interesting reading for most present-day students and workers in geology and allied fields.

This book, published in 1907 near the end of Reyer's life (1849–1914), is a summary of his thoughts and conclusions regarding many geological and cosmic processes. His major interests and major scientific contributions are focused, however, on igneous processes and mountain building, and these subjects make up about 65% of his book.

Reyer's orogenic model emphasizes the roles of thermal expansion and gravitational gliding in mountain building. In his view, large areas of geosynclinal troughs are uplifted by thermal expansion, or intrusion, or both, and the elevated sedimentary layers, saturated with fluid in many porous zones, glide off and fold as they pile up on the flanks of the uplift. When uplift ceases, cooling and collapse of the tectonically denuded area produce grabens and volcanic action.

The dominant theme in Reyer's model is the inexorable downhill movement of rock, caused by gravity acting over short or long periods of time: delta mud creeping toward the sea, inclined water tables, and fluid-rich sedimentary layers gliding downhill and folding. This theme, which is repeated with many variations and amplifications, is central to modern concepts of gravity tectonics.

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Appendix I. Photographs

MC-28D—Geologic Structure Section across Southern Klamath Mountains, Coast Ranges, and Seaward of Point Delgada, California

MC-28D — *Geologic Structure Section across Southern Klamath Mountains, Coast Ranges, and Seaward of Point Delgada, California.* William P. Irwin and Michael D. Dennis. (Contribution from Plate Margins Working Group, U.S. Geodynamics Committee, John C. Maxwell, Coordinator.) 1979. One sheet, 56″ × 32″, in color; scale, 1:250,000; with 12-page text. Folded: $7.25; rolled: $8.75

Four major thrust faults are conspicuous features of this newly-published geologic section across the continental margin in northern California. Each of these faults dips to the northeast, and the overlying block has moved to the southwest. Each of these faults is also a suture in the structural fabric of the continental margin.

The geologic section depicting these four sutures extends southwestward from a point near lat 41°N, long 122°W in Shasta County to Point Delgada, and continues offshore about 2 km to the San Andreas fault. The section line then bends sharply at the San Andreas fault and continues about 120 km nearly due west in order to incorporate data from a subbottom acoustic reflection profile and a deep-sea drill core.

The oldest suture near the northeast end of the section is of Devonian age. The next younger suture to the southwest is of Middle(?) Jurassic age. The next younger is of Late Jurassic age. These three sutures involve rocks possibly as old as Ordovician at depth, to Upper Jurassic rocks on the surface, and are the main structural features underlying the Klamath Mountains. The most highly metamorphosed rock in the Klamath Mountains is a belt of mica and hornblende schist of Devonian age lying between the Devonian and Middle(?) Jurassic sutures.

The youngest suture of Early Cretaceous age marks the geologic boundary between the Klamath Mountains and the Coast Ranges.

The Coast Ranges comprise deformed rocks of the Great Valley sequence of Jurassic and Cretaceous ages, the Franciscan Group of Late Jurassic and Cretaceous ages, and younger clastic marine rocks of Tertiary and Quaternary ages.

The seaward part of the geologic section shows three sedimentary units that dip gently westward. These units from youngest to oldest are Quaternary and upper Pliocene unconsolidated deposits; lower Pliocene and upper Miocene rocks; and middle Miocene and older rocks, undifferentiated.

Marginal information on the sheet includes an index map showing coverage for the line of the section provided by 14 detailed geologic maps, and a list of references to these and other reports pertinent to the geology of the area.

NOVEMBER BULLETIN SEPARATES

Summaries

At the request of members, the Summaries section may be ordered as one separate by those who have purchased the separates option. To order, write "November Summaries" on coupon.

• S91101—Petrography of sand tempers in Pacific Islands potsherds: Summary.

William R. Dickinson, Department of Geosciences, University of Arizona, Tucson, Arizona 85721; Richard Shutler, Jr., Anthropology Department, University of Iowa, Iowa City, Iowa 52242.

• S91102—Geologic history and stratigraphy of the Triassic-Jurassic Culpeper Basin, Virginia: Summary.

R. C. Lindholm, Department of Geology, George Washington University, Washington, D.C. 20052.

Bulletin Briefs

Titles and abstracts of conventional articles in the November 1979 GSA Bulletin, Part I *are provided on the following pages to aid members who have purchased the separates option to select* Bulletin, Part I *separates of their choice. See instructions for ordering on page 175.*

• 91103—Rock structures formed during back-arc basin deformation in the Andes of Tierra del Fuego.

Ronald L. Bruhn, Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112. (15 p., 15 figs.)

A back-arc basin formed along the Pacific margin of South America south of 50°S in the latest Jurassic and was uplifted and deformed beginning in the middle Cretaceous. Mapping in Tierra del Fuego between 67°W and 69°W revealed major lateral and vertical variations in the intensity and style of deformation. Penetrative rock structures, resulting dominantly from heterogeneously distributed progressive simple shear deformation, were formed along the rear part of the back-arc basin in the transition zone from the basin to the continental shelf. In this zone, the deformation affected the ophiolitic basin floor rocks, continental basement, and upper Mesozoic silicic to mafic volcanic and sedimentary rocks. In contrast, deformation in the central part of the basin was less intense and the sedimentary infill and ophiolitic crust were, in general, not penetratively deformed. Along the rear edge of the basin, the main-phase slaty cleavage dips southward, toward the original center of the basin. An extension lineation pitches south to southwest in the slaty cleavage plane and defines the direction of maximum finite extension. In the upper part of the upper Mesozoic rock section, the main-phase fold axes trend east to southeast, and the folds overturn to the north. Strain at this level was a flattening type. The intensity of deformation increased downward and is marked by the increased structural transposition of bedding, the tightening of folds, and the rotation of fold axes toward the direction of maximum finite extension. At the lowest stratigraphic levels, the fold axes parallel the extension lineation and are oriented perpendicular to the fold axes at the higher levels. Second-phase, asymmetric folds formed along the basement-cover contact during progressive deformation. In the central part of the basin, the sedimentary infill was folded into large flexural folds, but the ophiolitic crust was deformed only in narrow shear zones.

• 91104—Late Holocene faulting and earthquake recurrence in the Reelfoot Lake area, northwestern Tennessee.

David P. Russ, U.S. Geological Survey, Denver, Colorado 80225. (6 p., 5 figs.)

Faults, folds, and sand dikes have been identified in late Holocene sediments exposed in an exploratory trench excavated across Reelfoot scarp in northwestern Tennessee. In excess of 3 m of vertical displacement believed to be of deep-seated origin occurs across a 0.5-m-wide zone of east-dipping normal faults near the scarp base. The zone includes the only faults of probable tectonic origin known to cut Holocene sediments in the upper Mississippi embayment. Stratigraphic and geomorphic relationships suggest, however, that little (<0.5 m) or no near-surface fault movement occurred across the zone during the high-magnitude New Madrid earthquakes of 1811–1812. Numerous faults having only minor displacements were mapped elsewhere in the trench. Geologic relationships between the faults and sand dikes indicate that the faults formed contemporaneously with the dikes during high-magnitude earthquakes. Cross-cutting geologic features and local geomorphic history suggest that at least two periods of faulting predate sediments deposited before A.D. 1800. Thus historical data and the sediments in the trench record a history of three earth-

quakes near the trench site strong enough to liquefy sediments and generate faulting. Carbon-14 dates obtained on fresh-water shells indicate that the trench sediments have a maximum age of about 2,000 radiocarbon years. A recurrence interval of ~600 yr or less is suggested for large earthquakes in the New Madrid area.

• 91105—Recurrent faulting in the vicinity of Reelfoot Lake, northwestern Tennessee.

Mark D. Zoback, U.S. Geological Survey, Menlo Park, California 94025. (6 p., 5 figs., 1 tbl.)

Reelfoot Lake in northwestern Tennessee was the site of considerable ground motion at the time of the 1811–1812 New Madrid earthquakes. Thirty-two kilometres of conventional seismic-reflection profiling in the vicinity of the lake has revealed the existence of many faults. Most significant are two high-angle faults with 50 to 60 m of vertical offset at the contact of the Late Cretaceous embayment sediments and Paleozoic bedrock. One fault is associated with the scarp on the western edge of Reelfoot Lake and the other, with a major northeast-trending lineament that passes through the town of Ridgely, Tennessee, and near the southeast edge of Reelfoot Lake. The nature of the observed vertical offsets suggests recurrent motion on faults of Late Cretaceous, or older, age.

• 91106—Upper Mesozoic subsea fan deposits in the southern Diablo Range, California: Record of the Sierra Nevada magmatic arc.

Charles F. Mansfield, Department of Geology, Southern Illinois University, Carbondale, Illinois 62901. (22 p., 14 figs.)

Near Coalinga, California, about 8.5 km of feldspathic and lithic siliciclastic strata of the Great Valley sequence is exposed along the west side of the San Joaquin Valley. There are four distinctive lithofacies in the section. These include: (I) graded, thin-bedded mudstone and fine-grained sandstone; (II) graded, moderately thin-bedded sandstone; (III) graded and nongraded, thick-bedded, commonly scoured and amalgamated sandstone; and (IV) normally and inversely graded and nongraded, thick-bedded conglomerate. Lithofacies I and II consist of low- and intermediate-energy turbidite deposits, including distal fan, overbank, and, possibly, contourite deposits. Lithofacies III consists of high-energy turbidite, subaqueous debris-flow, and grain-flow deposits, most of which are restricted to fan channel systems. Lithofacies IV contains predominantly subaqueous debris-flow deposits confined in fan channels.

Primary sedimentary structures indicate that sediments were transported from the east and northeast, and the facies pattern indicates deposition mainly on a subsea fan. Furthermore, the sequence of facies is suprafan lobe over midfan over upper fan, indicating that the deposit is retrogradational toward the source, the Sierra Nevada magmatic arc.

Seven stratigraphically delimited petrofacies units, defined by the quartz, K-feldspar, plagioclase, and total lithic fragment QFL percentages, and the ratio of metamorphic to volcanic rock fragments (M/V), occur in the sand-size fraction. Throughout the section, the QFL percentage of total quartz is about 30, and that of K-feldspar is below 7 except for the uppermost petrofacies unit. The following units are recognized in terms of the aforementioned parameters: (1) Joaquin Ridge, 1.5 km (Campanian), 20% K-feldspar, low plagioclase (25%), low lithics (20%), and low M/V ratio (0.13); (2) Upper Los Gatos Creek, 1 km [Santonian-Coniacian(?)], high plagioclase (43%), low total lithics (21%), and moderate M/V ratio (0.59); (3) Lower Los Gatos Creek, 1 km (Turronian), moderate plagioclase (31%), total lithics (33%), and M/V ratio (0.78); (4) Studhorse, 1 km (Cenomanian), moderate plagioclase (27%) and total lithics (43%), and high M/V ratio (1.35); (5) Grabast, 1.5 km [Albian(?)], moderate plagioclase (27%), total lithics (40%), and M/V ratio (0.63); (6) Center Peak, 0.7 km [Aptian(?)-Albian(?)], low plagioclase (22%), high total lithics (51%), and low M/V ratio (0.19); and (7) Gravelly Flat, 0.7 km (Upper Jurassic–Lower Cretaceous), moderately high plagioclase (33%), moderate total lithics (44%), low M/V ratio (0.16), and also extensive epidotization. The Lower Los Gatos Creek and lower units contain diagenetic matrix including chlorite and, locally, laumontite.

In addition, the detrital petrology records events associated with the evolution of the Sierran batholith—in particular, the three late Mesozoic magmatic epochs. The detrital petrology indicates that extensive volcanism preceded, or accompanied, the start of each magmatic epoch. As emplacement of the plutons proceeded, the volcanic cover was generally stripped off, exposing older terranes as well as the terrane produced by that particular magmatic episode. Plutons of the Yosemite epoch were emplaced under and into a sedimentary-volcanic terrane, whereas the plutons of the Huntington Lake intrusive epoch were emplaced in a metamorphic terrane. Lastly, the K-feldspar–bearing sandstones of the Joaquin Ridge petrofacies record unroofing of plutons of the Cathedral Range epoch, plutons which were the most potassic and which were emplaced in an older plutonic terrane.

• 91107—Myrmekite as a marker between preaqueous and postaqueous phase saturation in granitic systems.

M. J. Hibbard, Department of Geological Sciences, Mackay School of Mines, University of Nevada, Reno, Nevada 89557. (16 p., 10 figs., 3 tbls.)

A nonreplacive, nonexsolution model of myrmekite growth is based on textural relationships in the Sand Springs porphyritic granodiorite, west-central Nevada. A sequence of crystallization is divided into (1) a preaqueous-phase saturation stage, characterized by major growth of plagioclase (zoned), quartz, and K-feldspar (phenocrysts), and (2) a postaqueous-phase saturation stage characterized by myrmekite, final euhedral growth of plagioclase and quartz, and final growth of K-feldspar phenocrysts and most K-feldspar of the matrix, including some crystals with adularia-habit characteristics. Myrmekite results from micropressure quenching during the separation of an aqueous phase as

crystallization progresses. The occurrence of myrmekite as lobate units on plagioclase, extending into K-feldspar, results from precipitation of oligoclase (the basic ingredient of myrmekite) as local continuations of plagioclase growth from a melt that simultaneously expels an aqueous-rich fluid enriched in K-feldspar component. Late K-feldspar crystallizes from the aqueous-rich fluid, filling in around the myrmekite. Quartz in myrmekite represents the inability of silica to diffuse from the quenched melt and occurs as vermicules chiefly in accord with the principles of binary eutectic crystallization.

The Sand Springs myrmekite model is tested by evaluating its occurrences in aplite-pegmatite systems, in granitic gneisses, and in the hydrothermal secondary K-feldspar environment. Myrmekite commonly occurs in all but the hydrothermal environment, which is postmyrmekite, and a fundamentally magmatic origin can be reasoned for the other rock types if the tectonic environment during crystallization is also considered.

• 91108—Th^{230}-U^{234} dating of pedogenic carbonates in gravelly desert soils of Vidal Valley, southeastern California.

Teh-Lung Ku, Department of Geological Sciences, University of Southern California, Los Angeles, California 90007; William B. Bull, Department of Geosciences, University of Arizona, Tucson, Arizona 85721; S. Thomas Freeman, Woodward-Clyde Consultants, 4000 W. Chapman Avenue, Orange, California 92668; Kevin G. Knauss, Lawrence Livermore Laboratory, University of California, Livermore, California 94550. (11 p., 6 figs., 7 tbls.)

Radioactive disequilibrium relationships among Th^{230}, U^{234}, and U^{238} can be used to date pedogenic carbonates formed in regions of arid to semiarid climate. Samples suitable for dating consist of dense carbonate rinds around pebbles from the Cca soil horizon. Analytically, the method involves leaching the samples with dilute hydrochloric acid and measuring U^{238}, U^{234}, Th^{230}, and Th^{232} in both the leachate and residue fractions. As the soil carbonate commonly incorporates silicate mineral-bearing detritus, corrections are made to account for possible introduction of detrital Th^{230} and U^{234} into the acid leachate. The corrections are based on the assumptions that (1) the carbonate initially contains negligible amounts of Th^{232} and Th^{230}, or has a Th^{230}/Th^{232} ratio similar to that in detrital minerals, (2) U^{238}, U^{234}, and Th^{230} in the detrital silicate phase are in secular equilibrium with each other, and (3) the thorium isotopes in the detrital phase are not fractionated by the acid leaching. Application of the method to calcareous soils developed on upper Quaternary alluvial deposits of the eastern Mojave Desert in southern California gives ages that are internally consistent and that agree with the geomorphic and stratigraphic relative age relationships. Fourteen samples from an upper Pleistocene geomorphic surface, Q2b, yielded an average age of 83,000 ± 10,000 yr. This age is confirmed by a different assessment of the data independent of the aforementioned assumptions. On one specimen two different layers of a pebble coating were dated, and a carbonate accumulation rate of about 1 mm/8,000 yr was obtained. It is hoped that this study will serve as a basis for further research into the absolute dating of various types of impure carbonates of late Quaternary origin.

• 91109—Pre-Triassic fit and alpine tectonics of continental blocks in the western Mediterranean.

R. Bourrouilh, Département de Géologie structurale, Université de Paris VI, Tour 26, 4 Place Jussieu 75230 Paris Cédex 05 France; D. S. Gorsline, Department of Geological Sciences, University of Southern California, University Park, Los Angeles, California 90007. (10 p., 5 figs.)

In the western Mediterranean, during Jurassic to Miocene time, the alpine orogenic belt fragmented into several continental blocks. The relationships between these different blocks, their initial (pre-Triassic) position, and their original fit have not been defined, although various hypotheses have been proposed. To reconstruct the pre-Triassic fit, a new approach is suggested which utilizes the reconstruction of the upper Paleozoic sedimentary basin as the basis for determining relationships between blocks. Examination of the sedimentology and tectonics of the upper Paleozoic of some parts of these scattered blocks, especially those of the Rif (Morocco), Djebel Chenoua (Kabylies, Algeria), and comparison with the upper Paleozoic of the Betic Cordillera (southern Spain) and of the island of Minorca (Balearic Islands, Spain), show the following. (1) Sedimentary zone I, in which Minorca, a part of the Rif, and the Djebel Chenoua have the same sedimentary facies (canyon, deep-sea fan, and slope deposits). These blocks must have been in proximity before the Triassic period. (2) Sedimentary zone II, which joins together southern Spain, the rest of the Rif, and the

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rest of the Kabylies. (3) These sedimentary zones are parts of a unique, mainly detrital marine basin, including all of these blocks which can then be fitted into a single original Alboran block. (4) A very important Variscan (Late Devonian to Permian) and pre-Variscan fracturing with two main directions (now N120°–140°E and N30°–50°E) existed in the Alboran block. This network has been reactivated during post-Triassic continental motion.

A proposed pre-Triassic fit is described, in which the Alboran block is considered to be a sliver of the Iberian block, attached to the latter near the Balearic Islands. In terms of global tectonics, a new alpine evolutionary tectonic pattern is proposed for the Alboran block, with two successive major events: (1) Californian-type tectonics with subduction and Californian-type rifting (Jurassic to Miocene); during this time, the Alboran block slid along the Iberian block, much as southern California and northern Baja California have shifted along the edge of the North American plate. In the Mediterranean, this motion was due to the presence of two oceanic plates which disappeared by subduction in the western Mediterranean. The displacement of the Alboran block was facilitated by the Variscan fracture directions (N30°–50°E), which promoted differential rifting in the block, with horizontal displacements of more than 700 km. (2) Collision tectonics occurred between Africa and Europe (Miocene to Holocene): the differential movements between African and European plates and the Iberian block provoked compressive tectonic episodes in the intermediate region, which constituted the Alboran block. Continental margins of the European and African plates as well as the continental margin of the Alboran block were crushed between the major plates, producing spectacular but superficial thrusts.

• 91110—Diatremes and shock features in Precambrian rocks of the Slate Islands, northeastern Lake Superior: Discussion. (3 p.)

Discussion: *H. C. Halls, Erindale College, Mississauga, Ontario L5L 1C6, Canada.*

• 91111—Diatremes and shock features in Precambrian rocks of the Slate Islands, northeastern Lake Superior: Discussion. (2 p.)

Discussion: *P. B. Robertson, R.A.F. Grieve, Earth Physics Branch, Department of Energy, Mines and Resources, 1 Observatory Crescent, Ottawa, Ontario K1A 0Y3, Canada.*

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