GSA news & information

VOLUME 2, NUMBER 11 NOVEMBER 1980

1980—THE DECADE OF NORTH AMERICAN GEOLOGY—1990

As we move into the last part of the 20th century, the finite nature of the natural resources that support the highly technological cultures of our world is becoming increasingly apparent. Our effort to understand the origin of these resources, and thus to improve the efficiency of our search for more, is still far from complete. Nearly three centuries ago, Joseph Lister proposed to the fledgling Royal Society of London the idea of a geologic map as the "first step in a quantitative analysis of the earth's crust. . . . Now if it were noted how far these (chalk, flint, sandstone, coal, etc.) extended, and the limits of each soil appeared on a map, something more might be comprehended from the whole, and from every part, than I can possibly foresee, which would make such a labor very well worth the pains." During these three centuries, knowledge of the Earth has increased at an exponential rate, and the labor of creating syntheses of geologic knowledge has become correspondingly complex, but Lister's philosophical justification remains unchanged.

A major part of the Decade of North American Geology, being sponsored by the Geological Society of America to celebrate its 1988 Centennial, will be devoted to the synthesis of geological, geophysical, and geochemical knowledge about the North American plate and adjacent areas. This international project to synthesize, for the first time, knowledge about an entire crustal plate will include new tectonic, geologic, and geophysical maps, correlation charts, geological and geophysical transects, and 26 volumes of regional geology covering the area from the Arctic Ocean to northern South America and the Mid-Atlantic Ridge to Hawaii (see Centennial News, p. 167 for additional information).

National compilations, including tectonic maps for Mexico and Canada, regional correlation charts for the Phanerozoic rocks of the U.S., and a variety of maps and charts being produced in Canada as a part of its decennial update of the Geology and Mineral Resources of Canada, will be additional contributions to the Decade of North American Geology.

Every effort is being made to facilitate integration of geological information and cross-disciplinary communication, and to make the vast fund of information about the North American plate and its surroundings available to the broadest possible audience. All the plate-wide maps will be on the same 1:5,000,000 computer-compatible base so that superposition of data from different geological disciplines and relatively easy addition of new data will be possible. Production of the regional synthesis volumes, at least for Canada and the U.S., may follow a new concept of presentation if the GSA Council and the Canadian Geoscience Council approve. All *chapters* in the synthesis volumes would be published separately so that no chapter would have its contents become outdated while awaiting completion of other chapters within a volume. Also, in the future, as significant new knowledge became available for regions covered by particular chapters, those would be the only chapters that would need to be replaced in order to keep the full synthesis series up-to-date.

The first book of the regional geology series will be a Workbook for the Decade of North American Geology. This will present one- or two-page statements describing the multitude of geological problems or anomalies throughout the continent whose resolution or clarification would assist the preparation of the subsequent maps, charts, transects, and books of regional synthesis. The workbook, which is intended to serve as a stimulus for research related to problems of regional geology, will grow out of a series of public workshops that will be held at each of the GSA section meetings, the eastern AGU meeting, the AAPG meeting, and perhaps the meeting of the Geological Association of Canada during the spring of 1981; it is projected to appear early in 1982.

Coordination of all of the international activities for the Decade of North American Geology is being provided by GSA and funded through a specially created Centennial Development Fund. Subsidies from this and other private or national sources will keep prices for all publications at a level affordable by graduate students as well as by professional geologists and libraries.

By the end of the Decade, when all of the maps, charts and regional synthesis volumes are complete, something more, indeed, might be comprehended from the whole, and from every part, than we can possibly foresee, and a model for international cooperation in regional geological synthesis will have been established.

UPDATE

Articles in *Bulletin, Part II,* November 1980

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 ($10/month) as a special service to those users (members and nomember 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. An analysis of drumlin form in the northeastern and north-central United States, by Hugh H. Mills, Doc. no. M01101. (On microfiche: 76 p., 7 figs., 9 tables)
2. Geology and petrology of Volcán Ceboruco, Nayarit, Mexico, by Stephen A. Nelson, Doc. no. M01102. (On microfiche: 142 p., 19 figs., 11 tables)
3. The structural analysis of the Wissahickon Schist near Philadelphia, Pennsylvania, by Daniel J. Tearpock and Richard Bischke, Doc. no. M01103. (On microfiche: 25 p., 10 figs., no tables)

In November *Geology*

1. Eolian dune field of Late Triassic age, Fundy Basin, Nova Scotia, by John F. Hubert, Karl A. Mertz
2. Tectonic implications of remagnetized upper Paleozoic strata of the northern Sierra Nevada, by Judith L. Hannah, Kenneth L. Verosub
3. Horizontal tectonic interaction of an Archean gneiss belt and greenstones, Pilbara block, Western Australia, by M. J. Bickle, L. F. Bettenay, C. A. Boulter, D. I. Groves, P. Morant
4. Sediment subduction and frictional sliding in a subduction zone, by Chi-yuen Wang
5. Late Wisconsin and Holocene tectonic stability of the United States mid-Atlantic coastal region, by Blake W. Blackwelder
6. Erosional origin of the Blake Escarpment: An alternative hypothesis, by Charles K. Paull, William P. Dillon
7. Neap-spring cycles reflected in Holocene subtidal large-scale bedform deposits: A preliminary note, by M. J. Visser
8. Axes of elongation of petrified stumps in growth position as possible indicators of paleosouth, Alaska Peninsula, by Leonid Smirnoff, William Connelly
9. Late Oligocene transgression of middle Atlantic Coastal Plain, by Richard K. Olsson, Kenneth G. Miller, Timothy E. Ungrady
10. Mount St. Helens eruptive behavior during the past 1,500 yr, by Richard P. Hoblitt, Dwight R. Crandell, Donal R. Mullineaux

ATLANTA MEETING

OPEN FORUM FOR GSA MEMBERS

An open forum will be held as part of the GSA Corporate Meeting on Tuesday, November 18, GWCC, Room 204, from 7:45 to 8:30 a.m. GSA members are invited to attend and participate. The forum may be extended for an additional hour if participation so indicates.

GEOLOGY DEPARTMENT CHAIRMEN
Discussion Session Program

Monday, November 17, 1980, 9:00 a.m.–11:30 a.m.
Marriott Hotel, Tara 2

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I. 9:00 a.m.–10:50 a.m.: "Aging Faculty in a Time of Limited Growth"

Speakers: Robin Brett, Director, Earth Sciences Division, National Science Foundation

Julian Goldsmith, Department of the Geophysical Sciences, University of Chicago

Richard H. Jahns, Department of Geology, Stanford University

Lawrence H. Lattman, Dean, College of Mines and Mineral Industries, University of Utah

Moderator: Charles B. Sclar, Department of Geological Sciences, Lehigh University

All faculty are cordially invited to attend this session.

II. 11:00 a.m.–11:30 a.m.: "Research Programs of the Earth Sciences Division, National Science Foundation": A discussion session. Presented by staff of the Earth Sciences Division, National Science Foundation.

Charles B. Sclar, 1980 Convener
Department of Geological Sciences
Lehigh University
Bethlehem, PA 18015
(215) 861-3660

GSA News & Information

Vol. 2, No. 11 November 1980

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

Gifts of art and stromatolite on display at GSA headquarters

During the summer, two paintings of geologic interest were presented to GSA for display in the headquarters building.

A painting of Monument Valley by the late Gladys W. Cole was presented to the Society by Dr. W. Storrs Cole. It is now hanging in the administrative offices of headquarters. As announced earlier, Dr. Cole also has endowed a new research fellowship for the Society in the name of Gladys W. Cole.

The other painting, by and presented by Dederick C. Ward, is of Siccar Point, Scotland. This locality, made famous by Hutton's description, shows Old Red Sandstone above a major unconformity. This painting is now hanging in the Meetings Department offices.

GSA's latest gift is 2 tons of stromatolite from the 1.8 b.y. old Kona Dolomite in the Chocolay Group of the Marquette Range supergroup near Negaunee, Michigan. This specimen was located by Dr. David K. Larue, now at Stanford, while he was doing field work for his dissertation under the direction of L. L. Sloss, the donor.

The laminated, convex upward structures built most likely by blue-green algae in shallow seas of the early Proterozoic Era are a fine example of the record of life during the early part of Earth's history. Such structures are widespread in carbonate rocks of the Proterozoic and early Paleozoic eras but are relatively rare in younger rocks supposedly because the evolution of effective grazing invertebrates restricted stromatolite development to marine areas of unusual salinity where the invertebrates could not thrive.

The stromatolite specimen now graces the garden immediately opposite the end of the front walkway to GSA Headquarters, and the graceful curvature of the laminae is well displayed as you leave the building and enter the parking lot.

This specimen was made available through the generosity of A. Lindberg and Sons, Inc., of Ishpeming, Michigan.

1981 ANNUAL MEETING
second call
for symposia proposals

Send titles and descriptions to:

Dr. Norman Hester, JTPC Chairman
Assistant Director, Kentucky Geological Survey
Breckenridge Hall, University of Kentucky
Lexington, KY 40506 (606) 258-5863

Deadline: January 1, 1981

CENTENNIAL NEWS

1888 – GSA – 1988

U.S. Leaders for Regional Geology Volumes

The biggest project of the Decade of North American Geology (D-NAG) is the synthesis of the geology of the North American plate and adjacent areas. The book publications of this project will include the Workbook on Problems of Regional Geological Synthesis growing out of the spring 1981 workshops announced last month, 23 volumes of regional geological synthesis, and probably three volumes summarizing the geology of North America. Eleven of the regional synthesis volumes will constitute the U.S. component of this project and will be published by GSA, as well as the Workbook and at least one of the summary volumes. The leaders for the U.S. volumes are listed below. They will be planning the outlines of their volumes and working with the Centennial Science Program Coordinator during the next 8 months to identify the authors of chapters within the volumes. Mode of publication of the volumes and other publication plans will be presented for discussion in the January issue of *News & Information*.

Geology of the North American Plate and adjacent areas—U.S. Project Leaders

1. **Eastern Pacific Ocean and Hawaii**
   E. L. Winterer, Scripps Institution of Oceanography
   D. L. Hussong, University of Hawaii
   R. W. Decker, U.S.G.S., Hawaii Volcano Observatory
2. **Alaska**
   George Plafker, U.S.G.S., Alaska Branch
   D. L. Jones, U.S.G.S., Alaska Branch
3. **Arctic Ocean**
   Leonard Johnson, Office of Naval Research, Arctic Programs
   Arthur Grantz, U.S.G.S., Alaska Branch
4. **Conterminous U.S. Cordillera**
   B. C. Burchfiel, Massachusetts Institute of Technology
   R. B. Smith, University of Utah
   P. W. Lipman, U.S.G.S., Central Environmental Geology Branch
5. **U.S. Continental Interior**
   L. L. Sloss, Northwestern University
   P. R. Vail, Exxon Production Research Corporation
   C. J. Mankin, Oklahoma Geological Survey
6. **Precambrian**
   J. E. Harrison, U.S.G.S., Central Environmental Geology Branch
   P. K. Sims, U.S.G.S., Central Mineral Resources Branch
   L. T. Silver, Caltech
   D. W. Rankin, U.S.G.S., Eastern Environmental Geology Branch
7. **Quaternary**
   H. E. Wright, Jr., University of Minnesota
   W. F. Ruddiman, Lamont-Doherty Geological Observatory
8. **Gulf of Mexico and Gulf Coastal Plain**
   A. Salvador, University of Texas, Austin
   R. T. Buffler, University of Texas, Galveston
9. **Appalachian/Ouachita Orogen**
   R. D. Hatcher, University of South Carolina
   G. W. Viele, University of Missouri
10. **Atlantic Coastal Plain and Shelf**
    J. A. Grow, U.S.G.S., Atlantic/Gulf Coast Marine Geology Branch
    R. E. Sheridan, University of Delaware
11. **Western Atlantic Ocean**
    P. R. Vogt, Naval Research Laboratory
    B. E. Tucholke, Woods Hole Oceanographic Institution

COUNCIL ACTIONS, SPRING 1980

The following actions were taken by the Council at its spring meeting in Boulder:

1. Discussed ways and means of preparing for the GSA Centennial in 1988; established a policy of holding an annual Centennial Decade Symposium, beginning with the Atlanta Annual Meeting.
2. Reviewed the completed GSA History manuscript received from Edwin B. Eckel.
3. Adopted a 1981 dues structure and various member and nonmember subscription prices.
4. Discussed the 1979 audit report and accompanying management letter.
5. Ratified the actions of the Investments Committee taken during its February 1, 1980, meeting in Boulder, Colorado, involving the various funds in the portfolio of the Society.
6. Approved the Atlanta Annual Meeting budget, including the supporting registration fees.
7. Changed the dates for the 1982 New Orleans Annual Meeting from October 25–28 to October 18–21.
8. Confirmed the following persons as members of the local committee for the 1983 Indianapolis Annual Meeting: Arthur Mirsky, General Chairman; Donald W. Levandowski, Co-Chairman; Haydn H. Murray, JTPC Chairman; Herbert J. Howe, Co-JTPC Chairman.
9. Approved certain financial resolutions.
10. Approved in principle the establishment of a GSA Foundation.
11. Received a report covering the May 12, 1980, meeting among the section treasurers, GSA controller, and meetings coordinator.
12. Selected a slate of nominees for officers and councilors for 1981 and selected a firm of certified public accountants to perform an audit for the year ending December 31, 1980, both to be presented by ballot to the membership for election in November.
13. Discussed an alternative method for electing councilors (not officers) other than by a single slate.
14. Selected Penrose and Day medalists and an Honorary Fellow; approved the award winners from the QG & G and Hydrogeology Divisions; selected a nominee for the 1980 National Medal of Science.
15. Ratified a Hydrogeology Division bylaw amendment.
16. Approved 192 research grants totaling $81,000; noted the recommendation to the Budget Committee that the 1981 funding level be raised to more than the $81,000 that was available in 1980; agreed that annually the applicant with the most outstanding proposal in the field of geomorphology be named the Robert K. Fahnestock awardee in honor of committee member Fahnestock who was killed in a light plane crash the day before the April 21 committee meeting; named the recipients of the Stearns Fellowship; noted the contributions received from industry, from past grant recipients, and from the membership; discussed the committee workload.
17. Advanced 46 Members to Fellowship; ratified the election of 411 candidates to Membership; declared that future appointments to the Membership Committee shall be made from the Fellowship of the Society; discussed the recruitment program and the campus representatives program.
18. Discussed the report on Access to Public and Private Lands prepared by a Geology & Public Policy Committee panel.
19. Approved two Penrose Conference proposals.
20. Accepted reports from standing committees, sections, and divisions.
21. Discussed the *Bulletin* format, manuscript flow, pricing, marketing, and member education.
22. Named a GSA designee/representative to the following:
    - Joint ASCE-GSA-AEG Committee on Engineering Geology, 7-1-79 through 6-30-82
    - U.S. National Committee on Tunneling Technology, 7-1-80 through 6-30-83
    - U.S. National Committee on Rock Mechanics, 7-1-80 through 6-30-83.
23. Set November 16 and 19, 1980, for the fall meetings of the Council in Atlanta, Georgia; set November 18, 1980, 7:45 to 8:30 a.m., for the corporate meeting/open forum, Room 204, Georgia World Congress Center.
24. Designated three proxy holders and three tellers and inspectors of election for the November corporate meeting.
25. Took other minor actions, records of which are on file at headquarters.

CALENDAR OF SECTION MEETINGS FOR 1981

SOUTHEASTERN
University of Southern Mississippi, Hattiesburg, Mississippi
March 19–20, 1981
Abstract deadline: October 28, 1980

CORDILLERAN
Valle Grande Hotel, Hermosillo, Sonora, Mexico
March 25–27, 1981
Abstract deadline: October 15, 1980

NORTHEASTERN
Bangor Civic Center, Bangor, Maine
April 9–11, 1981
Abstract deadline: October 31, 1980

SOUTH-CENTRAL
Trinity University, San Antonio, Texas
April 13–14, 1981
Abstract deadline: December 1, 1980

ROCKY MOUNTAIN
Rapid City Civic Center, Rapid City, South Dakota
April 16–17, 1981
Abstract deadline: November 17, 1980

NORTH-CENTRAL
Iowa State University, Ames, Iowa
April 30–May 1, 1981
Abstract deadline: November 27, 1980

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REQUEST FOR NOMINATIONS FOR THE SOCIETY'S PRESTIGIOUS HONORS AND AWARDS

FEBRUARY 1, 1981, has been set as the deadline for receipt at headquarters of nominations for the Penrose Medal, Day Medal, Honorary Fellowship, and the National Medal of Science.

To ensure thorough consideration by the appropriate subcommittee, the membership is asked to submit with each nomination a brief biographical sketch, such as used in *American Men and Women of Science,* a summary of the nominee's principal contributions to geology, and a *selected* bibliography of no more than 20 titles. In choosing nominees, scientific achievements should be considered, rather than contributions in administration and service.

The accompanying multi-purpose form may be used to submit nominations for any one of the four honors and awards. Completed forms should be sent to the Executive Director at headquarters.

Please keep in mind that although the automatic carryover of names of nominees is not permitted, headquarters retains the back-up material on each past nominee, and only updated information is necessary. If you resubmit a name, please ask headquarters to attach the back-up material to your nomination.

A brief description of each of the four honors and awards follows:

Please use this form. ☛

Penrose Medal

The Penrose Medal was established in 1927 by Dr. R.A.F. Penrose, Jr., to be awarded in recognition of eminent research in pure geology, for outstanding original contributions or achievements which mark a major advance in the science of geology. The award is to be made only at such time as the Council may decide. Nominees are to be selected by the Council, may or may not be members of the Society, and may be from any nation or any race of people. The sole object of Dr. Penrose in making the gift was to encourage original work in purely scientific geology.

Day Medal

The Day Medal was established in 1948 by Professor Arthur L. Day to be awarded annually, or less frequently, at the discretion of the Council, for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. It was the intent of Professor Day to recognize outstanding achievement and inspire further effort, rather than to reward a distinguished career.

Honorary Fellows

Honorary Fellows of the Society are selected from those geologists who have distinguished themselves as geological investigators or who have rendered special service to the Society. Only in very unusual circumstances will nominees in North America be considered for election to Honorary Fellowship. The subcommittee will select for nomination to the spring Council a list of at least four candidates. Rarely are more than two Honorary Fellows elected in any one year. A majority vote of Council is required for election.

National Medal of Science

In 1959, Congress established a National Medal of Science to be awarded by the President of the United States to individuals "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences." In addition, achievements of an unusually significant nature will be considered and judged in relation to the potential effects of such achievements on the development of scientific thought.

The GSA subcommittee normally nominates one candidate to the spring Council. The Council then submits the nomination to a committee composed of scientists and engineers which assists the President in identifying a limited number of distinguished candidates for these awards.

CHANGE OF ADDRESS,*

The Geological Society of America, P.O. Box 9140, Boulder, CO 80301

NAME _____
(Please print)

New Address _____

_____

_____

_____

_____
City State/Province Zip Code

_____
Country

Member Number _____

Former Address—Attach Mailing Label

_____
Effective Date of Change

*North American members should report address changes 6 weeks in advance; all others, 3 months, in advance.

THE GEOLOGICAL SOCIETY OF AMERICA

Nomination for Penrose Medal, Day Medal, Honorary Fellowship, or National Medal of Science
(Please circle one of the above)

Name of nominee:

Address:

Biographical information:

Summary of principal contributions to geology:

(over)

Selected bibliography: (No more than 20 titles)

SUPPORTING LETTERS MAY BE ATTACHED.

Name of person making this nomination _____

Address _____

_____

Date _____ Signature _____

Return to: Executive Director
The Geological Society of America
P.O. Box 9140
Boulder, CO 80301
(303) 447-2020

THE GEOLOGICAL SOCIETY OF AMERICA

Annual research awards program 1981

The Geological Society of America will continue its annual research awards program in 1981. Eligibility is not restricted to GSA members. New application forms for 1981 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 1981 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 $81,000 for grants in 1980. The grants went to 192 students doing research for advanced degrees. The average amount granted was $422.00. The highest grant was $1,000, but there is no predetermined maximum amount.

Applications must be postmarked by **February 15.** 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 Pacific Islands and 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. Applications must be postmarked by **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.

APPLICATIONS MUST BE POSTMARKED BY FEBRUARY 15, 1981.

[PLEASE POST]

Two contributions to the AESE "Aids to Geowriting" series

TIME AND TIME AGAIN

Janet L. Cluff, Woodward-Clyde Consultants, San Francisco, California

How many times do you write "upper" when you mean "late"? How often do you find this kind of misuse of time terms in formal publications? Because geology has largely to do with history, opportunities for the misuse of time terms are abundant. For the same reason, writers of geology need to take special care to use these terms correctly.

Every geoscientist who writes has been told, at some time in his training, that the terms "lower," "middle," and "upper" refer to lithostratigraphic position. He also should know that "early," "middle," and "late" are used when describing geologic time. Moreover, when used informally, these terms are not capitalized. They begin with capital letters only when they describe series or epochs of the Mesozoic or Paleozoic Eras, because these are formal, defined stratigraphic and time divisions. Thus, we have lower Tertiary rocks deposited during the early Tertiary, Upper Jurassic formations formed during the Late Jurassic Epoch, and upper Pliocene rocks of late Pliocene age.

The subdivisions themselves need to be treated with care. "Era," "period," and "epoch" are time terms. They are not capitalized when used generally; when used with a formal name, they are. We have, for example, Cenozoic Era, Tertiary Period, and Late Jurassic Epoch. Beware of incorrect casual usage such as Cenozoic period or Holocene period.

How many times have you seen a stratigraphic column that uses the heading "era"? Era, remember, is a time term. Corresponding terms for lithostratigraphic position are "erathem," "system," and "series." The capitalization rule is the same as that for time terms—do not capitalize a position term unless it is used as a proper name. Examples of formal position terms are Paleozoic Erathem, Permian System, and Upper Permian Series.

The proper use of time terms goes beyond formal descriptions of rocks and their time histories. Good technical writers also are aware of general time terms and use them accurately. Words that tell *when* are not interchangeable with words that tell *where* or *how much*.

Scrutinize sentences such as, "Streambanks, *sometimes* very steep, expose an *occasionally* well-developed soil profile and *frequent* granite boulders." Recognize the highlighted words as those that refer to time. A more accurate description would be: "Streambanks, *at places* very steep, expose a *locally* well-developed soil profile and *many* granite boulders."

Do you say "while" when you mean "whereas"? "Carbon-14 analyses resulted in some dates, *while* palynological analyses were inconclusive *since* insufficient pollen was present." In this sentence, "while" should be "whereas"; a more direct conclusion that omits the time term "since" would be: "because of insufficient pollen."

"Erosion *in* the *last* period of high discharge exposed deposits of *upper* Tertiary age." The use of the time term "during" would improve the first part of this sentence; "last" means final, and by now we should be aware of the incorrect use of "upper" when "late" is meant. A small amount of careful editing results in a more accurate sentence: "Erosion *during* the *most recent* period of high discharge exposed deposits of *late* Tertiary age."

With your new-found sensitivity, you can easily spot errors such as, "*When* active faults are present, terraces are *often* displaced." Time implications are best deleted, and a preferred style might be: "*Where* active faults are present, *most* terraces are displaced," or, even better, "Along active faults, terraces are commonly displaced."

Formal scientific papers are not the place for inaccurate time terms. Conversational geology and poor writing habits tend to distract the reader from your meaning and intention. When you are reviewing drafts of your writing, correcting informal terminology, and deleting jargon, remember to concentrate part of that polishing effort on differentiating between words that describe time and words that describe position. Correct them, time and time again, so that your poor writing habits will not detract from the quality of the science in your report.

STRIKE BACK AGAINST TECHNICAL DENSITY

Jay Fussell, University of Nebraska-Lincoln

Trends in English exposition are running toward shorter sentences but longer compounds, to the extent that the latter often neutralize the progress introduced by the former. Longer words—especially technical compounds—slow down reading comprehension even as shorter sentences speed it up. When one technical term is crowded next to others, the result is a supercondensed sentence that readers may have to reread a time or two before they can crack the code.

This means that abbreviated syntactical units carry reduced amelioration in sentential communicability when they are effectively qualified by multifarious elongated lexical constituents.

So much for the elegant variation.

The point here is not the often-encountered advice given to scientific writers to keep it short and simple, helpful as that may be. No, the main point here is that if you keep it simple, you don't always have to keep it short. In fact, you will write more interesting prose—and hence more readable exposition—if you deliberately vary your sentence length by mixing sentences that are shorter, longer, and somewhere in between. This effectively gets rid of a certain monotony known as the primer style produced by a text of all short, declarative sentences (Jane is a girl. Jane is eight years old. Jane goes to school. Jane likes school.).

So, to horrible example number one, please attend:

> A small, downthrown, east-west gravity fault trending southwesterly, with a throw of 300 feet and a strike of N82°E, occurs on the northern flank of the west-plunging Cochran Arch, possibly as an extension of

the complex Whalen Fault Zone, being limited on the east by the Bordeaux segment of the Bordeaux-Hyannis-North Platte Fault Trend and on the west by the Toadstool Park Fault.

That sentence could be rewritten as follows:

A gravity fault having a throw of 300 feet and a strike of N82°E occurs on the northern flank of the west-plunging Cochran Arch. That arch, possibly an extension of the Whalen Fault Zone, is limited on the east by the Bordeaux segment of the Bordeaux-Hyannis-North Platte Fault Trend and on the west by the Toadstool Park Fault.

This two-sentence revision gives the same basic information in six words less. The greatest drawback of the original sentence is that technical terms come thick and fast together, falling all over one another in a profusion of power-packed information that is hard to assimilate. The result: literary indigestion. Or a case of technical density, which is another way of saying the same thing.

Technical density is simply too many technical terms crammed together so close that the reader has to stop or slow down in his reading in order to comprehend the writer's meaning. When that happens, the writer is not communicating freely and easily with his reader. His text has become labored, unnatural, difficult, and dull. The text has lost some of its potential to interest the reader, which means that it has also lost some of its capacity to inform.

Since scientific writing aims primarily to inform, prose that is weighed down with technical density loses some of its ability to get itself read and some of its capacity to communicate; all this reduces its potential to inform. Technical density thus strikes at the heart of scientific writing's reason for being.

The Rule of Technical Density is inexorable: a reader's ability to understand a sentence goes up when the number of technical terms goes down. Put another way, the more technical terms included in a sentence, the less easily will the reader understand its meaning.

Victor Borge, that droll Dane of keyboard fame, once defined a mermaid as: "Half woman and more fish than you really need." Analogously, too many scientific reports are half statistics and more technical terms than you really need. Some scientists seem convinced that the ideal scientific report consists only of pure statistics that can be replicated within 100 percent accuracy.

But life is not like that; science is not like that; and good scientific reports are not like that. Somehow the writer must cast his results within a meaningful framework of language. And to accomplish that, he must develop some skill in expository writing.

The problem of technical density is akin to but not equivalent with the problem of technical jargon. Jargon is simply the shorthand language of a particular field, which appears mysterious to the uninitiated but which communicates speedily and well with the insider. Technical jargon may complicate a sentence, but it is not the same thing as technical density.

Technical density, on the other hand, is the cramming of technical terms too close together so that reading comprehension slows or stutters, forcing the reader to reread a passage in order to dig out the writer's meaning. This is why a certain amount of technical jargon may occur within the normal patterns of spoken English without impeding understanding. But too many technical terms piled upon one another make for such a compacted sentence that ready comprehension is sacrificed.

A sentence does not have to be long to be technically dense. For example, this relatively short sentence from a text on physical geology illustrates graphically the problem of technical density:

Millions of tons of bedrock have been moved in huge, mud-like plastic deep earth flows.

The clumping of technical terms comes in the phrase "huge, mud-like plastic deep earth flows." In returning to that phrase, the reader is puzzled by the term *plastic,* not being sure initially whether it is an adjective or a noun. The punctuation seems also to have been botched.

If we try to get rid of the passive voice in that sentence and recast it with less technical density, we might say:

Huge earth flows, coming from great depth and oozing along like mud, have moved millions of tons of bedrock.

Quite often the technical terms that fall all over one another are adjectives that precede a noun serving as the subject of its sentence, and frequently some of these are either unit modifiers or attributive nouns. But, of course, it is possible to pile abstract nouns so close together that another case of technical density is born, such as the following example taken from a remote-sensing bulletin:

The processing options currently available allow variable image annotation, mating of two corrected images, application of systematic corrections, sizing of an image through either pixel replication or sampling, and application of enhancements such as haze removal, contrast stretch, destriping, synthetic line generation, and high frequency edge enhancement.

A sentence burdened by technical density is an unnatural and forced form of communication that turns its back on the free-flowing patterns of spoken English. It may be short, but it is still unnatural. To overcome this liability, the writer may have to use more words and at times even more sentences.

Someone may point out that this advice flies in the face of the usual editorial admonition to keep sentences short and pruned of all unnecessary words. That's still good advice, but the law of diminishing returns operates here as well as in economics. Soil scientists know that when a soil becomes too compacted, it becomes impermeable and infertile. Good sentences, like good soil, need enough air spaces to produce a harvest.

So be kind to yourself: uncomplicate your sentences. You can do this be separating clumps of technical terms with the air spaces provided by less technical language, by using more dependent clauses, by subordinating part of your sentence so that another part receives primary stress, by using more connectives, and at times by breaking up a particularly dense sentence into two or more sentences.

But if all this seems too hard to remember, just use fewer technical terms. As Sir Winston Churchill once remarked: the old words are best, and when they are short, they are the best of all.

UPDATE

Irwin Remson named Birdsall Distinguished Lecturer

The Hydrogeology Division of the Geological Society of America has selected Irwin Remson as the John Birdsall Distinguished Lecturer in Hydrogeology for the 1980–1981 academic year. This is the fourth year of the lecture series, and Dr. Remson will visit about 10 institutions at which he will present a technical lecture on "Optimal Ground-Water Management" and a popular lecture on "Modern Hydrogeology—Capabilities and Challenges."

Dr. Remson is Professor and Chairman of the Department of Applied Earth Sciences at Stanford University. He shares an appointment as Professor of Geology and supervises the programs in Applied Hydrogeology and Environmental Earth Sciences. Dr. Remson was a coworker of John Birdsall when both were geologists with the U.S. Geological Survey.

Arrangements for the lecture tour are made possible by the bequest of John Birdsall. The Geological Society of America pays transportation expenses; the host institution covers the expenses of the lecturer's lodging and meals.

If your department or institution would like to be considered for scheduling of this year's tour, please contact: David A. Stephenson, Woodward-Clyde Consultants, 3 Embarcadero Center, Suite 700, San Francisco, CA 94111; Telephone: (415) 956-7070.

Fulbright awards for 1980–81 announced

The Council for International Exchange of Scholars has announced 500 Fulbright awards to American scholars for university teaching and advanced research abroad in a variety of disciplines for 1980–81. While complete lists are not yet available, three American recipients have been announced, including two GSA members:

James W. Collinson (GSA member), Associate Professor of Geology, Ohio State University, Columbus, for research on comparative study of Triassic rocks in the Tasmania-Antarctic sector of Gondwanaland; University of Tasmania, Hobart, Australia, 11/79–7/80.

Ernest H. Gilmour (GSA member), Professor and Chairman of Geology, Eastern Washington University, Cheney, for lecture on invertebrate paleontology, carbonate petrology and paleoecology, biostratigraphy, stratabound ore deposits, and field geology; University of Peshawar, Pakistan, 9/80–6/81.

Robert G. Raynolds, Professor of Earth Sciences, Dartmouth College, Hanover, New Hampshire, for lecture on stratigraphy, sedimentary geology, plate tectonics, and remote sensing; University of Peshawar, Pakistan, 9/80–6/81.

The Council is now reviewing American applications for 1981–82. Further information is available from the Council for International Exchange of Scholars, Department N, Eleven Dupont Circle, Washington, DC 20036. Registrations are now being accepted for the 1982–83 announcement, to be issued in March 1981.

NSF Chautauqua Short Courses for nonacademic scientists and engineers

Ten short courses in the 1980–81 series of NSF Chautauqua Short Courses will be open to a mixed audience of college teachers and nonacademic professionals in science and engineering. Topics include alternative fuels from an engineering perspective, frontiers of neurosciences, immunobiology, recent advances in genetics and fetal development, mathematical modeling in the biological sciences, risk-benefit analysis, chemical oceanography, remote sensing of the earth, advances in coherent optical science and engineering, and exploratory data analysis.

These courses are an extension of the successful series of NSF Chautauqua Short Courses for College Teachers held at Regional Field Centers throughout the U.S. The American Association for the Advancement of Science (AAAS) has developed the program each year since its inception in 1971.

The aim of these short courses is to enable invited scholars at the frontiers of various sciences to communicate recent advances in their fields directly to college science teachers and science and engineering professionals from industry or other nonacademic settings. The scholars meet intensively with 25 participants for a total of four days—two days in the fall and two days follow-up in the spring. Between the fall and spring sessions, participants work on projects related to the course or do independent study, depending on the nature of the course.

Fall sessions are scheduled in October-November; spring sessions in February-March.

Seven classes will be held at the Polytechnic Institute of New York/White Plains field center; five classes will be held at the Oregon Graduate Center. Lodging is provided for participants on a double-occupancy basis.

A brochure with full descriptions, schedules, and an application form is available from the AAAS Office of Science Education, 1776 Massachusetts Avenue, N.W., Washington, DC 20036.

SEE YOU IN ATLANTA!

Necrology

Notice has been received of the following deaths: Kenneth S. Fagg, Chappaqua, New York; Milford S. Lougheed, Bowling Green, Ohio; John C. Maher, Menlo Park, California; Caleb W. Wolfe, Salem, Massachusetts.

Upcoming GSA Annual Meetings

1981 Cincinnati, Ohio
November 2-5
HQ Hotel—Stouffers Cincinnati Towers
General Chm.—Warren D. Huff

1982 New Orleans, Louisiana
October 18-21
HQ Hotel—Hyatt
General Chm.— Jules Braunstein

1983 Indianapolis, Indiana
October 31-November 3
HQ Hotel—to be announced
General Chm.— Arthur Mirsky

GSA PUBLICATIONS

International atlas of ophiolites

MC-33—Working group, International Geological Correlation Program Project 39. 1979. Four sheets in color: (1) Ophiolitic Terranes of part of the Western United States, compiled by William P. Irwin, 18″ × 21″; (2) Ophiolitic Belts of the Central Mediterranean, compiled by Volker J. Dietrich, 35″ × 31″; (3) Ophiolitic Belt of the Urals, compiled by A. Knipper, 11″ × 40″; (4) Ophiolitic Belts of the Himalayan and Tibetan Region, compiled by Augusto Gansser, 51″ × 30″. Scale, 1:2,500,000. With 15-page text ....Folded: $19.00; rolled: $20.50

This first contribution to the International Atlas of Ophiolites presents data on four major ophiolitic belts: part of the western United States by W. P. Irwin; the central Mediterranean region by V. J. Dietrich; the Ural Mountains by A. L. Knipper with text by A. Perfiliev; and the Himalayan and Tibetan region by Augusto Gansser.

These studies by specialists on the respective orogenic belts contribute substantially to knowledge of the composition and age of disturbed stratigraphic sequences in these belts and to interpretations of tectonic histories of the belts. The studies should also aid in the search for chromite, nickel, copper, manganese, and other mineral commodities commonly associated with such belts.

In the western United States, ophiolitic rocks are important components of the California Coast Ranges, the Klamath Mountains, the Sierra Nevada, and the Ochoco–Blue Mountains of northeastern Oregon. Similar rocks crop out at a few localities in Nevada and form a poorly defined zone that extends from the north-central to the southwestern part of the state. The ophiolites and associated oceanic rocks of the western United States crop out in four, subparallel, belt-like terranes, the oldest of which is the easternmost, and the youngest of which is the westernmost. These terranes are considered to be of Early Paleozoic, Late Paleozoic and Triassic, Early or Middle Jurassic, and Late Jurassic ages, respectively.

In the central Mediterranean region, suites of ophiolites are important components of the relatively young orogenic belts of the Alps, Corsica, Apennines, Calabria-Peloritanian arc, Sicilian Maghrebides, Carpathians, Apuseni Mountains, Dinarides, Balkans, Hellenides, Crete, Cyclades, and the western part of Turkey.

In the long, narrow orogenic belt of the Ural Mountains, ophiolitic zones are a characteristic feature of the Paleozoic. They occur in rocks of pre-Ordovician, Ordovician–Lower Silurian, Upper Silurian–Lower Devonian, and Upper Devonian–Lower Carboniferous ages.

In the Himalayan and Tibetan region, which is tectonically disturbed on a massive scale, ophiolitic rocks are concentrated in three principal zones delineated from south to north as follows: (1) as conspicuous oversized masses and elongated slices in the main suture zone between the Himalayan (Indian) and Tibetan (Eurasian) subcontinental plates; (2) as disconnected slices of mantle-type, ultramafic rocks, probably of early Mesozoic age, within the southern part of the Tibetan plate; and (3) ophiolites, probably of pre–Late Carboniferous age, related to structures in the Kun Lun and Astin Tagh Ranges.

These four maps were prepared with the financial assistance of UNESCO within the framework of the International Geological Correlation Programme.

Geologic map of Mauna Kea volcano, Hawaii

MC-30—By Stephen C. Porter. 1979. In color, 50″ × 33″. Scale, 1:50,000. With 4-page text ....Folded: $6.00; rolled: $7.50

During Pleistocene time, glaciers formed on the peak of Mauna Kea, the highest (4,206 m) of the five massive shield volcanoes that make up the island of Hawaii. Comparable glaciers did not form elsewhere on volcanic peaks in the Hawaii chain. The glacial deposits on Mauna Kea are intercalated with various types of extrusive volcanic rock, and this association has permitted very accurate mapping and dating of both glacial and volcanic features.

This newly published map of Mauna Kea delineates deposits attributable to four periods of glaciation, the oldest of which occurred 278,500 ± 68,500 yr ago and the youngest of which occurred 9,090 ± 200 years ago. Assemblage of dates on volcanic rocks indicates that the oldest rocks exposed on the volcano are at least 382,000 ± 60,600 yr old, and suggests that the bulk of underlying volcanic material above sea level may be as much as 500,000 yr old.

A detailed article describing the geologic features and deposits depicted on the map appears in the *Geological Society of America Bulletin* (1979, v. 90, no. 7, Part I, p. 609–611, Part II, p. 980–1093). Subsidiary lines of investigation carried out as part of the mapping project also led to publication of several articles by the author and others on additional aspects of the geology of Mauna Kea. These are cited at the end of the text accompanying the map.

STRATIGRAPHY AND GLACIAL-MARINE SEDIMENTS OF THE AMERASIAN BASIN, CENTRAL ARCTIC OCEAN

SPECIAL PAPER 181

Edited by David L. Clark, Rick R. Whitman, Kirk A. Morgan, and Scudder D. Mackey. 1980. vi + 57 pages, 67 figures, 8 plates (black and white fold-outs), 10 tables. LC: 80-65270. ISBN: 0-8137-2181-4 . . . . . **$13.00**

This volume is a comprehensive summary of stratigraphic and sedimentologic investigations in the central Arctic Ocean supported by the Office of Naval Research during the past 12 years. Some 13 glacial-marine lithostratigraphic units ranging in age from late Miocene to Holocene are described and correlated over a major part of the Amerasian Basin. A classification of glacial-marine sediment designating four textural classes is proposed and is applied to selected non-Arctic glacial samples. Sections of the volume include a series of clay mineralogy maps for the Arctic, description of surface and in-core sedimentation processes, and a final chapter on paleoclimatology of the central Arctic.

Sedimentation rates based on magnetic stratigraphy suggest that glacial-marine sedimentation has been in progress in the central Arctic Ocean since at least the Miocene. Stratigraphic units are interpreted to represent intervals of alternating increased and decreased glacial ice-rafting. Correlation with glaciations, defined by oxygen-isotope stratigraphy, is demonstrated for the Pleistocene.

The volume is unique in synthesizing the sedimentologic history for the major part of an ocean basin. Tables, appendices, and maps provide the documentation.

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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.

• S01101—An analysis of drumlin form in the northeastern and north-central United States: Summary.

Hugh H. Mills, Department of Earth Sciences, Tennessee Technological University, Cookeville, Tennessee 38501. (3 p., 2 figs.)

• S01102—Geology and petrology of Volcán Ceboruco, Nayarit, Mexico: Summary.

Stephen A. Nelson, Department of Geology and Geophysics, University of California, Berkeley, California 94720 (present address: Department of Geology, Tulane University, New Orleans, Louisiana 70118). (5 p., 3 figs.)

• S01103—The structural analysis of the Wissahickon Schist near Philadelphia, Pennsylvania: Summary.

Daniel J. Tearpock, Atwater Consultants, Ltd., New Orleans, Louisiana 70130; Richard Bischke, Department of Geology, Temple University, Philadelphia, Pennsylvania 19122. (4 p., 4 figs.)

Bulletin Briefs

Titles and abstracts of conventional articles in the November 1980 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* at bottom of page.

• 01104—Collision-deformed Paleozoic continental margin of Alaska—Foundation for microplate accretion.

Michael Churkin, Jr., Claire Carter, James H. Trexler, Jr., U.S. Geological Survey, Western Region, Menlo Park, California 94025. (7 p., 7 figs.)

Construction of a map of basement rocks of Alaska has revealed a complexly deformed, arcuate Paleozoic continental margin that is a northwestern extension of the western margin of North America. Three key areas in Alaska (Nation River, Livengood, and Terra Cotta Mountains) have similar sections of Ordovician to Devonian and locally younger Paleozoic siliceous shale and chert, interfingering with limestone and containing various turbidity-current and slope deposits. Microplates moving north from the Pacific basin have collided with this Paleozoic continental margin and deformed and collapsed the original shale-out facies. A similar south-facing collapsed continental margin of middle and late Paleozoic age can be traced across the western Brooks Range of northern Alaska. We believe that this continental margin in the Brooks Range, although it is mainly younger, may be an extension of the same margin in central Alaska. This continental margin has been offset to the Brooks Range along the Porcupine megashear.

• 01105—Tertiary and Cretaceous paleoenvironments in the southwest Atlantic Ocean: Preliminary results of Deep Sea Drilling Project Leg 71.

William L. Ludwig, Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York 10964; Valery Krasheninnikov, Geological Institute, USSR Academy of Sciences, Moscow ZH-17 109017, USSR (Co-Chief Scientists).

Ivan A. Basov, Laboratory of Mineral Resources, USSR Academy of Sciences, Moscow 109017, USSR; Ulf Bayer, Institut fur Geologie und Palaontologie, Universitat Tubingen, 7400 Tubingen, Federal Republic of Germany; Jan Bloemendal, University of Liverpool L69 3BX, England; Brian Bornhold, Pacific Geoscience Center, Victoria, British Columbia, V8L 4B2, Canada; Paul Ciesielski, University of Georgia, Athens, Georgia 30602; Elaine H. Goldstein, Florida State University, Tallahassee, Florida 32306; Christian Robert, Centre Universitaire de Luminy, 13288 Marseille, Cedex 02, France; John C. Salloway, University of Edinburgh EH9 3J2, Scotland; John L. Usher, Scripps Institution of Oceanography, La Jolla, California 92093; Hans Von der Dick, Institut Geologie der Erdoels und der Kohle, 51 Aachen, Federal Republic of Germany; Fred M. Weaver, Exxon Production Research Co., Houston, Texas

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77001; Sherwood W. Wise, Jr., Florida State University, Tallahassee, Florida 32306. (10 p., 3 figs.)

DSDP Leg 71 in the South Atlantic confirmed that the early opening (Neocomian-Aptian) of the South Atlantic was marked with restrictive circulation in which shale units high in organic carbon (1.7% to 4.1%) were deposited. Ratios of gaseous hydrocarbons and pyrolysis-fluorescence analyses suggest a fairly high degree of maturity of the black shale. A comparatively complete Cretaceous section provides biostratigraphic reference for the South Atlantic. Major erosion occurred at or near the Tertiary-Cretaceous boundary prior to the opening of the Drake Passage (Eocene-Oligocene). The early Tertiary was marked by mild climatic conditions and periods of exceptionally rapid sediment accumulation (as much as 44 m/m.y.) separated by hiatuses or condensed intervals. Paleomagnetic measurements recognize the Brunhes and Matuyama (with Jaramillo and Olduvai events), Gauss (with Kaena and Mammoth events), and Gilbert (with Cochiti event) Epochs. Correlation of this paleomagnetic scale with siliceous microfossil zonations was accomplished. Siliceous and calcareous microfossils reveal pronounced fluctuations of the Polar Front in the Pliocene and Pleistocene. Warm intervals occurred in the late Gilbert and middle Gauss Epochs; cooler conditions were prevalent in the late Gilbert–early Gauss. The late Pliocene was marked by climatic deterioration with brief warmings in the uppermost Matuyama and upper Brunhes. Sedimentation rates dropped markedly from 180 m/m.y. in the early Pliocene (Gilbert Epoch) to 2.3 m/m.y. in the Pleistocene (early Brunhes).

• 01106—Use of immobile trace elements to determine original tectonic setting of eruption of metabasalts, northern Sierra Nevada, California.

Elwood R. Brooks, Department of Geological Sciences, California State University, Hayward, California 94542; David G. Coles, Nuclear Chemistry Division, L-233, Lawrence Livermore Laboratory, P.O. Box 808, Livermore, California 94550. (7 p., 5 figs., 3 tbls.)

New abundance data for Ti, Zr, Y, Sr, Cr, Hf, Ta, and Th in metamorphosed late Paleozoic basalts from the northern Sierra Nevada confirm that these rocks originated in an island arc. Furthermore, the data show that the original basalts belonged to the tholeiitic—rather than calc-alkalic—rock association of island arcs. Standard discrimination diagrams identify the island-arc tholeiite magma type; their utility was sternly tested by these thoroughly recrystallized (greenschist facies) rocks, whose island-arc origin had already been suggested by their petrography.

• 01107—Myrmekite as a marker between preaqueous and postaqueous phase saturation in granitic systems: Discussion and reply. (3 p., 1 fig.)

Discussion: *Evan R. Phillips* (deceased), *Department of Geology, University of Wollongong, P.O. Box 1144, Wollongong, N.S.W. 2500, Australia.*
Reply: *M. J. Hibbard, Department of Geological Sciences, Mackay School of Mines, University of Nevada, Reno, Nevada 89557.*

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