

GSA TODAY

A Publication of the Geological Society of America

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Inside the Exhibit Hall, San Diego, 1991 Annual Meeting

GSA "Goes Public" in San Diego

Sandra Rush, Media Consultant for the 1991 Annual Meeting
Sue Beggs, GSA Meetings Manager

GSA's "going public" won't appear on the stock exchange. In this case, going public means that GSA is getting more involvement, more participation, and more recognition from the public as a result of each annual meeting. San Diego proved to be the rule rather than the exception.

The meeting theme, Global Perspectives, underscored GSA's concern for preserving the environment of our planet while still meeting the needs for extraction and utilization of resources necessary to support human society. Geologists, many of whom have looked beyond their own interests to relate to this endeavor, attended a special opening keynote symposium at the San Diego meeting: The Global Challenge: Our Environment, Our Resources, Our Responsibilities. From Lynn Margulis's Gaia for Geologists: Darwinian Time and Vernadskian Space, to Brian Skinner's A Kilometer and Deeper: Will Geologists Be Ready for the Tough Prospecting Challenges Ahead?, the four-hour symposium, which was open to the public, covered a breadth of topics for the 2500-person audience.

Another way in which GSA is going public is through education. Local teachers at the secondary and community college levels were invited to attend the meeting as guests of the Society. They were encouraged to bring students who were interested in geology. Thirty-five teachers were able to take advantage of this invitation, some traveling more than 100 miles to attend. This outreach effort, which GSA has supported since 1989, will pay dividends in the classroom as these teachers bring back the ideas they learned in the Geology Education and other sessions as well as in short courses. Particularly well attended was the workshop on using videos in the classroom which was offered by the Annenberg/CPB Project as part of its outreach program related to *Earth*

Revealed, the new 26-part television series being introduced this fall.

Not content to just have teachers and students visit our Annual Meeting, we also reached out to teachers and students in the San Diego area with our 14th annual Geoscience Day field trip. Approximately 150 minority middle school students and teachers from O'Ferrill Community School, Bell Junior High School, Gompers Secondary School, and Correia Junior High School investigated active faults, collected fossils, and discussed the geologic evolution of the San Diego area with a group of 20 GSA scientists.

In addition, the San Diego Annual Meeting Committee, in conjunction with GSA's exhibitors and participating geology departments, arranged sponsorship for 43 top undergraduate seniors at the meeting. The purpose was to introduce some of the best and brightest of the nation's students to broader visions in geology. The students, two of whom came from Canada and two from Mex-

ico, have expressed such appreciation for this opportunity that it has been a pleasant reward for those who put many hours into providing local hospitality.

How else has GSA gone public? Through the media, of course. The media coverage at this meeting was excellent, and we continue to see geology and GSA in the news. During the meeting, GSA had articles published in the *New York Times*, the *Washington Post*, *USA Today*, the *Boston Globe*, and the *Los Angeles Times*, as well as the San Diego papers, and other newspapers all around the world. GSA was also mentioned on "Good Morning, America," had the featured science spot on CNN, and was on the San Diego television news every night of the meeting. Radio coverage from National Public Radio and Voice of America, along with the San Diego and Los Angeles stations also contributed to GSA's going public through the media. The cooperation of GSA members in being available for media interviews contributed in large part to this success.

The story garnering the greatest press interest was the controversy over the age of the Sphinx. Robert M. Schoch, Boston University, asserts that the Sphinx, previously thought to have been crafted by Pharaoh Khafre around 2500 B.C., was merely remodeled by him. It was originally carved, according to Schoch and coauthor John Anthony West, by an ancient civilization between 5000 and 7000 B.C., and possibly earlier. This controversial finding, based primarily on differential patterns of weathering and erosional features on both the surface of the Sphinx and the surface of the ground surrounding it, found its way into the news media around the globe. *USA Today* titled their half-page article, "The latest mystery of the Sphinx: His age." Apparently, the reporter didn't dig far enough into the sand to see that the Sphinx is actually female!

And dinosaurs, of course, always generate public interest. Convincing evidence was presented at the meeting and to the media of both sides of the dinosaur extinction story—that the creatures gradually became extinct over time or that extinction occurred catastrophically due to the impact of an asteroid on Earth. In fact, proponents of each of these theories agree on only one thing—dinosaurs have disappeared!

Local reporters were interested in a presentation on unusual marine conditions that indicate a coming El Niño in the San Diego area, as reported by Robert Casey, a member of a research team from the University of San Diego Marine Studies Program. The many studies on earthquakes, always of concern in California, also garnered local media attention. The Congressional Field Hearing held during the meeting focused on the threat in southern California. In addition, David Schwartz of the USGS in Menlo Park showed through trenching studies that the 1989 Loma Prieta earthquake did not rupture the Santa Cruz Mountain segment of the San Andreas fault, and therefore that segment may still be building toward a large earthquake.

And for *really* local press coverage, GSA published a daily meeting newsletter, *Down to Earth*, highlighting sessions and talks of general interest, late-breaking news, and social events of the meeting. Response to the newsletter has been very favorable. Participants at the meeting provided articles for it through news releases and personal requests. And again, as at last year's meeting, teachers brought stacks of the newsletters back to their classrooms to use as "up-to-date teaching materials."

Yet a third way to go public is to invite the public to special events of a meeting. The 1991 GSA Annual Meeting offered not only a keynote symposium, but also a public policy forum, and a congressional field hearing, all three free and open to the public. U.S. Congressman George Brown, Jr. (D—Calif.), Chairman of the House Committee on Science, Space, and Technology, chaired the Congressional Field Hearing. He also was a featured speaker at the Global Challenge Roundup, which, along with the keynote symposium, featured internationally recognized speakers on a wide spectrum of environmental and resource issues. The Geology and Public Policy Committee forum focused on emergency response planning and earthquake scenarios.

Field Trip registration was open to everyone, not only those who registered for the meeting. The Field Trip Committee, led by Michael Walawender, San Diego State University, organized 26 field experiences for 675 par-

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Mark Your Calendars—1992 Meeting Dates and Deadlines

SOUTH-CENTRAL SECTION

Houston, Texas, February 24–25
Preregistration Deadline: January 20

SOUTHEASTERN SECTION

Winston-Salem, North Carolina, March 18–20
Preregistration Deadline: February 21

NORTHEASTERN SECTION

Harrisburg, Pennsylvania, March 26–28
Preregistration Deadline: February 26

NORTH-CENTRAL SECTION

Iowa City, Iowa, April 30–May 1
Preregistration Deadline: March 31

CORDILLERAN SECTION

Eugene, Oregon, May 11–13
Preregistration Deadline: April 15

ROCKY MOUNTAIN SECTION

Ogden, Utah, May 13–15
Preregistration Deadline: April 15

GSA ANNUAL MEETING

Cincinnati, Ohio, October 26–29, 1992
Preregistration Deadline: September 25

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Going Public *continued from p. 1*

ticipants. The trips ranged from one to five days. While fees ranged from \$45 to \$325, most of the trips ran between \$140 and \$250. The two popular half-day trips to view the unique geology of downtown San Diego drew 162 participants.

Outreach included sponsorship of the Graduate School Interview program, which was well received by 54 participating university and college graduate programs. The interview area was active from Monday morning through Thursday afternoon. Primarily attended by Master degree candidates, interviews were also sought by undergraduates considering 1992 and 1993 graduate programs. This interview opportunity will be continued at future annual (and possibly section) meetings, giving universities ongoing opportunities for new contacts.

The 1991 Annual Meeting offered so many sessions during the day that registrants got their exercise by hiking from session to session in the new light and bright San Diego Convention Center, known internationally for its unique architecture. For those who needed even more exercise, the meeting offered a tennis tournament, a 5K sunrise run, and even a volleyball tournament.

The Exhibit Hall housed 168 exhibitors and 257 exhibit booths, offering everything from the latest camera and computer techniques to the most recent geology texts and videos, to fossil pendants and a myriad of gemstones. The planning and effort put into the upgrading of exhibitors and booth space has shown results since the 1979 San Diego Annual Meeting, when there were only 99 exhibitors and 127 booths.

Nightly entertainment offered by GSA included the Welcoming Party on Sunday, the Exhibitors' Global Reception and alumni parties on Monday, a Bay Lights Dinner Cruise and the Beach Party on Tuesday, and a final dinner trip to Tijuana on Wednesday. The meeting ended with the Thursday afternoon poster session and Thursday Afternoon Club, at which the informal combination of beer, geology, and the local geologist jazz group, Hermann Maugin and the Cymbals, made for an unusual and enthusiastic closing session.

General Chairman R. Gordon Gastil and the other chairmen of the San Diego Annual Meeting Committee are to be especially commended for their ideas and energy, which made the education and public outreach events a special part of this meeting. More than 100 volunteers, most of them associated with San Diego State University as students, faculty, and alumni, are also to be commended, as are the energetic and experienced members of the San Diego Association of Geologists. Together they helped to make the meeting unique.

Altogether, 5951 participants attended the 1991 Annual Meeting, making it the third largest meeting in GSA's history. Holding first place is the Centennial Celebration in Denver (1988) with 7428, while Reno (1984) holds second place with 6051. The attendance at the 1979 San Diego meeting was 4574. GSA is both reaching out and growing! See you in Cincinnati, October 26-29, 1992, with the sequel to the global challenge. The meeting occurs during a significant quincennial year with the theme: *Columbus to Magellan: The Voyage Continues.* ■



1991 GSA Annual Meeting, San Diego, California

Photos by Bill Cronin

1991 San Diego Annual Meeting Facts and Figures

Technical Program

Abstracts submitted	2526
Abstracts presented	2270
Abstracts rejected or withdrawn	256
Percentage of abstracts accepted	88.9
Oral presentations:	
Invited symposia	230
Volunteered	1379
Poster presentations	661
Number of presentations in discipline sessions	1493
Number of presentations in theme sessions	547
Number of presentations in symposia	230
Highest number of concurrent oral sessions	16

Registration

Professional	3532
Student	1346
Exhibitor	665
Guest	408
Total attendance	5951

Short Courses

Number of GSA-sponsored courses	13
Participants	432

Field Trips

Half-day trips	2
Participants	162
One or more days	26
Participants	675

Exhibits

Number of booths	257
Number of exhibitors	168

Employment Service

Applicants	247
Employers	32
Interviews	422
Positions available	101

Forum is a monthly feature of *GSA Today* in which many sides of an issue or question of interest to the geological community are explored. Each Forum presentation consists of an informative, neutral introduction to the month's topic followed by two or more opposing views concerning the Forum topic. Selection of future Forum topics and participants is the responsibility of the Forum Editor. Suggestions for future Forum topics are welcome and should be sent to: Bruce F. Molnia, Forum Editor, U.S. Geological Survey, 917 National Center, Reston, VA 22092; (703) 648-4120; fax 703-648-4227.

Readers Comment on Forums Published in *GSA Today* in 1991

April and May Forum: Future Energy Needs

Comment by Dexter Perkins, University of North Dakota, Grand Forks

A Secure Energy Future? Dwindling energy supplies and the need to be energy independent are hotly debated topics in Washington, D.C. At one extreme are promoters of traditional energy sources—oil, gas, coal, nuclear, and hydropower. At the other extreme are staunch environmentalists who point out the problems of all these energy sources and advocate energy policies based primarily on alternative sources and on conservation.

The President has sided strongly with the first group. His energy plan, released in February 1991, included plans for increasing the rate of oil consumption, refurbishing coal and nuclear power plants, increasing natural gas usage, and drilling in the Arctic National Wildlife Refuge (ANWR). The plan does little to promote conservation or energy efficiency. A similar plan was approved by the Senate Energy Committee. Legislation before the 102nd Congress to implement the Administration's energy plan would exclude the public from nuclear licensing decisions, open ANWR to oil development, extend offshore oil development, limit environmental review of dam projects, weaken the Clean Air Act, provide billions of dollars in taxpayer subsidies to the energy industries, and create a weak automobile fuel efficiency program. There are no strong incentives in this proposed legislation to promote energy efficiency and development of renewable energy resources.

How do our oil and gas reserves look in the near future? At present, the United States has about 30 billion barrels of *proven* reserves, but some experts say we may have roughly 120 billion barrels (BB) of oil left. If we accept 120 BB as correct, this amounts to about 20 years supply at current use rates. If we continue to import half our oil, which runs counter to the notion of energy independence advocated by the President, we may have 40 years of domestic oil remaining.

The problem is that we have located nearly all the large U.S. oil reservoirs that are easy to find and put into production. Enhanced recovery may provide some respite, and some smaller untapped fields may exist. But, as M. King Hubbard pointed out several decades ago, we are approaching the point where the amount of energy required to produce such sources is often greater than the energy that can be produced. We need major technological improvements if we are to tap these sources. There is no indication that the technology will be available soon.

The near-future prospects are not encouraging. Consider for example, drilling in ANWR. The oil industry says that ANWR is the best prospect for discovering a new large oil field in North America. To date there has been no exploratory drilling program on the ANWR coastal plain. Using stratigraphic and seismic data, however, industry estimates that the maximum amount of oil present in ANWR could be 10 BB. Other estimates, including those of the Department of Energy, put the maximum amount at about 3 BB. With an expected 20–30 years of production, ANWR oil might possibly provide 3% to 10% of our needs. The figures for the nation as a whole, and for ANWR in particular, clearly suggest that while we need not panic at present, oil will not be a reliable energy source for our children. A practicable energy plan must pursue alternatives.

While there is a variety of smaller industries that may contribute to some of our future energy needs, there are no obvious long-term solutions. The only traditional energy sources that appear to have a significant future are gas, coal, and nuclear. Qatar, the Soviet Union, Prudhoe Bay, and other places all contain large untapped gas resources totaling more than 100 years' supply at current use rates. While only about 20%–25% of the U.S. (and world) energy now comes from gas, the future use of natural gas will surely increase. Coal, which now provides about 20% of U.S. energy, has a long future as well—especially if gasification and other technologies prove efficient.

Use of these fossil fuels, however, has some significant costs. Some critics point to the Persian Gulf War and argue that more such conflicts are inevitable if we don't wean ourselves from foreign petroleum. A more immediate problem may be smog and other forms of pollution that result from the burning of gasoline and coal. The American Lung Association estimates that we spend as much as \$100 billion annually to combat the health-related effects of pollution. Acid rain has taken a major toll in many places, such as the European Alps, the eastern United States, and Germany's Black Forest. By far the worst consequence may be global warming. The build-up of CO₂ and other greenhouse gases appears responsible for a significant warming trend in many parts of the world during the past several decades. In the U.S. northern Great Plains, studies based on temperature logging of abandoned oil wells suggests about a 3 °C warming in the past 100 years. Some scientists estimate that, if unchecked, the "greenhouse effect" may result in a global warming of up to 5 °C during the next century. The National Academy of Sciences, while noting that there is still a lot we don't

know about causes and effects of global warming, has concluded that the problem is so serious that remedial steps should be taken immediately.

About 20% of U.S. electricity is generated by nuclear power plants. This percentage could increase. However, there are potential problems, especially a general public distrust of the nuclear industry, and a real concern for safety. Perhaps the primary problem is that of public perception. On April 26, 1986, the Chernobyl incident brought into sharp focus the threat of nuclear accidents.

The threat of accidents may not, however, be as real or important as the public thinks. Long-term waste disposal, on the other hand, is a looming problem with no apparent solution. Current plans call for a permanent U.S. repository by 2010, but it is not at all clear if that goal will be met, or if Yucca Mountain or any of the other possible disposal plans can stand the test of time. In the meantime, spent reactor fuel collects at generator sites all over the country, and even proposed temporary disposal sites are a long way from being a reality.

The United States, and the entire world, will continue to use traditional energy sources well into the next century. The limited nature of some of these sources and the problems discussed above make it imperative that we pursue alternatives. While alternative, nonpolluting energy sources (i.e., solar, wind, and geothermal) can provide much more energy than they now do, given current technology it seems unlikely that they will ever be more than a partial solution to our problems.

If long-term energy supplies are problematic, it seems only natural to investigate ways to reduce demand. During the past few decades, the United States has taken major steps to increase energy conservation and efficiency, but much more can still be done. Using less energy has the dual advantages of extending the lifetime of traditional sources while eliminating many environmental problems.

Much energy could be saved for future use with little sacrifice in our life styles. Japan and Germany use much less energy than we do, but they show a marked increase in technology and quality of life, while we lag behind. Improving automobile fuel efficiency by as little as 5%–10%, for example, could save as much energy as the North Slope of Alaska may produce. Yet, today we have the technology to increase fuel efficiency by 10 times that amount. We can realize major energy savings by constructing homes and businesses that are more energy efficient. Mass transit can be expanded in many places, with more programs to encourage car pooling.

There are many conservation and efficiency options that could be pursued and that should be part of any comprehensive energy plan. These measures could slow the rate of global warming and reduce pollution in metropolitan areas. Unfortunately, these measures are missing from the legislation pending in Congress. It is not clear why they are missing. Special-interest groups, each arguing its own self-interests, must be in part responsible.

Polls of the American public indicate that they are willing to invest in energy-saving programs. They, too, share the blame for allowing business-

as-usual legislation to move forward. If the United States is to have a secure energy future, the public must speak out. If we confront the realities of our energy future sooner, rather than later, the necessary transitions will be much less painful.

June Forum: The Age of Earth

Comment by Karl A. Riggs, Consultant, Mississippi State University

Your forum on the Age of Earth fails to consider the possibility of the variability of the dimension of time. Both creationism and evolution assume that time is a constant. The clock is constant, but that does not mean that time has always been constant.

If time varied and varies, that opens up a whole new can of worms.

September and October Forum: Minorities in the Earth Sciences

Comment by Judith B. Moody, J.S. Moody & Associates, Athens, OH

How Can GSA Enhance Women and Minorities in the Geosciences? The Geological Society of America (GSA) strongly needs to support women and minorities. Women compose 6% of the geoscience work force and minorities <3%. Continued effort is needed not only for women's and minorities' increased participation in the geosciences, but also to encourage *all* younger people to enter into science, especially the geosciences.

In addition to its present activities, GSA must provide educational support and input at all levels from K–12 to college and university. GSA participation in state science fairs followed by participation in the International Science and Engineering Fair is worth considering. Increasing the junior and senior high school earth science curriculum to *two* courses would have a positive influence on students—short-term for some, but long-term for others, possibly resulting in a geoscience career. Continued help for and support of teachers at all levels is needed, including the development of new geoscience teaching tools.

Some consideration should be given to developing education that would help to change attitudes dealing with sexism and racism—or, at least, special courses could be identified as critical relative to those issues. Social attitudes must be changed to create an equalitarian society.

Greater utilization of women and minority members in GSA activities is needed. Working for GSA is voluntary and depends on one's time availability (and perhaps income) and on the desire to support GSA with action.

GSA could sell its societal activities to all its membership better than it has done in the past. The "old boys' club" syndrome must be removed from GSA's internal structure completely if GSA desires a fully representative membership.

In the past three years GSA has had a minority president and a female president. What has been done to involve women and minorities at all

Forum continued on p. 4

levels of GSA professional activities—both regional and national?

To this day, discrimination and occupational problems still plague women and minorities in many different activities, including hiring, salary, and promotion. Could GSA recognize these problems and suggest different ways for its members to deal with them (i.e., create a special GSA subcommittee to deal with these issues both individually and collectively)? [Editor's note: GSA has an ad hoc Committee on Minorities and Women in the Geosciences.] The committee could also create a GSA document with a very carefully stated position on discriminatory issues. This activity would facilitate an increase in young persons' desires to pursue a career in the geosciences. Role models would be available to foster that interest, with greater confidence that measures to eliminate discriminatory practices were being implemented.

Very few GSA professional awards have been given to women and minorities. The token percentages of women and minorities in the total profession are still a reality. Recognizing high-quality women and minority individuals now working in the geosciences by means of GSA visibility and awards would go a long way to encouraging gifted people to enter the geosciences (a problem for all U.S. sciences today). Professional recognition that GSA can give, in many different ways, to women and minority individuals would be a very positive sign that GSA is changing for the best, as we move into the 21st century. ■

SLIDE SETS OF GREAT BRITAIN'S CLASSIC GEOLOGIC SITES

These Slide Sets are the combined effort of members of NAGT and GSA, and largely taken during the 1991 NAGT-GSA GeoVenture, Great Britain's Classic Geologic Sites. Profits go to NAGT's Summer Field Scholarship Fund. This fund supports students completing their required summer field courses for undergraduate degrees.

A. Slide Set of Primary Features for Introductory Geology—20 slides, including slate, chalk, flint, basalt, peat, gneiss, anticline, syncline, unconformity and fault, Siccar Point, cross-cutting and intrusive relationships, U-shaped valley, pothole, tombolo, baymouth bar, etc.

B. Slide Set of Features for Historical Geology—20 slides, including thrust sheets, unconformities including Huttonian sites on Arran and at Siccar Point; Hutton's section at Arthur's Seat in Edinburgh; Hutton's Cross-cutting Relationship Site at Glen Tilt; Fossil Scale Trees from the Carboniferous; Tertiary Giant's Causeway basalts; ice-dammed strandlines of the Parallel Roads of Glen Roy; upraised beaches, etc.

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B. Historical Geology	\$30 ___ M	\$35 ___ N
(20 slides)		

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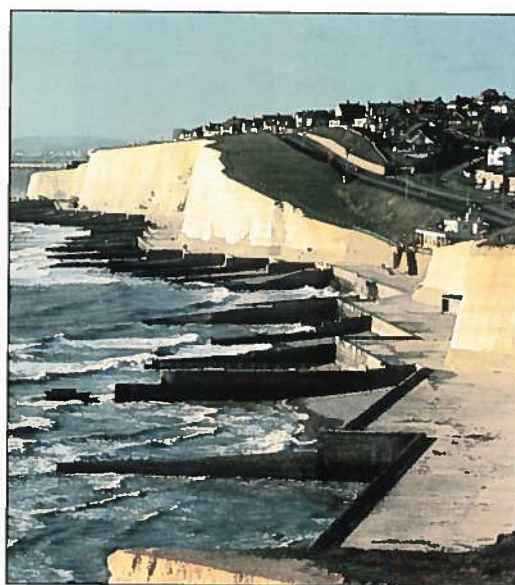
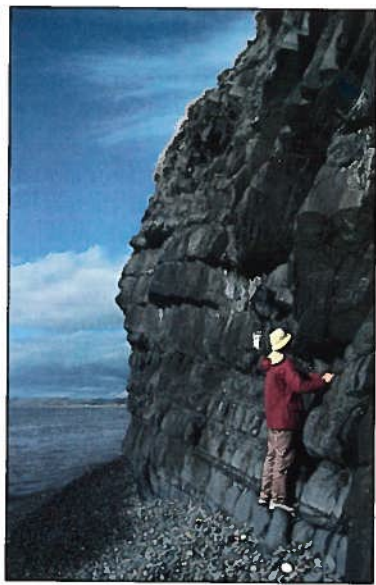
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Martin Stout examines Aberystwyth Grits, western Wales (left). Brighton, England, with Cretaceous Chalk Cliffs (center). Hutton unconformity at Siccar Point, Scotland, showing basal breccia (above).

GeoVenture '91

Great Britain's Classic Geologic Sites June 15–July 6, 1991

Kennard B. Bork, Author and Trip Participant
Department of Geology and Geography, Denison University

The cliché about enjoying a busman's holiday takes on new meaning when geologists travel 3500 miles looking at the classic sites of British geology. It would be difficult to imagine a more pleasant and rewarding quasi-vacation for geologists than GeoVenture '91, cosponsored by the Geological Society of America and the National Association of Geology Teachers. In a packed three-week period, 20 of us were squired around the perimeter of England, Wales, and Scotland by an exceptional group of British colleagues. The whole tour was conceived and superbly coordinated by Dorothy Stout, 1991 President of the National Association of Geology Teachers. Uncertainties about the Gulf War may have dissuaded some people from participating, but the GeoVenture concept is so good that I hope that GSA members can more fully take advantage of the opportunity in coming years.

As the trip's title indicates, we were treated to an overview of Great Britain's classic geologic sites. The names of just a few of the places visited evoke images of geology's birth and evolution—Cambridge and the Sedgwick Museum; the London basin and the Weald; the Dorset coast; Lyme Regis; William Smith's house in Bath; Dartmoor; Silurian type sections in south Wales; Cambrian slate mines in north Wales; the Lake District; James Hutton's localities on the Isle of Arran; the Highlands of northwest Scotland, including the Moine thrust; Hutton's famous dikes along the River Tilt; Siccar Point; and the University of Edinburgh.

Mere lists cannot do justice to all that we saw and learned, because even the most resonant names of classic sites do not factor in the excellence of our on-site guest leaders and the richness of information they supplied. All of us who have led field trips know how many details need attention and how much is involved in producing an informative and smooth-running tour. Ron Roberts (England), Michael Bassett (Wales), and Donald McIntyre (Scotland) all succeeded in running trip segments that had that rare combination

of huge amounts of relevant geologic information, rich background commentary on cultural and historical elements, excellent site selection, and exceptional efficiency in travel, with no "orbits" to find outcrops. The amounts of preplanning and thoughtful preparation were constantly evident. In addition, we profited from valuable contributions by Don Tarling (Plymouth, Dartmoor), Gilbert Larwood (Durham), and Sir Kingsley Durham (Durham Cathedral). Thanks to the overall planning of Dottie Stout and the on-site expertise of our local leaders, we saw so much geology, scenery, and history that any account takes on the flavor of a spotty smorgasbord rather than the feast it was.

This 3500-mile journey began in London with an introductory lecture on British geology by Ron Roberts, the recently retired director of education for the Geological Museum (now part of the British Museum of Natural History). History came alive on the evening of our first day as we received a cordial welcome at Burlington House, home of the Geological Society of London. We received a tour of the historic building, and a display was arranged which allowed us to heft Sir Charles Lyell's own hammer, scan a hand-written manuscript of Hutton's *Theory of the Earth* and read Mary Anning's letter



Cambrian-Ordovician angular unconformity at Trwyn Lech Y Doll, western Wales.

to her friend Charlotte Murchison, reporting that she had just heard Charlotte's husband give a lecture and Sir Roderick was "the handsomest piece of flesh and blood I ever saw." Immersion in Britain's rich history of geology continued the next day as we toured the Sedgwick Museum, University of Cambridge. We learned about Adam Sedgwick and other Cambridge geologists, heard from Muriel Arbor about the landslips of Dorset, and were privileged to open the beautiful wooden cabinets housing the geological collections of John Woodward (1665–1728).

Actual fieldwork began the third day as we crossed the Weald on our way to the Dorset Coast. Our first geostop of the trip (the Philpot Quarry, Lower Cretaceous) included something for just about everyone—dinosaur teeth and skin impressions, conifer remains, sedimentary structures, calcite-filled tensional cracks, and discussions about quarrying and economic geology. Throughout the trip we profited from exposure to an impressive variety of geologic subdisciplines: geomorphology and landform evolution, regional stratigraphy, structural geology, paleontology, sedimentology, economic geology, and history of geology. For the academicians in the group, some of what we saw was relevant to introductory courses—spectacular coastal features such as arches and sea stacks, photogenic folds and faults, and examples of environmental geology in action. There was also a great deal that related to advanced courses—from the classic turbidites of the Aberystwyth Grits to the mylonitized zones along the Moine thrust or the petrology of the Shap Granites of the Lake Country.

The route to Southampton included stops at Beachy Head (where the marvelous view of the chalk cliffs was tempered only by the strength of the wind, which threatened to transport careless gawkers over the

edge) and the famous sea-side resort of Brighton (known to many Britons as a slightly scandalous place where mildly dangerous liaisons could be carried on, well away from prying eyes of fellow Londoners). Numerous islands reside off the coast of Great Britain, stranded from the mainland by postglacial rise of sea level. The Isle of Wight sits in scenic splendor just south of Southampton. Its northern half is Tertiary, separated from the Cretaceous southern part by an east-west-trending monocline. The famous Needles, at the western terminus of the isle, are sea stacks of chalk. More than once the group was amused by British place names: Scratchy Bottom beach on the Isle of Wight, Durdle Door (a sea arch) on the Dorset coast, and the Piddle River (later in the trip, Welsh names left us tongue-tied). Back on the mainland, we visited quarries and observed some of the huge ammonites in the famous Portland Limestone. Lyme Regis, home of Mary Anning, and site of John Fowles's *French Lieutenant's Woman* was as picturesque and fossil-rich as the postcards promised. After a night in Plymouth, enriched by a lecture and tour of the town, courtesy of Don Tarling, we headed across Dartmoor to south Wales. The weather continued to cooperate, providing properly atmospheric backdrops—crystalline clear when we needed views of the Dorset coast, but gray, dreary, and sleeting when we entered the moors. The granite tors (erosional mounds) of Dartmoor have been dated as Devonian. They were quarried to supply rock for the London Bridge (1835), but the primary resource (until the 1950s) of the moors was tin. Bath was known in Roman times for its hot springs, and it became a fashionable spa in the 18th century, but for geologists the town is perhaps best known for its beautiful golden building stone and as William Smith's base of operation and site of his early (1789) geologic map.

Our introduction to Wales was gray and rainy but enjoyable nonetheless, as Michael Bassett (National Museum of Wales, Cardiff) opened the French Impressionist wing of the museum on a Sunday and plied us with valuable reprints concerning regional geology. We headed north across flat Devonian strata into the South Wales Coal Field, where the Carboniferous strata yielded so much coal that Wales was the world's largest exporter of coal in the 1920s. As with the slate of north Wales, the coal- and iron-mining industries have fallen on hard times, but new, high-tech industries are locating in the region. Evidence for invasion of the land by plants was glimpsed in the Devonian Old Red Sandstone of Brecon Beacons Quarry. Lunch at the Castle Hotel in Llandovery (Lower Silurian type area) was memorable, as we dined where Murchison used to stay during his field investigations of the Silurian System. In the Aberystwyth area we witnessed the spectacular graded beds resulting from the turbidity currents that coursed down from the edge of the Welsh basin during the Silurian. The Harlech dome region of north Wales was a critical area for study of Cambrian strata. After an interesting tour of Harlech Castle, we entered the slate mines of the Llechwedd Slate Caverns, being alternately impressed by the extraction process and appalled by the working conditions that prevailed into this century. Mike Bassett, patriotic Welshman that he is, took us to Trwyn Llech y Doll ("Hell's Mouth Peninsula" on English-language maps) and showed us an angular unconformity that, he quietly but forcefully observed, rivaled

Siccar Point. It was impressive—lower Middle Ordovician strata sat horizontally on near-vertical Lower Cambrian units (a count of photographs taken at both places hints that Siccar Point's allure and Scotland's pride remained intact, but we're not telling any of our Welsh friends). On our way out of Wales we visited the imposing Dinorwig power plant and a museum featuring the famous Penrhyn (Dinoric) slates.

Chester, with its Roman wall and Tudor-style downtown, was our entry point to the Lake Country, as we moved north toward Scotland. Donald McIntyre (a student of Arthur Holmes at the University of Edinburgh; 30 years on the faculty of Pomona College) was our energetic guide through Scotland. His depth of knowledge concerning the work of James Hutton illuminated many a field stop. On the Isle of Arran we followed Hutton's steps as we traversed the dikes in the contact-baked Permian redbeds, walked upsection through the Paleozoic beds north of Brodick, and observed the Old Red Sandstone sitting on the Dalradian Schist near Lochranza Castle. Then it was into the Highlands, where we had lunch in Glencoe, site of the 1692 massacre of McDonalds by Campbells. The drive north to Ullapool took us by Ben Nevis (Misty Mountain) and Loch Ness. Alas, not one of our sharp-eyed group saw a sign of Nessie. In the Assynt region of the Northwest Highlands we walked across the bogs to stand at the contact of the Moine thrust. It was graphic evidence of the power of the Caledonian orogeny (Silurian), as the Precambrian Moine Schist was thrust over the Cambrian Durness limestone. Our rather minimal bit of field work made us appreciate the efforts of prior generations of geologists who struggled with the complex geology of the Highlands (see, for example, David Oldroyd's 1990 book *The Highlands Controversy*). Heading south and east toward Edinburgh, we passed through Birnam Wood—as Donald McIntyre read relevant parts of Shakespeare's *Macbeth*—on the way to Dunsinane. Today the site of Macbeth's castle ("dun on the scianes," or "fort on the fairy knolls") is threatened by a quarrying operation, a process being fought by McIntyre and other historically attuned citizens. On the morning after a gourmet dinner at Prestonfield House in Edinburgh, we set off for one of the highlights of the trip—a visit to Siccar Point. The weather gremlins struck with a haar (North Sea mist blanket) so thick that visibility was measured in inches. Good vibrations prevailed (we had a few Californians on the trip), and by the time we arrived at Siccar Point it was possible to see something a few yards away. Cameras clicked and smiles abounded as we saw firsthand what had so impressed James Hutton two centuries ago.

All good things come to an end, and the GeoVenture finished with a flurry of geological and historical highlights. On the 4th of July we walked along the top of Hadrian's Wall and visited a quarry in the Great Whin Sill (a diabase) that forms an impressive ridge upon which the Romans built parts of their 70-mile-long wall across England. On our last full day, Gilbert Larwood (University of Durham) gave a valuable overview of the Permian stratigraphy in the Durham area, and Sir Kingsley Dunham (a past director of the British Geological Survey) regaled the group with a fascinating tour of Durham Cathedral. We then headed to Nottingham, driving through Sherwood Forest—neither Robin Hood, Maid Marian, nor Kevin

GSA Distinguished Service Award Presented to Staff Member Dorothy M. Palmer

Citation by E-an Zen

The GSA Distinguished Service Award was established by Council in 1988 to recognize individuals for their exceptional service to the Society. This year, for the first time, it was awarded to a GSA employee, Dorothy M. Palmer, for her twenty-four years of dedicated and steadfast service to the Society.

Everyone who has worked with GSA in some way, either as a committee member, an officer or a councilor, a conference organizer, or a member who has called with a question or needed help of some kind, knows Dorothy Palmer. Contrary to what you might think, she has not spent all of her life at GSA. Her home during her early years was in Morton, Minnesota, where she was first introduced to geology while swimming in an abandoned Rainbow Granite quarry.

Before coming to GSA in 1968, Dorothy spent seven years working in Washington, D.C., first for the FBI, then for the Federal Power Commission, and lastly as secretary to the Executive Officer of the National War College—outstanding training for someone who would soon experience the rigors of employment at GSA!

In a congratulatory letter to Dorothy, President Doris Curtis stated, "As a dedicated employee who has worked with twenty-four presidents and four executive directors, you have been the 'glue' that has provided continuity to the Society and its governing Council. The many hours that you have served in performing the duties of your position are reflected in the high quality and volume of historical data that exists as a record for future leaders of the Society." ■

Presented by Acting President E-an Zen, October 22, 1991, at the GSA Award Ceremony during the 1991 Annual Meeting in San Diego.



Presentation of the GSA Distinguished Service Award to Dorothy M. Palmer by E-an Zen at the 1991 San Diego Annual Meeting.

Costner appeared. At the farewell banquet we presented some silly gifts to Dottie Stout and performed some even sillier songs, targeting various members of our merry band. Brian Holcroft, our virtuoso coach driver whose driving skill and patience with sometimes tardy geologists had so impressed us, made the serious point that he had never seen such camaraderie, good humor, and professional focus in a tour group. Sharing ideas and observations with other members was, in fact, yet another benefit of the experience. Levels of geologic background varied greatly, but everyone, including spouses with little formal training (aside from putting up with geologists for years), retained high enthusiasm and contributed significantly to the success of the excursion.

In terms of the "touristy" aspects of the trip, it is difficult to find anything to quibble about—aside, that is, from the frequency with which cauliflower and broccoli appeared at our dinners. In fact, the overnight accommodations, travel arrangements, baggage handling, coach facilities, and food were all excellent. The large guidebook (331 pages) was helpful on the trip and is a valuable reference now that we are back. Dottie and Martin Stout lugged an incredible amount of professional literature from California in order to supply us with a mini-library on the coach. Although the trip was not free, it was extremely cost effective. If one treats the bottom line as value received rather than simply dollars spent, I strongly believe that the GeoVenture was a major bargain. The only facet of the program that struck my wife and me as less than ideal was that younger geologists and earth science teachers were not on the trip. Ken Hamblin alluded to this same problem in his commentary on the New Zealand GeoVenture (*GSA Today*,

October 1991). The trip was such a wonderful learning experience that it would be nice if some sort of scholarship support could be available for people who are not well-set financially or double-income-no-kids-at-home couples. Costs and schedules will no doubt limit the number of people who can take advantage of such opportunities, but the GeoVenture concept is a superior one, and I hope that it will prosper in the future. ■

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Bruce F. Molnia

Washington Report provides GSA membership with a monthly window on the activities of the federal agencies, Congress and the legislative process, and international interactions that could impact the geoscience community. In future issues, Washington Report will present summaries of agency and interagency programs, track legislation, and present insights into Washington, D.C., geopolitics as they pertain to the geosciences.

Acronym Immersion—101: Part 1

Happy New Year! In 1991, each of the ten Washington Reports printed in *GSA Today* included several acronyms. As there have been no reports of readers suffering from adverse acronym reactions and as you are all well rested from your holiday breaks, I think that this is the appropriate time for each of you to undergo full acronym immersion. I have, therefore, prepared a list of 500 acronyms that you can use to navigate your way through Washington, D.C., and the earth sciences community. The first 250, AAAS-ICSI, are listed below. The second 250, ICWQ-WRD, will be presented in February's Washington Report. The list contains federal agencies, professional earth science societies, organizations of the National Academy of Sciences, international earth science organizations, selected Earth Observing System [EOS] research facility instruments, and a variety of other useful terms. The list is far from being inclusive. Clearly visible is my bias as a high-latitude researcher. The international terms focus on the International Council of Scientific Unions [ICSU] councils and affiliates and on the International Union of Geological Sciences [IUGS] and International Union of Geodesy and Geophysics [IUGG] societies.

AAAS—American Association for the Advancement of Science

AAPG—American Association of Petroleum Geologists

AAS—American Astronomical Society

AASG—Association of American State Geologists

AASP—American Association of Stratigraphic Palynologists

ABLE—Arctic Boundary Layer Expeditions

ACA—American Crystallographic Association

ACE—Advisory Committee on the Environment (ICSU)

ACSM—American Congress on Surveying and Mapping

ADB—Asian Development Bank

ADEOS—Advanced Earth Observation System

AEC—Atomic Energy Commission

AEDD—Arctic Environmental Data Directory (IARPC)

AEPFG—Association of Engineering Firms Practicing in the Geosciences

AEG—Association of Engineering Geologists

AEG—Association of Exploration Geochemists (IUGS)

AESE—Association of Earth Science Editors

AF—Air Force (DOD)

AFGL—Air Force Geophysical Laboratory

AFN—Alaska Federation of Natives

AFOSR—Air Force Office of Scientific Research

AFSC—Air Force Systems Command

AGA—Association of Arab Geologists (IUGS)

AGASP—Arctic Gas and Aerosol Sampling Program

AGI—American Geological Institute

AGID—Association of Geoscientists for International Development (IUGS)

AGR—Department of Agriculture (used by DOS, see DOA)

AGS—American Gem Society

AGU—American Geophysical Union

AID—Agency for International Development

AIH—American Institute of Hydrology

AIP—Arctic Investigations Program

AIPEA—International Association for the Study of Clays (IUGS)

AIPG—American Institute of Professional Geologists

AIRS—Atmospheric Infrared Sounder (EOS)

ALS—American Lunar Society

ALT—Altimeter (EOS)

AMC—American Mining Congress

AMI—Advanced Microwave Instrument

AMQUA—American Quaternary Association

AMRAP—Alaska Mineral Resource Assessment Program (USGS)

AMS—American Meteorological Society

AMSR—Advanced Microwave Sounding Radiometer (NOAA)

ANCSA—Alaska Native Claims Settlement Act

ANILCA—Alaska National Interest Lands Conservation Act

ANWR—Arctic National Wildlife Refuge

ANZUS—Australia, New Zealand, and U.S. Council

AOGA—Alaska Oil and Gas Association

AORIS—Arctic Offshore Research Information System (DOE)

AOSB—Arctic Ocean Sciences Board (NRC)

APA90—Antarctic Protection Act of 1990

APOA—Arctic Petroleum Operators Association

APS—American Physical Society

ARC—Arctic Research Commission

ARCSS—Arctic Systems Science (NSF)

ARCUS—Arctic Research Consortium of the United States

ARO—Army Research Office (DOD)

ARPA—Arctic Research and Policy Act

ARS—Agricultural Research Service (USDA)

ASCA—Asian Crystallographic Association

ASCE—American Society of Civil Engineers

ASCS—Agricultural Stabilization and Conservation Service (USDA)

ASF—Alaska Synthetic Aperture Radar Facility (NASA)

ASGA—Association of African Geological Surveys (IUGS)

ASPRS—American Society for Photogrammetry and Remote Sensing

ASTM—American Society for Testing and Materials

ATLID—Atmospheric Lidar (EOS)

AVHRR—Advanced Very High Resolution Radiometer (NOAA)

AWG—Association for Women Geoscientists

AWRA—American Water Resources Association

AWSS—Association of Women Soil Scientists

BAHC—Biological Aspects of the Hydrological Cycle (IGBP)

BBS—Biological Behavioral and Social Sciences Directorate (NSF)

BESR—Board on Earth Sciences and Resources (NRC)

BIA—Bureau of Indian Affairs (DOI)

BLM—Bureau of Land Management (DOI)

BLS—Bureau of Labor Statistics

BOM—Bureau of Mines (DOI)

BOR—Bureau of Reclamation (DOI)

CAB—Civil Aeronautics Board

CAP—Circum-Atlantic Project

CBGA—Carpathian Balkan Geological Association (IUGS)

CCAMLR—Commission for the Conservation of Antarctic Marine Living Resources

CCCO—Committee on Climate Changes and the Ocean (SCOR/IOC)

CCT—Computer Compatible Tape

CDC—Centers for Disease Control (HHS)

CD-ROM—Compact Disk-Read-Only Memory

CEAREX—Coordinated Eastern Arctic Experiment

CEES—Committee on Earth and Environmental Sciences (FCCSET)

CEQ—Council on Environmental Quality (EOP)

CFCs—Chlorofluorocarbons

CG—Coast Guard (see USCG, DOT)

CGER—Commission on Geosciences, Environment, and Resources (NRC)

CGMW—Commission for the Geological Map of the World (IUGS)

CIA—Central Intelligence Agency

CID—Center for Infectious Diseases (HHS)

CIMRI—Center for Inter-American Mineral Resource Investigations (USGS)

CIRES—Cooperative Institute for Research in Environmental Sciences

CISE—Computer and Information Science and Engineering Directorate (NSF)

CMG—Commission for Marine Geology

CMS—Clay Minerals Society

CODATA—Committee on Data for Science and Technology (ICSU)

COE—Army Corps of Engineers (DOD)

COGEODATA—Committee on Geologic Data

COGEODOC—Commission of Geological Documentation

COM—Department of Commerce (used by DOS, see DOC)

CONRIM—Council on Northern Resources Information Management

COSPAR—Committee on Space Research (ICSU)

COWAR—Committee on Water Research (ICSU)

CPCEMR—Circum-Pacific Council for Energy and Mineral Resources (IUGS)

CRAMRA—Convention for the Regulation of Antarctic Mineral Resources

CRER—Cretaceous Rhythms, Events, and Resources Program (GSGP)

CRREL—Cold Regions Research and Engineering Laboratory (DOD)

CRRES—Combined Release and Radiation Effects Satellite

CSRS—Cooperative State Research Service (USDA)

CUIR—College and University Innovative Research Program (NSF)

CUSMAP—Conterminous U.S. Mineral Resources Appraisal Program (USGS)

DEA—Drug Enforcement Agency

DHHS—Department of Health and Human Services

DIA—Defense Intelligence Agency (DOD)

DIFAS—Digital Ice Forecasting and Analysis System

DIS—Data and Information Systems (IGBP)

DMA—Defense Mapping Agency (DOD)

DMSP—Defense Meteorological Satellite Program (DOD)

DNA—Defense Nuclear Agency (DOD)

DNAG—Decade of North American Geology (GSA)

DOA—Department of Agriculture

DOC—Department of Commerce

DOD—Department of Defense

DOE—Department of Energy

DOI—Department of Interior

DOMSAT—Domestic Satellite

DOS—Department of State

DOT—Department of Transportation

DPP—Division of Polar Programs (NSF)

DSDP—Deep Sea Drilling Project (NSF)

EAGS—European Association of Exploration Geophysicists

EASE—European Association of Science Editors (IUGS)

ECC—European Crystallographic Committee

ED—Department of Education

EDC—EROS Data Center (USGS)

EEOC—Equal Employment Opportunity Commission

EHR—Education and Human Resources Directorate (NSF)

ENG—Directorate for Engineering (NSF)

EOP—Executive Office of the President

EOS—Earth Observing System

Eos—Transactions of the American Geophysical Union

EOSAT—Earth Observation Satellite Company

EPA—Environmental Protection Agency

EPSCoR—Experimental Program to Stimulate Competitive Research (NSF)

ERC—Engineering Research Centers (NSF)

ERL—Environmental Research Laboratory (NOAA)

EROS—Earth Resources Observation System

ERS—Economic Research Service (USDA)

ERS-1—European Remote Sensing Satellite (ESA)

ESA—European Space Agency

ESDD—Earth Science Data Directory (USGS)

ESIC—Earth Science Information Center (USGS)

EURATOM—European Atomic Energy Community

FAA—Federal Aviation Administration (DOT)

FAGS—Federation of Astronomical, Geophysical Services (ICSU)

FAGS—Friends of Antarctic Geological Sciences

FAO—Food and Agriculture Organization (UN)

FBI—Federal Bureau of Investigation (JUS)

FCC—Federal Communications Commission

FCCSET—Federal Coordinating Council for Science, Engineering, and Technology (EOP)

FDA—Food and Drug Administration (HHS)

FDA—Office of U.S. Foreign Disaster Assistance (AID)

FEMA—Federal Emergency Management Administration

FERC—Federal Energy Regulatory Commission

FHWA—Federal Highway Administration (DOT)

FMS & HRC—Federal Mine Safety and Health Review Commission

FOFCC—Federal Oceanographic Fleet Coordinating Council

FOIA—Freedom of Information Act

FS—Forest Service (USDA)

FTC—Federal Trade Commission

FWS—Fish and Wildlife Service (DOI)

FY—Fiscal Year

GAC—Geological Association of Canada

GAIM—Global Analysis, Interpretation and Modelling (IGBP)

GAO—General Accounting Office

GARP—Global Atmospheric Research Programme

GARS—Geological Applications of Remote Sensing Program

GATE—GARP Atlantic Tropical Experiment

GCM—General Circulation Model

GCRP—U.S. Global Change Research Program

GCTE—Global Change and Terrestrial Ecosystems (IGBP)

GD—Geologic Division (USGS)

GEBCO—General Bathymetric Chart of the Oceans

GEMS—Global Environmental Monitoring System (UNEP)

GEO—Geosciences Directorate (NSF)

GES—Geophysics Study Committee (NRC)

GEWEX—Global Energy and Water Experiment

GGG—Global Geospace Science

GIS—Geographic Information System

GIS—Geoscience Information Society

GISP II—Greenland Ice Sheet Project II (NSF)

GLORIA—Geologic Long Range Inclined Asdic

GLRS—Geoscience Radar Ranging System (EOS)

GMCC—Geophysical Monitoring for Climatic Change

GPO—Government Printing Office

GPS—Global Positioning System

GRID—Global Resource Information Database (UNEP)

GS—Geochemical Society

GS—Geological Survey (see USGS, DOI)

GSA—General Services Administration

GSA—Geological Society of Africa (IUGS)

GSA—Geological Society of America

GSC—Geological Survey of Canada

GSFC—Goddard Space Flight Center (NASA)

GSGP—Global Sedimentary Geology Program

HD/GEC—Human Dimensions of Global Environmental Change Programme (ISSC)

HHS—Department of Health and Human Services

HIRIS—High-Resolution Imaging Spectrometer (EOS)

HPCCP—High Performance Computing and Communications Program (FCCSET)

HRIS—High-Resolution Imaging Spectrometer (EOS/ESA)

HUD—Department of Housing and Urban Development

IA—U.S. Information Agency

IAEA—International Atomic Energy Agency

IAEG—International Association of Engineering Geology (IUGS)

IAG—International Association of Geodesy (IUGG)

IAGA—International Association of Geomagnetism and Aeronomy

IAGC—International Association of Geochemistry and Cosmochemistry (IUGS)

IAGLR—International Association for Great Lakes Research

IAGOD—International Association on the Genesis of Ore Deposits (IUGS)

IAH—International Association of Hydrogeologists (IUGS)

IAHS—International Association of Hydrological Sciences (IUGG)

IAMAP—International Association of Meteorology and Atmospheric Physics (IUGG)

IAMG—International Association of Mathematical Geology (IUGS)

IAOE—1991—International Arctic Ocean Expedition—1991

IAP—International Association of Planetology (IUGS)

IAPSO—International Association for the Physical Sciences of the Ocean (IUGG)

IARPC—Interagency Arctic Research Policy Committee

IAS—International Association of Sedimentologists (IUGS)

IASC—International Arctic Science Committee

IASPEI—International Association of Seismology and Physics of the Earth's Interior (IUGG)

IAU—International Astronomical Union (ICSU)

IAVCEI—International Association of Volcanology and Chemistry of the Earth's Interior (IUGG)

IBC—International Boundary Commission—U.S. and Canada

IBN—International Biosciences Networks (ICSU/UNESCO)

IBWC—International Boundary and Water Commission—U.S. and Mexico

ICA—International Cartographic Association (ICSU)

ICC—Interstate Commerce Commission

ICES—International Commission on Erosion and Sedimentation

ICES—International Council for the Exploration of the Sea

ICG—Inter-Union Commission on Geodynamics

ICL—Inter-Union Commission on the Lithosphere (ICSU)

ICRSDT—International Committee on Remote Sensing and Data Transmission

ICS—International Commission on Stratigraphy

ICSI—International Commission on Snow and Ice ■

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Dwornik Planetary Geoscience Award

The Foundation has received a gift of \$4500 to establish an endowment that will fund annual best student paper awards in planetary geoscience. Stephen E. Dwornik, a science and technology consultant living in Springfield, Virginia, has advised the Foundation that he will make additional contributions to the Stephen E. Dwornik Planetary Geoscience Fund in 1992 and 1993 in order to raise the fund balance to a goal of \$12,000.

A \$500 check was given to Laurinda Chamberlin of Caltech for her paper, and she received a certificate for the Stephen E. Dwornik Planetary Geoscience Student Paper Award at the GSA Annual Meeting in San Diego in November. Another \$500 award is planned for the 1992 Lunar and Planetary Science Conference, and future awards will be given at appropriate meetings that are sponsored by the Planetary Geology Division of GSA.

The objectives of the Dwornik Fund are fourfold: (1) to reward a deserving student financially and provide recognition among his/her peers, (2) to motivate other students to enter into planetary geoscience, (3) to publicize the contributions of planetary geoscience in the exploration of space, and (4) to support the NASA Solar System Exploration Program.

Stephen Dwornik received B.S. and M.S. degrees in geology from the University of Buffalo in 1950 and 1951. After graduation he worked for the U.S. Army Corps of Engineers for 12 years as a research geologist. In 1963 he joined NASA to work as a planetary geologist, a field that has held his attention and occupied his time ever since. Since 1979 he has been an aerospace consultant, principally engaged by Ball Aerospace Systems.

In the letter accompanying his gift Mr. Dwornik said, "My work in Planetary Geoscience at NASA was an exciting, fulfilling career, one of which I am very proud. I feel privileged to have worked for NASA and deeply believe in and support its efforts and accomplishments. I believe that it is the responsibility of people like myself, who have

been fortunate enough to enjoy such a rewarding career, to give something back to the young Planetary Geoscientists who follow. They deserve encouragement, motivation and recognition for their work."

Foundation Board Chairman Charles J. Mankin expressed appreciation for the Dwornik gift: "It is very gratifying to witness the establishment of an endowment, the income from which will provide direct benefits to young geoscientists. Our profession is indebted to these geo-philanthropists such as Stephen Dwornik who provide the financial means to stimulate and reward geologic study and research."

History of Geology, Back to the Future

The History of Geology Division is looking ahead with respect to its Division Fund. Recently, Division Chairman and GSA Council member Bob Dott and the Foundation developed a plan to increase the balance in this fund, which currently stands at \$1621.47.

Gifts to the History of Geology Fund in 1992 and 1993 will be augmented by the Foundation from its unrestricted monies in the amount of \$0.50 for each \$1 of new contributions, until the fund balance reaches \$10,000.

In announcing this plan, Bob Dott said, "The Foundation has in essence challenged us to expand our Fund, and we hope that each Division Member will take advantage of this opportunity to make a contribution. In addition to sending checks to the Foundation, members may use the annual GSA dues statement. The first goal is \$5000, and a fund balance of this size will allow the Division to make larger and more frequent scholarships, grants, and awards."

History of Geology Division members and others in GSA may contribute to this fund by using the accompanying coupon. ■

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Cole Memorial Research Awards in Geomorphology and Micropaleontology

Through the generosity of W. Storrs Cole, two awards for support of research are offered through GSA. The Gladys W. Cole Memorial Research Award provides research support for the investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. It is to be given to a GSA Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology. Funds cannot be used for work already accomplished, but recipients of a previous award may reapply if additional support is needed to complete their work. The amount of this award in 1992 will be \$6000.

The second award, the W. Storrs Cole Memorial Research Award, has been established to support research in invertebrate micropaleontology. This award will also carry a stipend of \$6000 and will be given each year to a GSA Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.

Additional information and application forms may be obtained from June R. Forstrom, Research Grants Administrator, GSA, P.O. Box 9140, Boulder, CO 80301.

All applications must be postmarked on or before February 15, 1992. Actions taken by the Committee on Research Grants will be reported to each applicant in early April.

These are two of GSA's most prestigious awards; all qualified applicants are urged to apply.

SAGE REMARKS

Edward E. "Dr. Ed" Geary, *Educational Programs Coordinator*

Picture Perfect Partnerships



An effective way to promote and explain partnerships to others is to actually show teachers, students, and scientists doing science together in dramatic, thoughtful, and entertaining settings. If you have a slide or photograph that captures the essence of partnering in the classroom, the laboratory, or the field, then GSA would like you to share that experience with others. Your slide may end up in a future issue of *GSA Today*, on one of the SAGE booth panels, or in a future educational brochure. In addition, a total of twelve awards will be given for the best slide or photograph depicting:

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All you need to do is send us a copy of your slide or photograph (Attention: SAGE, 3300 Penrose Place, Boulder, CO 80301), and allow GSA to reproduce it for educational purposes. Please include your name, address, work telephone number, and a brief description of the slide, including the names of people in the slide, grade level, school, approximate date, location, and earth science activity under investigation. You may send in more than one entry, but all entries must be received by February 17, 1992. ■

The Crisis in Publication Prices

As *GSA Today* science editor, one of my tasks is periodically to go through the flood of books that arrive at GSA headquarters in Boulder and select those to be sent out for review. In doing so, I try to select well-written, innovative books that will be of interest to a broad spectrum of GSA members. In addition, I pay attention to the price of the book. When I was editor of *Geology*, we had a rule that we would not review books that cost more than \$100. Inflation being what it is, that rule seems no longer to be enforceable. I continue, however, to be shocked by the prices of some of the books that I see.

Recently I came across a volume edited by a couple of GSA members, published by a for-profit publication house, with not quite 200 pages—mostly line drawings with a few black-and-white photographs—that was priced at \$135. I asked the GSA publications marketing staff to estimate what price GSA would charge for a comparable book. The response was “between \$20 and \$30, depending upon the sales estimates.” The price of such books and, indeed, the price of journals leads me to ask whether the profit-making publishing industry is not in the process of “killing the goose that laid the golden egg.”

All of our institutions of employment are going through tough economic times. Most universities are facing major cutbacks in their library budgets. Most individuals I know have cut way back on their book purchasing. At my university, in the course of library cutbacks, faculty members have been asked to make a cost-benefit analysis of all journals, and it is the highest priced ones that face the most severe scrutiny. Does not a similar situation exist in industrial and governmental organizations?

Back in the early 1960s my grad student companions and I routinely bought books and subscribed to journals. I look back upon that practice as an integral part of my education. As a student, I would have unhesitatingly bought the interesting volume mentioned above, if I could have afforded it. I wonder, however, how many students can afford to buy a \$135 book.

What can we, as scientists and the book-consuming public, do about this state of affairs? If you have an idea, please write to me. I will keep you posted on the response.

Eldridge Moores
Science Editor, *GSA Today*
University of California
Davis, CA 95616

The Indoor Radon Problem.

Douglas G. Brookins. Columbia University Press, New York, 1990, 229 p., \$29.95.

Brookins has succeeded in creating a very readable text for informed citizens, concerned scientists, and students of environmental hazards. The impact of the radon hazard, which is now known to exceed all other naturally occurring carcinogens in terms of preventable loss of human life, is well documented in this book.

The presentation is carefully developed, starting with a particularly clear discussion of radioactivity, radiation units, and recommended maximum exposure levels. Brookins then presents the geochemistry of uranium and

radon in rocks, soils, and ore deposits, to describe the conditions and locations that can pose the greatest risk of being an indoor radon hazard.

Two chapters early in the book are devoted to in-depth explanations of radioactivity (decay energies, decay series, penetration power, etc.) and health effects (radiation in the bronchial system, DNA damage, studies of lung cancer in uranium miners, etc.). Included in this section is a good presentation of how scientists have projected data from high-risk miner case studies to low-risk homeowner populations, plus discussions of radiation hormesis (the idea that a little radon is more healthy than none or a lot) and the possibility that radon ingested in well water poses a greater cancer risk than typical levels of indoor radon.

One chapter midway through the book explores where and how radon can enter a home, with emphasis on soil types, building materials, groundwater radioactivity, geological structure (faults, foliation, and folds), and the prevention of radon entry. The subsequent chapter is a good, concise review of all the radon detection methods that are currently in use.

Two chapters are reviews of case studies in and outside of the United States. These studies give the reader an appreciation of the concern felt by state and federal agencies that study public health problems. Also obvious is the fact that while radon is not a local problem, it has been studied in detail in very few locations. Most undeveloped countries and most populated areas in developed countries have yet to be studied.

Brookins devotes a late chapter to economic uses of radon. This includes prospecting for uranium and other metals, geothermal energy, gas and oil, and faults (e.g., in the search for stable waste-disposal sites). This is followed by a summary chapter that compares the risk level of radon to other types of common radiation exposure, and to the most common nonradiation risks. The chilling observation is that the risk of death related to radon exceeds the risk from all other causes with the exception of smoking, alcohol, cars, and fossil fuel pollution, and the radon risk approximates the risk of death by handguns.

Overall, the book is notable for its clear well-defined presentations, its concise coverage of introductory radiation geochemistry, and its up-to-date reviews of studies by university and government agency scientists. An obvious urgency frequently emerges, but only in the context of documented evidence. For the citizen who knows about radon but not in useful detail, this book is just at the right level. For the academic scientist, this book is probably most useful in an undergraduate course on environmental hazards.

Douglas Mose and George Mushrush
George Mason University
Fairfax, VA 22030

Grand Canyon Geology. Stanley S. Beus and Michael Morales, editors. Oxford University Press, New York, 1990, 518 p., cloth: \$45, paper: \$21.95

Thousands of visitors to the rims of the Grand Canyon have gazed awe-struck into the fantastic exposure of geologic history beneath them. *Grand Canyon Geology* is organized into two sections; the first reviews

the stratigraphy and related structural and tectonic aspects of Grand Canyon geology, and the second looks at past and present geologic processes and their results in the Grand Canyon. The chapters are written by researchers who themselves have contributed much to the present understanding of Grand Canyon geology. The book is written for readers with strong backgrounds in sedimentology, stratigraphy, paleontology, structure, and physical sciences; it is not casual reading for the lay reader.

The first 14 chapters of *Grand Canyon Geology* are organized in ascending stratigraphic order, and they review current thoughts on the sedimentologic, stratigraphic, paleontologic, metamorphic, igneous, structural, and tectonic histories of the Grand Canyon region. Starting with a brief overview of the geography and history of non-native exploration of the region, the book proceeds up through the rock column, starting with Precambrian crystalline basement and finishing with the Mesozoic and Cenozoic rocks of the Colorado Plateau. Interspersed are a brief chapter on the Precambrian structural history and a very complete chapter that places the Phanerozoic rocks into regional and plate-scale tectonic and structural frameworks. The last six chapters discuss the history of the Colorado River and the erosional history of the Grand Canyon (topics of considerable debate), the hydrology of the rapids of the Colorado River, lava dams, historical seismicity, mass wasting and geomorphic processes, and a brief discussion of the side canyons of the Grand Canyon.

Grand Canyon Geology contains some frustrating weaknesses. Although the book is profusely illustrated with photos that supplement the text, the quality of photo reproduction is generally so poor as to obscure features the reader is to see. Some of the photos seem to be poorly chosen for the features they are supposed to illustrate, and one photograph was inserted upside down. The introductory chapter could have used more and better illustrations to set a geographic and stratigraphic context for the reader unfamiliar with the Colorado Plateau and surrounding regions in the western United States. Indeed, the introduction to the last chapter would have been better placed in the first chapter. Some references mentioned in the text were omitted from the reference list, and others were improperly cited in the reference list. The chapters generally are up-to-date, but a few chapters are noticeably outdated or are based on a level of scientific rigor not up to par with the rest of the book.

Regardless of these shortcomings, *Grand Canyon Geology* contains the most up-to-date and complete review and discussion of Grand Canyon geology available from a single source. There is no doubt that anyone practicing geology in the Grand Canyon region or elsewhere on the Colorado Plateau would benefit from reading this book. Researchers will especially appreciate its large reference list, with about 400 entries. Likewise, a quick reading of this book would certainly enhance any geologist's visit to the Grand Canyon region.

Perhaps the most astonishing idea presented in this book is that the understanding of the geology of the Grand Canyon is in a nascent state. One would expect that in an area of

such excellent exposure and beauty, geologists would descend on the Grand Canyon and environs in hordes, but it is only in the past few years that many of the older ideas (some in existence for more than 50 years and formulated by just a few researchers) have been reformulated in light of current geologic theory. It seems obvious from this book that the Grand Canyon is a fertile area for research, with much left to be understood.

J. Steven Davis
University of California
Davis, CA 95616

Ophiolites—Oceanic Crustal Analogues. J. Malpas, E. M. Moores, A. Panayiotou, and C. Xenophontos. Geological Survey Department, Ministry of Agriculture and Natural Resources, Nicosia, Cyprus, 1990, 733 p., \$65.

This handsome quarto-bound volume contains nearly 61 papers that represent the results of an international meeting in Nicosia, Cyprus, in late 1987. The impetus behind this meeting was to provide a forum for an international deep-drilling and field-mapping consortium that had been gathering data on the Troodos ophiolite since 1980 as an analogue of oceanic crust. Studies of the Troodos ophiolite are featured in the first section of the book, where detailed accounts of the petrologic variations of the cores are given along with accounts of the structural setting and evolution of the Troodos ophiolite in the Late Cretaceous Tethyan ocean. The second part of the book leads the reader into a potpourri of discussions concerning other Tethyan ophiolites, the Oman ophiolite receiving the most attention. For the first time, to my knowledge, an English account of the Albanian ophiolites is given. The third section of the book gathers similar descriptions of ophiolites from Japan, Indonesia, California, Oregon, the Mid-Atlantic Ridge, Scotland, and Ocean Drilling Program Hole 504-B from the Costa Rica Rift. The final section of the book contains 12 papers dealing with hydrothermal alteration and its relation to the formation of sulfide deposits as well as other magmatic deposits found in ophiolites. The volume is well edited and provides numerous illustrations of both large-scale and small-scale relations within ophiolites.

A decade earlier (1979), a similar volume resulted from an international conference held in Nicosia on nearly the same theme. It is worthwhile to ask, What new ideas have developed in that decade of intensive research on ophiolites? The discovery of black smokers forming in active spreading centers in the East Pacific Rise and the Juan de Fuca Ridge has produced one of the most startling examples of actualistic hydrothermal ore-deposit systems being produced before our very eyes. Since the discovery of the black smokers in modern oceans, careful studies in Cyprus and Oman have shown that the ancient massive sulfide deposits within these ophiolites are formed as a result of similar hydrothermal systems developed when the ophiolites formed in ancient spreading centers. Deep dives by submersible to observe these black smokers have provided the oceanographic community with a strong incentive to concentrate some of their efforts on the effect of this hydrothermal alteration of

oceanic crust as a major buffer system for such elements as Mg, K, Rb, Ca, and Na in ocean waters.

Petrologists have long debated the reasons for the disparity of the chemical composition of Troodos and Oman ophiolites with mid-ocean ridge basalts even though these ophiolites exhibit all of the structural features expected of deep oceanic spreading centers. It is apparent that this problem is of intense interest, but it was not resolved in this symposium. Several papers in this volume invoke a process called suprasubduction (spreading above a subduction zone) to explain the calc-alkaline chemical trends of the Troodos and Oman ophiolite. To me it seems contrived to use the chemistry of the rocks to explain a tectonic process that is unobserved or at the very least undocumented by field evidence.

Perhaps the most important aspect of this conference was the general consensus that ophiolites do indeed represent fragments of oceanic crust formed at oceanic spreading centers. The budget for this international drilling and field project was modest, but the results greatly increased our knowledge of the magmatic and extensional tectonic processes operating at spreading centers. Even though the oceanographic community is still trying to drill completely through the average oceanic crust, so as to apply these results to all ocean crust, it becomes apparent after reading this volume that oceanic crust is diverse in its formation and that no single all-encompassing model will suffice for the formation of oceanic crust. There still remains that nagging conundrum of why there are vanishingly small amounts of ophiolite with mid-ocean ridge crust chemistry present within accreted orogenic zones of continental margins.

The editors of this symposium volume and the leaders of the International Crustal Research Drilling Group are to be congratulated for advancing our knowledge of ophiolites within the confines of a spartan budget, an example of good science produced with a minimum of resources. Anyone following the ophiolite trail, either on land or in the oceans, will need to become familiar with the contents of this book.

R. G. Coleman
Stanford University
Stanford, CA 94305-2225

Dinosaur Systematics—Approaches and Perspectives. Kenneth Carpenter and Philip J. Currie. Cambridge University Press, New York, 1990, 318 p., \$54.50.

With all the hype surrounding dinosaurs these days, those outside the field of paleontology may have the impression that most dinosaur workers spend much of their time being consulted by marketing strategists, preparing for media events, or engineering scale models of clawing, tail-swinging, roaring dinosaurs. Not true. Although directed primarily toward specialists in the field, this volume provides nonspecialists with a realistic insight into research issues and methods that challenge dinosaur paleontologists in the study of systematics and morphological variation.

The volume resulted from the Dinosaur Systematics Symposium, held in 1986 at the Tyrrell Museum of Palaeontology in Drumheller, Alberta. The purpose of the symposium was to "examine sexual dimorphism, ontogeny, individual variation, and any other factors that may influence the taxonomic designation of a particular specimen of dinosaur" (p. xv). Many dinosaur species were originally named

to draw attention to slight but perceptible differences among individual fossils; several such "species" might fall within the range of morphological variation observed in a single extant reptilian or mammalian species. Size variation due to growth stage or gender was also frequently denoted by the naming of new "species." The critical need for a reevaluation of many such dinosaur species is illustrated clearly in just one of several possible examples from the book. Ostrom and Wellnhofer (Chapter 18) claim that all 16 named species of *Triceratops* are conspecific with *T. horridus*, based on a reexamination of the type specimens.

After a brief introduction to systematic and morphometric methods, the chapters are organized taxonomically, with several contributions each devoted to sauropodomorphs, theropods, ornithomorphs, pachycephalosaurs, ceratopsians, stegosaurians, and ankylosaurs. The final chapter discusses the classification of behavioral variation, specifically as it relates to dinosaur footprints. Several interesting issues crop up in the book, including the monophyly of certain dinosaurian higher taxa (e.g., theropods, ornithomorphs, hadrosaurs), problems of small sample sizes in quantitative studies of morphological variation, and the use of modern analogues in establishing the range of conspecific variation.

The book presents a diverse array of original research on numerous dinosaur taxa, provides an excellent source of references, and is abundantly illustrated. Unfortunately, because the volume was some time in preparation, the chapters may seem slightly dated. Nevertheless, it succeeds in "developing a better understanding of dinosaurs as biological species" (p. 309) and provides solid empirical evidence for ontogenetic and dimorphic variation in a broad range of dinosaurs.

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Antarctica as an Exploration Frontier—Hydrocarbon Potential, Geology, and Hazards. Bill St. John. American Association of Petroleum Geologists, Tulsa, Oklahoma, 1990, 154 p., \$60 (\$39 for AAPG members.)

This volume follows a symposium held during the 1987 AAPG annual meeting. It is timely because of the recent adoption of an environmental protocol to the Antarctic Treaty that includes a 50-year moratorium on exploitation of nonliving resources.

The symposium included ten presentations on aspects of the tectonic evolution, sedimentary basins, and operational hazards of the continent. Regrettably, it lacked discussion of the Queen Maud Land coast, where one 45 m interval of Lower Cretaceous sediment has a mean total organic carbon (TOC) content of 9.8% and of the Prydz Bay region, which is a Phanerozoic aulacogen. In almost all discussions of the sedimentary basins, the lack of ground truth for evaluation of the MCS results is conspicuous, making assessment of hydrocarbon potential speculative. The basins of the Ross Sea are well known because the relative ease of access has enabled much MCS data to be gathered. The paper by Cooper and others describes the basin geology and includes a thorough evaluation of factors that control hydrocarbon occurrences. The paper by MacDonald and Butterworth similarly addresses the Mesozoic of the Antarctic Peninsula. They believe the Larsen Basin, known only from its northwest-

ern margin, has potential because of suitable Upper Jurassic source rocks (TOC up to 3.5%) and possible Upper Cretaceous and lower Tertiary reservoir rocks. They note that analogies with South American basins break down when investigated in detail (e.g., in the differing tectonic and thermal histories). This sort of analysis is welcome; some analogies drawn in the past with other Gondwana margin basins have been misleading, as in the case of the Bass Strait, where structural traps post-date rifting, rendering comparisons with the Ross Sea of doubtful value.

Interesting discussions of the Pacific flank of the Antarctic Peninsula are hampered by the lack, except in the Bransfield Basin, of drill-core data. Like other hydrocarbon occurrences in cores from Antarctica, those from the Bransfield Basin have fueled speculation without regard to the geologic setting—in this instance high biologic productivity in a young (<3 Ma) marginal basin. The significance of Bransfield Strait hydrocarbons may lie more in understanding processes than in potential resources.

The papers range from Geosat data on the tectonic fabric of the Southern Ocean floor, via interpretations of the data sets from the Adelie Land coast (somewhat unconstrained because of the absence of drill-core information) to the Larsen Basin. The latter has, for Antarctica, excellent ground control but no MCS data. The lack of data is caused by sea ice and icebergs that make the offshore parts of the basin one of the least accessible areas of the continental shelf. On the topic of hazards, Reid and Anderson point out major operational issues, such as icebergs that occasionally attain dimensions of 130 by 30 km, iceberg scouring that may extend to hundreds of metres water depth, and geotechnical problems of sea-floor stability. Only brief discussions are given on polar lows—atmospheric disturbances well known in the Arctic and a potential hazard to both air and sea operations—and clathrates are mentioned only in passing by Cooper and others.

Prospects for hydrocarbons do not appear bright, but the outcome of research on a continent so little known is unpredictable. The environment is the greatest operational hurdle and will levy cost penalties that will probably make a supergiant field a minimum requirement for economic exploitation. Because the protocol provides for lifting the moratorium, it is important that informed opinion be available and heard so that loose speculation is muted and all parties start from a common understanding of the geologic issues. This volume should do much to promote informed debate.

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Geology and Ore Deposits of the Great Basin: Symposium Proceedings. Gary L. Raines, Richard E. Lisle, Robert W. Schafer, and William H. Wilkinson, editors. Geological Society of Nevada, Reno, 1991, 2 volumes, 1257 p., \$95, including shipping.

These two volumes are the edited proceedings of a five-day symposium entitled *Geology and Ore Deposits of the Great Basin* that was held in Reno, Nevada, April 1–5, 1990. The symposium was sponsored by the Geological Society of Nevada and the U.S. Geological Survey. The symposium attracted presentations on a broad array of topics, ranging from regional geological and geophysical studies of

the Great Basin and the more largely defined Basin and Range to detailed presentations of particular ore bodies. Contributors represented many mining companies, state and federal surveys, and many universities—an excellent cross section of the large number of geologists working in the Basin and Range in the past decade. The *Symposium Proceedings* include 74 full-length papers and 21 extended abstracts gathered under ten headings: **Volume I**—(1) Regional Geological and Geophysical Studies in the Great Basin: Structure, Tectonics, and Magmatism, (2) Regional Setting of Ore Deposits, Mineral Belts, and Resource Assessment, (3) Miscellaneous Studies: Transport and Deposition of Precious Metals and Remote Sensing, (4) Porphyry Molybdenum and Copper Systems and Related Precious Metal Deposits, (5) Other Deposit Types in the Great Basin: Barite, Lead-Zinc, Tungsten, Rare Earth, and Lithophile Elements, (6) Geology and Gold Deposits of the Independence Range, Nevada and Southeastern Idaho. **Volume II**—(7) Geology and Ore Deposits of the Carlin Trend and East-Central Nevada, (8) Geology, Geophysics, and Ore Deposits of the Getchell Trend and Vicinity, Nevada, (9) Precious Metal Deposits Hosted by or Related to Volcanic Rocks, (10) Applied Geophysical Methods.

The volumes are notable for bringing together a great variety of detailed alteration and other ore-deposits data, along with geochemical and geophysical data in the context of good local and regional geologic maps and cross sections. For many districts these volumes represent the first reasonably detailed published accounts. The quality of reproduction of photographs and other illustrations is excellent, and the editing in general is very good. The data from industry are particularly notable for the breadth of subject matter and the quality of illustration. Earth scientists concerned with any aspect of Basin and Range tectonics or ore deposits will find these volumes an extremely valuable and probably necessary addition to their reference library.

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Early Precambrian Basic Magmatism. R. P. Hall and D.H. Hughes. Routledge, Chapman and Hall, New York, 1990, 486 p., \$141.

The concept of a generally unchanging Earth espoused in the Huttonian and Lyellian uniformitarian doctrines has gradually been replaced with one of some directionality. Indeed, Murchison and Sedgwick immediately started the process of such replacement. Time's arrow was clearly demonstrated for a planet with the modern study of the Moon, on which the evolutionary process has virtually ended, but secular change on Earth has been well known by serious students of geology for decades. In that basaltic and related rocks have a fundamental role in planetary chemical, thermal, and physical evolution both in the earliest known times and (on Earth at least) at the present time, they are an appropriate and appealing target for study in the context of variations with time.

One of the two main stated intentions of *Early Precambrian Basic Magmatism* is to address whether ancient suites of basic rocks do have systematic temporal variations, and what those variations imply for early Earth history if they do exist. (*Early Precambrian* has a floating meaning in this book, but

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it generally encompasses the Archean and the earliest Proterozoic). This attempt to refine by review the nature of an already acknowledged secular change (for instance, the presence of komatiites virtually restricted to the Archean is now well known) is, I would think, a creditable endeavor of general interest to geologists. This book does indeed review a lot of valuable information and ideas relevant to the subject. The other stated intention is to evaluate whether basic magmas at a given time were globally uniform, with tectonic controls analogous to the present day. To me, this is also another look at secular change, again of wide interest, but it is actually a much more difficult subject to attack.

Early Precambrian Basic Magmatism is a collection of (apparently) invited chapters about basic volcanics, dikes, and intrusions. It is in two distinct parts, but not parts that correspond to the two main intentions summarized. Instead the first part covers fundamental characteristics and inferred processes, and the second describes regional areas. This may not be the best way to address the questions asked, but it is certainly a good way to organize a comprehensive review. However, the book has no concluding chapter that ties together everything in the context of the two intentions, and readers are left to figure out general answers for themselves from the chapters. Yet the individual chapters do not all give the impression that these editorial intentions were those of the authors. The book's effectiveness is also diminished by the general, if intentional, ignoring of associated intermediate and felsic rocks, which in some cases may be part of the same magmatic systems. But no book has room for everything. Room was found for a chapter on lunar magmatism, but not for that on other planets or that represented in meteorites.

This book is almost entirely a review of the geochemistry of basic rocks, despite the claims to a comprehensive review. Virtually all of the diagrams are geochemical and isotopic plots of one kind or another; they get somewhat repetitive and tiresome. There are only six photomicrographs and one field photograph of terrestrial rocks, and almost all of the maps show locations, not geology in any decipherable sense. There are a few idealized sections. Much of the reasoning and modeling is left understood, to be figured by the reader or found in the extensive references (the book is an excellent annotated bibliography). It is not all easy reading, particularly because of overuse of jargon and acronyms, many directly from the original reference without explanation. For readers who like "Subduction zone related basalts (SZB) (which carry an SZC) are enriched in U, Th, Ce and Pb relative to Nb. Continental within-plate basalts (CWPB) generally overlap SZB or fall between SZB and OIB and N-MORB in terms of these ratios" (p. 50), this book will be easy; the rest will have a harder, if ultimately rewarding, time. In the end, the tectonic aspects of at least Archean volcanism get severely neglected (partly through the nature and biases of the geological record). Nonetheless this book provides a lot of information in a well-produced, well-referenced set of chapters that is worth the effort of extracting for those interested in the secular nature of magmatism. The book can be taken one chapter at a time, in almost any order. It should certainly be perused, if not

bought, by those interested in the past workings of our planet.

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Geology of the Higher Central Himalaya. Anshu K. Sinha. John Wiley & Sons, Inc., Chichester, U.K., 1989, 219 p., \$221.

During the past 20 years, geologists from the Wadia Institute of Himalayan Geology (Dehra Dun, India) have been conducting geological research in the Garhwal and Kumaun Himalaya of northwest India. The first monograph to be published by a Wadia Institute geologist on this region was K. S. Valdiya's *Geology of Kumaun Lesser Himalaya* (Wadia Institute of Himalayan Geology, Dehra Dun, India, 1980, 291 p.). Anshu K. Sinha's *Geology of the Higher Central Himalaya* came almost 10 years later. Sinha's book, based on 15 years of research at the Wadia Institute, discusses the geology of the "Higher" Kumaun Himalaya, including the Central Crystallines and the sedimentary sequences of the Tibetan Himalaya, and may be considered a companion volume to Valdiya's monograph, which concentrated on the geology of the Lesser Himalaya of Kumaun and Garwal.

The region covered in Sinha's *Geology of the Higher Central Himalaya* lies between the (Maha) Kali River on the India-Nepal border in the east and the Alaknanda River and Badrinath in the west. Encompassing only 150 km of the 2500-km-long Himalayan arc, Sinha's term "Central Himalaya" is somewhat misleading! The study area also includes all of the metamorphic, igneous, and sedimentary rocks exposed between the Main Central Thrust to the south and the Indus-Tsangpo Suture to the north and, thus, includes both the Higher Himalaya and the Tibetan (-Tethys) Himalaya in the generally accepted terminology of A. Gansser (*Geology of the Himalayas*, Interscience Publishers, London, 1964, 289 p.). The region mapped by Sinha and his colleagues covers approximately 20,000 km², most of which has been off-limits to non-Indian geologists since India gained its independence more than 40 years ago. As the first major publication to appear on the Higher and Tibetan Himalaya of Kumaun since A. Heim and A. Gansser's *Central Himalaya, Geological Observations of the Swiss Expedition, 1936* (Denkschriften, Schweizerische Naturforschende Gesellschaft, B LXXIII, A. 1, 1939, 245 p.), this book fills an important gap in our knowledge of the geology of the Himalaya.

Following an introductory chapter (Chapter 1) and a brief sketch of the history of geological research in the Kumaun and Garwal Himalaya (Chapter 2), Chapter 3 discusses the general geology of the Tibetan, Higher, and Lesser Himalaya of Kumaun. Most of this chapter is devoted to outlining the geologic set-up and stratigraphy of the Tethyan sedimentary rocks of the Tibetan Himalaya; along with two stratigraphic columns (Figure 15) in color, this provides the most comprehensive description of the Kumaun Tibetan Himalaya to date. It is unfortunate, however, that Sinha makes no attempt to correlate his formations in the Kumaun Himalaya with those of the central Nepal Himalaya studied in detail by French geologists during the 1970s. Sinha's discussions on the complex structure and tectono-stratigraphy of the Higher and Lesser Himalaya are

less complete than those found in Valdiya's *Geology of Kumaun Lesser Himalaya*, but do offer some new observations from the high mountains of Kumaun (e.g., the Badrinath and Nanda Devi regions) and are a useful overview for those unfamiliar with the geology of the Kumaun Himalaya.

Chapter 4 discusses the tectonic framework of the Kumaun Himalaya. As with Chapter 3, the sections on the Higher and Lesser Himalaya are brief, offering little in the way of new data or interpretations. Most of Chapter 4, however, is devoted to discussing the structure of the Tibetan-Tethys Himalaya. Unfortunately, discussions of some of the major problems in Himalayan tectonics are quite limited, such as the importance of, and the amount of displacement along, the Main Central Thrust; the presence of the commonly observed "inverted metamorphism"; and the significance of the tectonic discontinuity between the Tibetan and the Higher Himalaya. In fact, it is interesting to note that Valdiya and Sinha have defined their respective Main Central Thrusts differently and have placed them in different locations along the same traverses and cross sections—a fact that is only alluded to by Sinha.

Chapter 5 describes in detail a series of traverse sections through the Higher and Tibetan Himalaya of Kumaun. Along with geologic cross sections found in the back pocket (Figures 70, 72, 89, and 103), this chapter contains several new observations and most of the information upon which Sinha's structural and tectonic interpretations are based. These structural interpretations, along with a discussion on the structural and tectonic evolution of the Central Himalaya, are given in Chapter 6. Sinha's structural analysis and interpretations, however, leave much to be desired. There has been no attempt to incorporate into his structural and tectonic models the concepts of fold and thrust belt geometry and collision tectonics, which have permeated the structural geology and the Himalayan geology literature during the past two decades. There has also been no attempt to unravel the problems associated with polyphase and progressive deformation in the Central Crystallines and the Lesser Himalaya. In addition, Sinha all but ignores the large body of literature on the structure and tectonics of Nepal, southern Tibet, and the Kashmir-Ladakh-Zaskar regions. Therefore, his structural interpretations are not put into the context of the Himalayan arc as a whole.

Chapter 7 discusses K/Ar systematics and the geochronology of metamorphic and igneous rocks collected in the Higher and Lesser Himalaya of Kumaun. Brief petrographic descriptions of assorted metamorphics and granites from the Higher Himalaya, along with some geochemical analyses, are given in Chapter 8.

Chapter 9 is devoted to a description of barite deposits discovered by Sinha in the Tibetan Himalaya; and will be of interest primarily to economic geologists.

Sinha closes his book with a brief concluding discussion in Chapter 10.

Two geologic maps in color (Figures 12 and 13), six line-drawing maps, two stratigraphic columns in color (Figure 15), four geologic cross sections, and six panoramic photographs are included in a pocket in the book box. These maps, cross sections, and stratigraphic columns are extremely important and useful additions to the publication. The 1:150,000 scale *Geo-*

logic Map of Higher Central Himalaya (Figure 13), covering the entire 20,000 km² study area, is a particularly useful contribution to Himalayan geology. Unfortunately, the map contains very few structural data; strikes and dips of foliations and sedimentary bedding are few and far between, and lineation measurements are absent. This is a major oversight on the part of the author and the publishers and makes the map significantly less useful than it otherwise might have been.

Despite the shortcomings described above, Sinha's book is an important contribution to the study of Himalayan geology. In particular, the *Geology of the Higher Central Himalaya* offers geologic descriptions, sections, and maps of regions that are at present off-limits to most geologists. Sinha's book is, therefore, an essential reference for any geologist studying the Himalaya, and especially for those geologists interested in the structure and stratigraphy of the Tibetan-Tethys Himalaya.

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Graptolites: Writing in the Rocks. Douglas Palmer and Barrie Rickards, editors. Broydell and Brewer, Woodbridge, England, 1991, 182 p., \$79.

This nicely published book is first in the series entitled "Fossils Illustrated," dealing with particular groups of fossils. A lucid, up-to-date text compiled by the members of British and Irish Graptolite Group (BIG G) is copiously illustrated to produce a truly fascinating portrait of an extinct group of fossils, commonly considered obscure and hard to grasp even for a professional. The book is an attempt to refute this approach and to make graptolites more familiar to both amateurs and academics.

Fourteen chapters and eight appendixes expose different aspects of the general appearance, organization, construction, mode of life, and geologic setting of graptolites, as well as classification and application of graptolite studies in geological practice. Methods for collecting and preparing of graptolite remains are also discussed, along with friendly advice for the beginner.

One chapter deals with recent controversies, but many other disagreements are discussed throughout the text. Because graptolites have a unique, and in many ways even bizarre, organization, the authors are right in saying that certain questions still remain unanswered. Even the authors have disagreed in past publications on such controversial issues as the mode of secretion of the skeleton and the mode of life of the graptoloid colony. Now, juxtaposed in a single volume they present both strong and weak aspects of their alternative explanations. This volume is dedicated to Nancy Hartshorne Kirk, who, more than others, has stirred up the graptolithological community with her stimulating, although somewhat iconoclastic, ideas.

Unfortunately, some of the important issues have been presented in a one-sided way or omitted entirely. For example, the clonal nature of graptolite colonies is not addressed, although this fact has an immediate bearing on many important features of graptolite

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biology and evolution. The reader will never learn that the evolution of graptolite colonies differs in many respects from that in solitary organisms.

The use of the literature is distinctly biased, and references to some important recent works produced outside the BIG G are missing. However, papers of secondary significance are cited, thus producing erroneous impressions about priority and authorship of certain ideas (e.g., the collagenous nature of skeletal fibrils; p. 7).

There are also some technical shortcomings: staggering of thecal types cannot ensure cross-fertilization (p. 5), because of genetic identity of all zooids within the colony; pterobranchs as an extant group of hemichordates cannot have separated from the graptolites proper in the Middle Cambrian (p. 75) because pterobranchs are generally considered more primitive hemichordates than graptolites; new rhabdosomes were not produced asexually (p. 50) but almost surely by sexual processes and only later grew by iterative budding; generally useful terminology does not mention graptoblast, but explains minor details (blastocrypt, blastotheca).

The accompanying plates (138 in all) are useful as a source of information on a wide variety of graptolites as well as being esthetically pleasing. Separation of explanations from the plates, however, produces difficulty for the reader. I would recommend this book as a delightful summary of knowledge and as an invitation to collect and study these unusual fossils.

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Simulating the Earth: Experimental Geochemistry. J. R. Holloway and B. J. Wood. *Unwin Hyman Inc., Winchester, Massachusetts, 1988, 196 p., cloth: \$49.95, paper: \$24.95.*

In the preface to *Simulating the Earth: Experimental Geochemistry*, J. R. Holloway and B. J. Wood state that one of their main goals in writing the book was "to try to encourage more petrologists and geochemists to become experimentalists." This concise, well-written text probably has a better chance of achieving this aim than any other books we know of. It is a practical, how-to manual designed for geologists with at least a graduate-level understanding of chemical thermodynamics. It provides information useful to beginning and experienced experimentalists as well as the background necessary for nonexperimentalists, many of whom have occasion to use experimental data, to understand their meaning and limitations.

Simulating the Earth includes sections outlining the most commonly used experimental apparatus and describing different approaches to metamorphic (solid-solid, solid-fluid) and igneous (crystal-melt, fluid-melt) petrologic problems. To do this, they use examples of well-designed and -executed studies from the literature. In addition, they include sections on "just fluids" and on the determination of physical properties (e.g., viscosity, diffusion). One of the major strengths of the text is its strong emphasis on the principle that experimental studies must have a sound thermodynamic foundation. This approach is introduced in a section on The Good Experiment and is woven throughout each subsequent chapter. In this way, Holloway and Wood stress that every experiment should be designed to answer a specific question that justifies the expense and effort of performing it.

This concept may be the single most valuable lesson to be learned by (or reinforced in) both experimentalists and non-experimentalists from reading this text.

It is impossible, of course, to cover every aspect of a subject as broad as this one, and inevitably some topics get better treatment than others. In this instance, the section on measuring physical properties is much weaker than those on phase equilibria. The only mention of viscosity measurements is a short discussion of the high-pressure determinations by Shaw and Kushiro, which, remarkable as they were, are scarcely representative of the problems faced by experimentalists trying to investigate the rheological complexities of silicate melts. Holloway and Wood may have thought it wiser to steer clear of that morass. But if chemical diffusivity can be discussed at length, why can't we have a word or two on thermal diffusivity? Methods of measuring other properties, such as density, thermal expansion, electrical conductivity, and surface tension, receive no mention. Perhaps the authors are saving these for a later book.

No single work can convey all of the subtlety and potential complications of doing experiments. Even with the best educational background, most of us learn by doing, and often by doing incorrectly. But Holloway and Wood's book can be a great help in surmounting common problems by teaching the experimentalist to reason out possible experimental results, successful and otherwise. Surprisingly thorough for a book of only 193 pages, this is likely to become a well-used handbook that belongs on every laboratory's bookshelf.

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Alexander R. McBirney
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Eugene, OR 97403-1272 ■

In Memoriam

John B. Allcock
Bartlesville, Oklahoma

John H. Beeson
Eugene, Oregon
June 11, 1991

Oliver D. Blake
Columbus, Ohio

Gail E. Carpenter
Wichita, Kansas

Walter M. Chappell
Wakeman, Ohio
July 9, 1991

William E. Davies
Falls Church, Virginia
June 17, 1990

Richard V. Fischer
Grand Junction, Colorado

Donald M. Fraser
Sun City, Arizona

David E. Gee
Wichita Falls, Texas
July 13, 1988

Frederick K. Heller
Atlanta, Georgia
January 1, 1991

Godfrey F. Kaufman
Lakewood, Colorado

Fred Kunkel
Palo Alto, California
September 3, 1991

Burton H. Marliave
Walnut Creek, California
February 10, 1991

Ralph L. Miller
Bethesda, Maryland

Carl A. Moritz
Tulsa, Oklahoma
September 24, 1991

Juergen Reinhardt
Madison, Wisconsin
September 18, 1991

George E. Siple
Columbia, South Carolina
March 9, 1991

Oscar W. Tollefson
Colorado Springs, Colorado

Andreas H. Vogt
Vancouver, British Columbia

Burrell S. Whitlow
Vinton, Virginia
October 11, 1991

John A. Young
Devon, Pennsylvania
August 23, 1991



The Geological Society of America

Congressional Science Fellowship 1992-1993



The Geological Society of America is accepting applications for the 1992-1993 Congressional Science Fellowship. The Fellow selected will spend a year (September 1992-August 1993) in the office of an individual member of Congress or a congressional committee. The program provides an opportunity to gain a better understanding of science and technology issues facing Congress and to advise on a wide range of scientific issues as they pertain to public policy questions. The American Association for the Advancement of Science conducts an orientation program and assists the Fellow seeking a congressional staff position in which he or she can work on major legislative issues.

Criteria

The program is open to highly qualified earth scientists in early or mid-career. Candidates should have exceptional competence in some area of the earth sciences, cognizance of a broad range of

matters outside the Fellow's particular area, and a strong interest in working on a range of public policy problems.

Award

The GSA Congressional Science Fellowship carries with it a \$38,000 stipend, and limited health insurance, relocation, and travel allowances. The fellowship is funded by GSA and by a grant from the U.S. Geological Survey. (Employees of the USGS are ineligible to apply for this fellowship.)

To Apply

Procedures for application and detailed requirements are available in the geology departments of most colleges and universities in the United States or upon request from: Executive Director, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

DEADLINE FOR RECEIPT OF ALL APPLICATION MATERIALS IS FEBRUARY 15, 1992

Final Announcement

NORTH-CENTRAL SECTION, GSA 26th Annual Meeting

Iowa City, Iowa
April 30–May 1, 1992

The North-Central Section of the Geological Society of America will meet at the Iowa Memorial Union on the University of Iowa Campus. The meeting will be hosted by the Geological Survey Bureau of the Iowa Department of Natural Resources and the Department of Geology of the University of Iowa. Several associated societies will be meeting in conjunction with the North-Central Section of GSA: The Pander Society, the North-Central Section of the Paleontological Society, the Great Lakes Section of SEPM, the Central Section of the National Association of Geology Teachers, the Midwest Section of the National Association of Earth Science Teachers, and the Geological Society of Iowa.

TRAVEL ARRANGEMENTS

Iowa City is located on Interstate 80, five miles east of its junction with Interstate 380. The Iowa Memorial Union is located on the campus of the University of Iowa, on the east bank of the Iowa River, near the center of Iowa City, and can be reached by exiting Interstate 80 at the Dubuque Street exit (exit 244) and proceeding south about one mile to the University of Iowa campus (see map).

The Iowa City Airport, located on the south edge of Iowa City, serves general aviation only. Commercial air service to Iowa City is through the Cedar Rapids Municipal Airport, located about 15 miles northwest of Iowa City on Interstate 380. The Cedar Rapids Municipal Airport is served by United, TWA, Northwest, US Air Express, American West, American Eagle, and United Express. Airport Limousine Service between the airport and Iowa City is available, and several car rental services operate at the airport.

Transportation and Parking. No shuttle vehicles will be provided between hotels and the Memorial Union; however, bus service is available, including University of Iowa Cambus service, which is free. A copy of bus routes and schedules will be included in the registration packets.

Parking is available in two University parking ramps within two blocks of the Iowa Memorial Union, and two city parking ramps, located about five blocks from the union. University ramp rates are 50¢ per hour or \$5 per day (a daily pass for \$5 per day is available, which allows unlimited access); the city ramp rates are 40¢ per hour. Additional metered street parking is available in the area of the University of Iowa campus, and unmetered street parking is available about five blocks east of the Iowa Memorial Union.

REGISTRATION

Registration is required for all who participate in any event at the meeting, including technical sessions, symposia, exhibits, planned social events, and field trips.

Preregistration. Advance registration is encouraged to aid the local committee in making the final plans for the meeting. A preregistration discount is available to those who register using the Registration Form on page 16 by April 1, 1992. NO REFUNDS WILL BE MADE ON CANCELLATION NOTICES RECEIVED AFTER THIS DATE. Advance registration is required for those who

plan to attend a field trip. Return the completed Registration Form with check or money order (payable to North-Central Section GSA). Mail to North-Central GSA, Iowa DNR—Geological Survey Bureau, 123 North Capitol Street, Iowa City, IA 52242.

On-Site Registration. Registration will be from 5:00 to 9:00 p.m. on Wednesday, April 29, 1992, in the Big Ten Lobby on the third floor of the Iowa Memorial Union. Registration will continue daily in the Big Ten Lobby from 8:00 a.m. to 5:00 p.m. on Thursday, April 30, and 8:00 a.m. to 4:00 p.m. on Friday, May 1. Preregistrants may pick up their folders and tickets at the registration desk. A limited number of tickets for special events will be available for those who did not preregister. NO REFUNDS WILL BE GIVEN FOR ON-SITE REGISTRATION.

WELCOMING RECEPTION

A welcoming reception will be held for all registrants on the evening of Wednesday, April 29, in the Big Ten Lobby on the third floor of the Iowa Memorial Union from 5:00 to 9:00 p.m.

STUDENT ARRANGEMENTS

Student Travel. The North-Central Section will provide travel assistance to students who are members of the North-Central Section of GSA as of January 1992. The assistance will be offered on a first-come, first-served basis. The students must be enrolled in an academic geology department in the North-Central Section, and priority will be given to those presenting an oral or poster paper (as author or coauthor) at the 1992 North-Central meeting. Applications for travel assistance awards may be obtained by writing meeting Co-Chairman Holmes Semken, Dept. of Geology, University of Iowa, Iowa City, IA 52242. Applications must be received by February 7, 1992.

Student Paper Awards. The North-Central Section of GSA will award \$50 for each of the eight best papers (oral or poster) whose principal author and presenter is a graduate or undergraduate student. Abstracts submitted for these awards should be clearly indicated. Also, the SEPM Great Lakes Section will award \$50, a certificate, and an SEPM publication to the best student paper in the fields of stratigraphy, sedimentation, and paleontology.

TECHNICAL PROGRAM

Technical sessions are scheduled as oral and poster presentations on

Thursday, April 30, and Friday, May 1. The meeting will present technical symposia on a number of topics, and will continue the new North-Central Section tradition (initiated last year in Toledo) of presenting a symposium for consultants, providing an opportunity to share new ideas and developments with other consultants, geologists, and geology students. Additionally, the meeting will continue another Section tradition by including a symposium dedicated to educators in geology. All 1992 North-Central GSA symposia are listed and described below.

SYMPOSIA

Symposia include invited as well as volunteered papers. Authors are encouraged to contact the individual symposia organizers for information.

1. Hydrogeology of Fine-Grained Tills. George R. Hallberg, Iowa DNR—Geological Survey Bureau; William W. Simpkins, Iowa State University; D. Roger Bruner, Iowa DNR—Geological Survey Bureau, (319) 335-1582.

Participants will discuss current research into how water and chemicals move in fine-grained glacial materials. Topics could include the fate and transport of organic and inorganic contaminants, estimating recharge rates through till, and other hydrogeologic investigations.

2. Paleozoic Sequence Stratigraphy. Great Lakes Section, SEPM. Brian J. Witzke, Iowa DNR—Geological Survey Bureau, (319) 335-1590; Jed Day, Illinois State University.

Sequence stratigraphic analyses provide powerful means for integrating regional depositional histories within empirical stratigraphic constraints. Interpretations of relative sea-level changes and the development of event stratigraphies for the Paleozoic can provide ideas for improved chronostratigraphic resolution and inter-regional correlation. The intent of the symposium will be to propose and test ideas of relative sea-level changes during the Paleozoic in regional and inter-regional stratigraphic frameworks.

3. Diagenetic Analysis of Transgressive-Regressive Events. Great Lakes Section, SEPM. Luis A. Gonzalez, University of Iowa, (319) 335-0567; Greg A. Ludvigson, Iowa DNR—Geological Survey Bureau.

The advent of sequence stratigraphic analysis not only provides a genetic framework for interpreting the deposition of marine sedimentary successions, but also can imply predictable depositional controls on pore fluid evolution during the diagenesis of those deposits. The intent of the symposium will be to explore petrographic, geochemical, and modeling approaches to interpreting the diagenesis of transgressive-regressive cycles in both carbonate and siliciclastic depositional systems.

4. New Developments in Midcontinent Precambrian Research. Raymond R. Anderson, Iowa DNR—Geological Survey Bureau, (319) 335-1589.

This session will focus on new research results on the Precambrian geology of Midcontinent North America, including local studies and broad-scale syntheses. Possible topics could include the Midcontinent Rift System and Proterozoic plate tectonics.

5. Conditions in the Midcontinent During the Last Glacial Maximum, 21,000–16,500 B.P. Timothy J. Kemmis, Iowa DNR—Geological Survey Bureau (319) 335-1587;

E. Arthur Bettis III, Iowa DNR—Geological Survey Bureau.

The symposium will feature discussions of the biologic, sedimentologic, and stratigraphic record dating from the last glacial maximum in the upper Midwest. Of special interest are the climatic conditions suggested by the preserved records.

6. What Should Every Geoscientist Know About Earth Science in Our Schools? (With Apologies to Pete Palmer). National Association of Geology Teachers; National Earth Science Teachers Association; Earth Science Teaching Section, Iowa Academy of Science. Jan Wielert, Iowa City West High School, (319) 339-6817.

A panel of teachers and educational leaders experienced in earth science education will discuss the past, present, and future of earth science in our nation's public schools. The learning styles of children, the characteristics of practicing public school teachers, and the history of the earth sciences in our schools will be explained. Current education initiatives in the sciences will be described with emphasis on the role of the earth sciences in these programs.

7. Experimentation as a Tool for Paleontological Study. North-Central Section, Paleontological Society. Lawrence A. Wiedman, Monmouth College, (309) 457-2353; Michael L. Savarese, Indiana University.

This symposium will provide a look at successful experimental approaches to functional morphology, biomechanics, flumes, wind tunnels, flow meters, and other "tinker toys," as well as taphonomy, paleoecology, phylogeny, and other areas of interest to students and practitioners of paleontology.

8. Innovative Methods of Teaching Concepts in Earth History. North-Central Section, Paleontological Society. Lawrence A. Wiedman, Monmouth College, (309) 457-2353.

In this symposium we will take a timely look at successful and innovative ways to address concepts of earth history, including paleomagnetism, paleogeography and paleobiogeography, taxonomy, and paleobiology. The session will be directed at undergraduate students and faculty instructing them.

9. Recent Advances in Sandstone Petrology and Sedimentology. Robert L. Brenner, University of Iowa, (319) 335-1829; Robert H. Dott, Jr., University of Wisconsin.

In this session we will examine recent developments in the study of sandstone genesis. The focus will be on new petrographic techniques, as well as the depositional and burial histories of sandstones in the Midcontinent and elsewhere.

10. Consultant's Symposium: Interdisciplinary Environmental Consulting. Curtis M. Hudak, Foth and Van Dyke, (612) 942-0396.

Participants will discuss environmental projects integrating geology with engineering and other sciences. Environmental projects may include hazardous material remediations, landfill sitings, hydrology, wetland delineation, and geoarchaeology.

11. 25th Annual Meeting of the Pander Society. Gilbert Klapper, University of Iowa; Brian J. Witzke, Iowa DNR—Geological Survey Bureau, (319) 335-1590.

The Pander Society is an international organization dedicated to the

study of conodonts and conodont biostratigraphy (Paleozoic-Triassic).

EQUIPMENT AND FACILITIES FOR PRESENTATIONS

Oral Presentations

All slides used in oral presentations must be 2" x 2" and fit in a standard Kodak 35 mm carousel projector. Only one projector, screen, and pointer will be available in each meeting room. Please bring your own loaded carousel tray, identified with your name, session, and speaker number, to the appropriate session projectionist 15 minutes prior to the beginning of the session.

A speaker ready room equipped with projectors will be available for review and practice. Carousel trays will not be available.

Any questions or special requests should be directed to Orrin Plocher, Iowa DNR—Geological Survey Bureau, (319) 335-1590.

Poster Presentations

Poster sessions will be housed in and just outside of the Big Ten Room, near the room with the exhibits, and will be available for viewing for one-half day. Poster booths will consist of three 4' x 4' display panels set on tables: tacks and masking tape will be provided.

Any questions or special requests should be directed to Jim Kralik, University of Iowa, (319) 335-1818.

SOUND EQUIPMENT AND SMOKING POLICY

Annual meeting policy prohibits the use of cameras or sound-recording equipment at technical sessions. A no smoking policy has been adopted by the Program Committee in conjunction with the University of Iowa and will be followed in all rooms at the Iowa Memorial Union.

FIELD TRIPS

Registration. Field trip registrants must register for the meeting.

Registration procedures, deadlines, and forms are provided in this announcement. Registration at the meeting for the postmeeting field trips may be possible if trip logistics and space permit. If trips are under-enrolled, participants will be notified no later than ten days before the start of the meeting, and all registration fees will be refunded. There will be no refunds if participants fail to show on time for a field trip other than documented serious illness or extreme family emergency. Sponsoring agencies assume no liability whatsoever for failure of participants to show for a trip, for missed connections, or for injury, loss, or damage during or resulting from participation in the field trips. The number of participants in most field trips will be limited, so get your registration in as soon as possible to ensure a seat. Further information, if required, will be sent to trip participants. Field trip coordinators are Brian Glenister, University of Iowa, (319) 335-1829; and Bob Libra, Iowa DNR—Geological Survey Bureau, (319) 335-1585.

Premeeting (April 29, 1992)

1. Silurian Depositional and Carbonate Mound Facies, Jones and Cedar County, Iowa. Brian J. Witzke, Iowa DNR—Geological Survey Bureau, (319) 335-1590.

Shifts in biofacies and carbonate lithofacies in the Silurian dolomite sequence record a series of relative sea-level changes during deposition. Three stages of carbonate mound growth will be examined along with intervening horizontally stratified units. Cost: \$30.

2. Holocene-Late Wisconsinan Paleocology and Archeological Geology of East-Central Iowa.

Richard G. Baker, University of Iowa, (319) 335-1827; E. Arthur Bettis III, Iowa DNR—Geological Survey Bureau.

Participants in this trip will visit several eastern Iowa localities where well-preserved paleoecological and stratigraphic records spanning the Holocene are preserved. Alluvial stratigraphy, vegetation history, and archaeology will be integrated to provide an environmental history of the area. Cost: \$30.

During Meeting (April 30 and May 1, 1992)

3. Quaternary Geology of Conklin Quarry. E. Arthur Bettis III, (319) 335-1587; Timothy J. Kemmis, Iowa DNR—Geological Survey Bureau.

Trip participants will examine the most complete exposed record of Pre-Illinoian glacial deposits in the upper Midwest. They will also examine soil stratigraphy and weathering-zone characteristics of the deposits. Friday afternoon, May 1. Cost: \$15.

4. Walking Tour of the Geology of the University of Iowa Campus.

Brian J. Witzke, Iowa DNR—Geological Survey Bureau, (319) 335-1590.

On this field trip conference participants will get the opportunity to examine the Pennsylvanian and Middle Devonian rocks exposed within walking distance of the University of Iowa Campus. Guidebooks will be available for \$3 and can be used for self-guided tours. Organized tours, about 1 1/2 hours long, will be led by Brian Witzke on Thursday, April 30, and Friday, May 1. Times for tours will be announced in fliers enclosed in the registration packet. No cost (\$3 if purchasing guidebook).

Postmeeting (May 1-2, 1992)

5. Cyclic Sedimentation of Upper Pennsylvanian Rocks, Winterset, Iowa, Area. Philip H. Heckel, University of Iowa, (319) 335-1804; John Pope, Des Moines, Iowa.

On this trip we will visit the classic lower Upper Pennsylvanian (Missourian) eustatic marine cyclothem characteristic of the Northern Midcontinent shelf. Facies include thin transgressive limestones, deep-water phosphatic black shales, thick shallowing-upward regressive limestones, and paleosols. There will be good opportunities for invertebrate fossil collecting. Cost: \$70 (includes one night's lodging).

6. The Stratigraphy, Paleontology, and Depositional and Diagenetic History of the Middle-Upper Devonian Cedar Valley Group of Central and Eastern Iowa. Jed Day, Illinois State University, (309) 438-8676; Bill J. Bunker, Iowa DNR—Geological Survey Bureau.

Participants in this field trip will examine the nearshore peritidal to offshore subtidal environments in the carbonate succession of the Cedar Valley Group. The guidebook will contain contributed papers addressing the sequence stratigraphy of the Cedar Valley Group, as well as biostratigraphic aspects of conodont, brachiopod, trilobite, and stromatoporoid faunas and miospore floras in the sequence. Additional contributions will describe the chemostratigraphy and paleomagnetism of these Devonian strata. Cost: \$40.

7. Environmental Geology of the Big Spring Groundwater Basin, Northeast Iowa. Robert D. Libra,

(319) 335-1585; George R. Hallberg, Iowa DNR—Geological Survey Bureau.

Participants will visit the Big Spring Basin, a moderately karstified ground-water basin in northeast Iowa. The trip will focus on the impact of agricultural land use on water quality, the environmental effects of the geologic setting, and the results of 10 years of hydrologic and water-quality monitoring. Cost: \$95 (includes one night's lodging).

CORE WORKSHOP

Cambrian Core Workshop. Robert McKay (Iowa DNR—Geological Survey Bureau) will host a core workshop on Wednesday, April 29, 1992, from 1:00 to 4:00 p.m. at the Survey's Oakdale Research Facility. The workshop will include examination of Upper Cambrian cores from central and eastern Iowa. The focus will be on biostratigraphy, lithostratigraphy, and sedimentology. Transportation to the Oakdale facility will be by private car or University Cambus (free). Cost: \$5, includes core logs, publications, and other materials.

EXHIBITS

Space will be available for educational, research, and commercial exhibits. Exhibits will be located on the second floor in the Iowa Room of the Iowa Memorial Union, adjacent to the registration and coffee break area, and next to the room in which the poster papers will be presented. A single booth is 10' x 10'; costs will be: Commercial Exhibitors—\$50; Non-Profit Exhibitors (Educational and Service Organizations)—\$15 (\$30 if selling); Collective Commercial—\$20 (\$40 if materials are returned). For additional information on exhibits, contact Julia Golden, University of Iowa, (319) 335-1822, fax 319-335-1821.

SPECIAL EVENTS

GSA North-Central Section Management Board Breakfast and business meeting will be held on Thursday, April 30, at 7:00 a.m. in the South Room of the Iowa Memorial Union.

Great Lakes Section of the SEPM, North-Central Section of the Paleosociety, and the Pander Society will hold a joint luncheon in the South Room of the Iowa Memorial Union on Thursday, April 30, at 12:00 noon. Please indicate on the preregistration form if you plan to attend.

GSA Campus Representatives Breakfast will be held in River Room 1 of the Iowa Memorial Union on Friday, May 1, at 7:00 a.m. Please indicate on the preregistration form if you plan to attend.

National Association of Geology Teachers and GSA North-Central Section Education Committee will hold a joint luncheon on Friday, May 1, at 12:00 noon in River Room 1 of the Iowa Memorial Union. Please indicate on the preregistration form if you plan to attend.

ANNUAL BANQUET

The North-Central Section Annual Banquet will be held on Thursday, April 30, at 7:00 p.m. in the Main Lounge of the Iowa Memorial Union. After the banquet, a short business meeting will precede the banquet speaker, Eugene M. Shoemaker, U.S. Geological Survey, Branch of Astrogeology in Flagstaff, who will discuss the Manson Impact Structure in northwest Iowa and its relation to the Cretaceous-Tertiary (K-T) Boundary. Shoemaker is one of the leading impact researchers

and is at the forefront of the search for K-T boundary impact sites. The banquet will be preceded by a *Social Hour* with a cash bar, scheduled to begin at 6:00 p.m. in the Sunporch adjacent to the Main Lounge.

GUEST AND SPOUSE ACTIVITIES

A series of activities have been organized for the guests and spouses of North-Central GSA meeting registrants. Please preregister for these activities, as participation will be limited. Activity organizer is Cris Plocher, Iowa DNR—Geological Survey Bureau, (319) 335-1575.

1. Tour of the Amana Colonies. Following a short bus trip to the Amana Colonies, about 30 miles west of Iowa City, participants will have an opportunity to tour several colony facilities including a furniture shop and the woolen mills, visit some of the many treasure-filled shops, and enjoy a world-famous, family-style German lunch. Cost: \$20, includes transportation and lunch.

2. Tour of the Old Capitol, Art Museum, and Natural History Museum. This tour will visit the first Iowa State Capitol building, recently restored and maintained by the National Park Service, the University of Iowa Museum of Art, and the University Natural History Museum and its newest section, Iowa Hall, allowing participants to walk through exhibits of the geologic and cultural history of Iowa. No cost.

HOUSING

A number of motels and hotels in the Iowa City-Coralville area are available to North-Central Section Meeting attendees. They are located and listed on the accompanying map (p. 16). Rooms have been reserved in the Holiday Inn—Iowa City, the Days Inn, and the Heartland Inn. Be sure to specify that you are attending the GSA meeting in order to qualify for reduced rates. Information on reservations at these and other motels is given with the maps. All reservations are on a first-come, first-served basis.

MEALS

Meals are available in several areas of the Iowa Memorial Union, including the River Room Restaurant, the Union Station Cafeteria, and the Union Pantry. Also, the Union is located about three blocks from the Iowa City downtown business district. There are numerous restaurants and fast-food outlets in the downtown area. Additionally, there are many restaurants in and around the Iowa City area. The Amana Colonies, located 30 miles west of Iowa City, are world famous for their German cuisine and family-style service.

ADDITIONAL INFORMATION

For more information on program content, call Raymond Anderson, Iowa DNR—Geological Survey Bureau, (319) 335-1575; for registration call Paul VanDorpe, Iowa DNR—Geological Survey Bureau, (319) 335-1580; fax 319-335-2754. ■

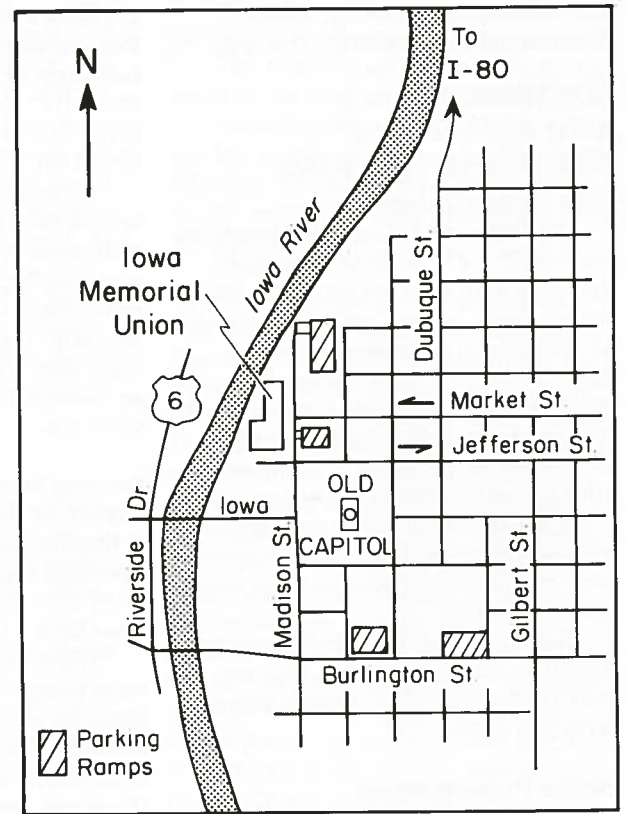
Please See Housing Information, Maps, and Registration Form on p. 16.

MOTELS PROVIDING SPECIAL NORTH-CENTRAL GSA MEETING RATES

Motel	Rate (# of people in room)	Rooms reserved	Room release date
Heartland Inn 87 2nd Avenue Coralville, IA (319) 351-8132	\$36 (1) 44 (2) 52 (3) 60 (4)	40	3-30-92
Days Inn Ironman 1200 1st Avenue Coralville, IA (319) 351-6600	\$37 (1) 42 (2)	50	4-15-92
Holiday Inn—Iowa City 210 South Dubuque Street Iowa City, IA (319) 337-4058	\$65 (1) 70 (2)	75	3-30-92

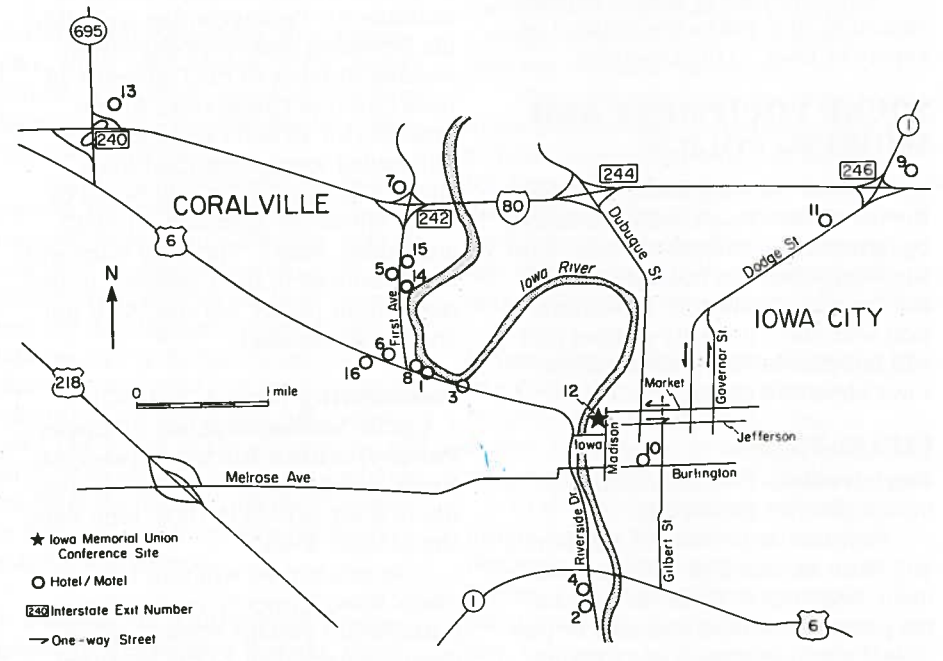
HOTELS AND MOTELS IN THE IOWA CITY-CORALVILLE AREA (numbers locate hotels and motels on map)

- | | |
|--|---|
| 1. The Abbey Retreat
73 2nd Street
Coralville, IA 52241
(319) 351-6324 | 9. The Highlander Inn
2525 North Dodge Street
Iowa City, IA 52240
(319) 354-2000 |
| 2. The Airlane Motel
1231 South Riverside Drive
Iowa City, IA 52246
(319) 351-9643 | 10. Holiday Inn—Iowa City
210 South Dubuque Street
Iowa City, IA 52240
(319) 337-4058 |
| 3. Alamo Motor Inn
Highway 6 West
Coralville, IA 52241
(319) 337-9888 | 11. Howard Johnson
Highway 1 and Interstate 80
Iowa City, IA 52240
(319) 351-1010; (800) 654-2000 |
| 4. Alexis Park Inn
1165 South Riverside Drive
Iowa City, IA 52246
(319) 337-8665 | 12. Iowa House—Iowa Memorial Union
300 West Jefferson Street
Iowa City, IA 52242
(319) 335-3513 |
| 5. The Canterbury Inn
704 1st Avenue
Coralville, IA 52241
(319) 351-0400 | 13. Westfield Inn
Highway 965 N. and Interstate 80
Coralville, IA 52241
(319) 354-7770 |
| 6. Capri Motor Lodge
Highway 6 West
Coralville, IA 52241
(319) 354-5100 | 14. Super 8 Motel
611 1st Avenue
Coralville, IA 52241
(319) 337-8388 |
| 7. Days Inn Ironman
1200 1st Avenue
Coralville, IA 52241
(319) 351-6600 | 15. Mar-Kee Motel
707 1st Avenue
Coralville, IA 52241
(319) 351-6131 |
| 8. Heartland Inn
87 2nd Street
Coralville, IA 52241
(319) 351-8132 | 16. University Inn
Highway 6 West
Coralville, IA 52241
(319) 354-4400 |



IOWA CITY MAP

CORALVILLE AND IOWA CITY AREA MAP



REGISTRATION FORM North-Central Section, GSA • April 30–May 1, 1992 • Iowa City, Iowa

IMPORTANT

- Full payment must accompany registration: payable to North-Central Section GSA.
- Registrants are responsible for their own lodging arrangements.

- Preregistration deadline is April 1, 1992.
- Register ONE person per registration form.

PLEASE PRINT OR TYPE • COPY FOR YOUR RECORDS

Name (for badge) _____

Professional affiliation/business _____

Address _____

City _____ State _____ ZIP _____

Business phone () _____ Home phone () _____

GSA Member Yes No GSA Member # _____

GSA Student Associate Yes No GSA Student Associate # _____

PREREGISTRATION

GSA Member	\$40.00
Other professional	\$45.00
GSA Student Associate	\$10.00
Other student	\$15.00
Teacher (K-12)	\$10.00
Spouse/Guest	\$ 5.00

On-Site REGISTRATION

GSA Member	\$50.00
Other professional	\$55.00
GSA Student Associate	\$20.00
Other student	\$25.00
Teacher (K-12)	\$20.00
Spouse/Guest	\$10.00

ABSTRACTS WITH PROGRAMS (reserved, pick up at registration table) \$ 8.00

FIELD TRIPS (meeting registration required)

Premeeting:	
1. Silurian (Wednesday, April 29)	\$30.00
2. Holocene (Wednesday, April 29)	\$30.00
During meeting:	
3. Quaternary (Friday, May 1)	\$15.00
4. Campus (Thursday and Friday, April 30 and May 1—please preregister)	FREE
Optional guidebook available	\$ 3.00
Postmeeting:	
5. Pennsylvanian (Friday and Saturday, May 1 and 2)	\$70.00
6. Big Spring (Friday and Saturday, May 1 and 2)	\$95.00
7. Cedar Valley (Saturday, May 2)	\$40.00

SPECIAL EVENTS

Core Workshop—Cambrian (Wednesday, April 29)	\$ 5.00
Annual Banquet (7:00 p.m., Thursday, April 30; cash bar @6:00 p.m.)	\$25.00
Combined Paleosociety, Pander Society, and Great Lakes SEPM Luncheon (noon, Thursday, April 30)	\$15.00
NAGT and GSA N-C Section Education Committee Luncheon (noon, Friday, May 1)	\$15.00
GSA Campus Representatives Breakfast (7:00 a.m., Friday, May 1)	FREE

SPOUSE/GUEST ACTIVITIES

Thursday, April 30, Tour of Amana Colonies (includes lunch)	\$20.00
May 1, Tour of Old Capitol, Art Museum, Natural History Museum (please preregister)	FREE

TOTAL FEES

..... \$

Send registration form to: North-Central GSA,
Iowa DNR—Geological Survey Bureau, 123 North Capitol Street, Iowa City, IA 52242

Applications of Strain, from Microstructures to Mountain Belts

Over the past two decades, a variety of methods for measuring total and incremental strains have been developed. This progress is exciting because strain analysis provides a quantitative basis for understanding and resolving the kinematic and mechanical evolution of outcrop-scale structures as well as orogen-scale deformation. The concepts and methods of strain analysis are now widely taught in introductory structure courses, but they are not as commonly used in actual field research studies. In particular, our understanding of the strain variations at the scale of an entire orogen is limited to only a few well-studied areas, such as the Alps and central Appalachians.

Two difficulties have stymied the application of strain analysis to real geologic problems. The first is that there is considerable disagreement and uncertainty over the correct interpretation of strain data. For instance, (1) What part of the deformational history of a rock does a particular strain method measure? (2) Are strain measurements strongly biased by unresolved pre-tectonic fabrics or volume strains? (3) Given a typically heterogeneous strain field, how precise and representative are our measurements? (4) How does slip on small faults contribute to the total deformation and how can this brittle strain be represented?

The second difficulty is how to actually pose research questions that can be addressed and solved by strain analysis. To quote a comment from a previous Penrose Conference, "strain analysis is a solution in search of a problem." The complexities of deformation under real geologic conditions make it difficult to pose testable hypotheses, although research on micro-scale deformational mechanisms and geodynamic modeling of tectonic processes have helped to improve this situation.

These problems have prompted us to organize a Penrose Conference that will focus specifically on the application of strain analysis to real geologic problems. In particular, we seek to learn how strain data can be used to better understand the evolution of structures on all scales, from the thin section to the mountain belt.

The conference will be held September 9–13, 1992, at Liscombe Lodge, located at Liscomb Harbour on the east coast of Nova Scotia, Canada. There will be two and a half days of presentations encompassing the following broad topics: (1) new methods of strain analysis, including computer-assisted data reduction, (2) strain partitioning and microscale deformation mechanism, (3) volume strains and solution–mass transfer, (4) strain fields and macroscale structures, (5) orogen-

scale deformation, including ductile strain and fault strain, and (6) the integration of strain data into geomechanical models. Each theme session will include an introduction by an invited keynote speaker, some additional oral presentations by selected participants, and extended general discussion.

This conference will also include two days of field trips. The Liscomb Harbour area provides superb coastal exposures of the Paleozoic shale-sandstone sequences of the Meguma Group. Jack and Marie Henderson and Tom Wright will lead the first field trip in the area between Halifax and Liscomb Harbour. On this trip we will examine a remarkable variety of strain markers that have helped elucidate the strain history of the Meguma Group. Paul Williams will lead the second trip along the coast between Liscomb Harbour and Chedabucto Bay. Here, we will examine folding and vein arrays formed by transpressive shear and rotated(?) porphyroblasts and will consider the implications of these structures for strain analyses.

Prospective participants should send a letter of application to one of the conveners, Scott Paterson or Mark Brandon. The letter should briefly describe the relevance of your research to the objectives of the conference. In order to foster general discussion, we intend to limit the number and duration of prepared oral presentations. Those who want to make a presentation, either oral or poster, should provide a tentative title in your letter of application. Those who would like to have time for a prepared oral presentation should include a brief statement explaining their request. Please note that a presentation is not a necessary

requirement for admittance to the conference.

The application deadline is April 15, 1992. For further information about the technical scope of the conference, please contact one of the conference conveners. Questions about logistics should be directed to Lois Elms, the conference coordinator, (619) 943-7694.

Scott R. Paterson
Dept. of Geological Sciences
University of Southern California
Los Angeles, CA 90089-0740
(213) 740-6103; fax 213-740-8801

Mark Brandon
Dept. of Geology and Geophysics
Yale University, P.O. Box 6666
New Haven, CT 06511-8130
(203) 432-3135; fax 203-432-3134 ■

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Low-K Silicic Magmas in Subduction Settings

A Geological Society of America Penrose Conference entitled Origin and Emplacement of Low-K Silicic Magmas in Subduction Settings will be held September 25–30, 1992, in Chelan, Washington. Conveners are James S. Beard, Virginia Museum of Natural History, Martinsville, VA 24112; George W. Bergantz, Department of Geological Sciences, University of Washington, Seattle, WA 98195; Marc J. Defant, Department of Geology, University of South Florida, Tampa, FL 33620; and Mark S. Drummond, Department of Geology, University of Alabama, Birmingham, AL 35294.

Low-K silicic magmas are of particular interest because they are the first silicate melts produced during the partial melting of most basalts, andesites, graywackes, and their metamorphic equivalents at pressures ranging from 1 to 30 kbar. Recent field, geochemical, and experimental work has suggested that tonalitic melts can and will be generated in the subducted slab, especially during the early stages of subduction and during the subduction of young, hot oceanic crust. Part of the conference will focus on whether these melts are preserved in the geologic record. Possible candidates (and certain subjects for debate) are "adakites" found in several arcs of Phanerozoic

age, including several modern arcs, and the tonalitic rocks that make up 90% of the Archean record. Even if these melts reach the crust in unmodified form only rarely or not at all, their ascent into the high-temperature region of the sub-arc mantle may lead to assimilation and partial melting of periodotite and, ultimately, to the generation of some primitive arc basalts. Within the crust, tonalitic and granodioritic magmas can be formed by partial melting of amphibolites and graywackes. These melts may then be directly emplaced to higher levels of the arc crust. Alternatively, they may serve as a principal agent of crustal contamination in ascending, mantle-derived magmas within zones of mixing and assimilation, (MASH zones) in the crust of the arc. The conference will also address the time and length scales of magma generation, extraction, and ascent. Evidence for melt extraction, diapirism, and structurally controlled ascent will be assessed from the perspectives of both field studies and magma physics.

This conference will bring together geologists whose recent and ongoing research programs in geochemistry, tectonics, magma physics, and experimental petrology have given them a range of perspectives on low-K silicic

rocks. It is our goal that the resulting exchange of ideas and information lead to new ideas, new directions for research, and new collaborations that will ultimately result in a better understanding of the generation, emplacement, and significance of low-K silicic magmas.

The conference will begin on Friday evening, September 25, with a welcoming gathering and introduction to the conference. This will be followed by three and a half days of technical sessions and discussions along with a one-day field trip. The conference will be organized as follows: Day one—Experimental petrology and the petrogenesis of low-K magmas; Day two—Geochemistry of low-K silicic magmas; Day three—The segregation, migration, and emplacement of tonalite and other silicic melts; Day four—Field trip to the Chelan Migmatite Complex; Day five—Archean tonalites. Most sessions will begin with a keynote address to provide an overview of current understanding of the topic. This will be followed by poster sessions, discussion, and, perhaps, one or two short talks on specific topics. Each session will be capped by an open discussion and summary, and plenty of time will be allotted for formal and informal discussion throughout the schedule.

Day four will be devoted to a field trip to the Chelan Migmatite Complex, led by Clifford A. Hopson and James M. Mattinson. The complex consists of metatonalite, migmatitic metabasite-metapyroxenite, banded and swirled metaplutonic migmatite, and migmatitic quartz diorite and hornblendeic appinite hybrids, all intermingled, but formed in that order. All four members

show pervasive development of trondhjemitic neosomes, mafic synplutonic dikes, structural evidence of mass flowage, metamorphic fabrics, and amphibolite-facies mineral assemblages. The Chelan Migmatite Complex evolved in the Early to Middle Cretaceous from lower-crustal tonalitic protoliths that were pervasively intruded by mafic magma, partially melted, and diapirically emplaced into the middle crust. Mixing of mafic magma and cumulates with silicic melts and their restites accompanied mass flowage, as shown by structural, petrologic, and isotopic evidence. It will be argued that this batholith-scale migmatite complex is an intrusive mass, not an in situ melting product and that it may be likened to a MASH zone, but with mixing of mafic and silicic melts and their crystalline residua occurring during diapiric rise into the middle crust.

Participation in the conference will be limited to 70 persons. Prospective participants can apply by submitting a summary of past, present, and future research interests in low-K silicic magmas and a description of proposed contribution(s) to the conference to James S. Beard, Virginia Museum of Natural History, 1001 Douglas Ave., Martinsville, VA 24112; (703) 666-8611; fax 703-632-6487.

The application deadline is May 15, 1992. The registration fee will be approximately \$650 and will include transport to and from the airport, all food and lodging in Chelan, and all costs associated with the field trips. ■

GSA Penrose Conferences**March 1992**

Continental Tectonics and Magmatism of the Jurassic North American Cordillera, March 28–April 3, 1992, Lake Havasu City, Arizona. Information: David M. Miller, U.S. Geological Survey, 345 Middlefield Road, MS-975, Menlo Park, CA 94025; (415) 329-4923; fax 415-329-4936; or Richard M. Tosdal (same address); (415) 329-5423.

May 1992

■ **The Origin and Evolution of the Coast Mountains, British Columbia, Yukon, and Alaska**, May 16–22, 1992, Bellingham, Washington. Information: George E. Gehrels, Dept. of Geosciences, University of Arizona, Tucson, AZ 85721, (602) 621-6026, fax 602-621-2672; Maria Luisa Crawford, Dept. of Geology, Bryn Mawr College, Bryn Mawr, PA 19010, (215) 526-5111, fax 215-526-5086; James W.H. Monger, Geological Survey of Canada, 100 West Pender Street, Vancouver, B.C. V6B 1R8, Canada, (604) 666-6743 or 0529, fax 604-666-1124.

September 1992

■ **Applications of Strain: From Microstructures to Mountain Belts**, September 9–13, 1992, Liscomb Mills, Nova Scotia, Canada. Information: Mark Brandon, Dept. of Geology and Geophysics, Yale University, P.O. Box 6666, New Haven, CT 06511-8130, (203) 432-3135; or Scott R. Paterson, Dept. of Geological Sciences, University of Southern California, Los Angeles, CA 90089-0740, (213) 740-6130.

■ **Origin and Emplacement of Low-K Silicic Magmas in Subduction Settings**, September 25–30, 1992, Chelan, Washington. Information: James S. Beard, Virginia Museum of Natural History, Martinsville, VA 24112, (703) 666-8611, fax 703-632-6487; George W. Bergantz, Dept. of Geological Sciences, University of Washington, Seattle, WA 98195, (206) 545-4972; Marc J. Defant, Dept. of Geology, University of South Florida, Tampa, FL 33620, (813) 974-2238, fax 813-974-2668; Mark S. Drummond, Dept. of Geology, University of Alabama, Birmingham, AL 35294, (205) 934-8130.

October 1992

Fluid-Volcano Interactions, October 4–9, 1992, Warm Springs, Oregon. Information: Steve Ingebritsen, U.S. Geological Survey, MS 439, 345 Middlefield Road, Menlo Park, CA 94025, (415) 329-4422, fax 415-329-4463; Bruce Christenson, Geothermal Research Centre, Private Bag 2000, Taupo, New Zealand; Craig Forster, Dept. of Geology and Geophysics, University of Utah, 719 W.C. Browning Building, Salt Lake City, UT 84112; Grant Heiken, Los Alamos National Laboratory, MS-D462, Los Alamos, NM 87545; Craig Manning, Dept. of Earth and Space Sciences, University of California, 405 Hilgard Avenue, Los Angeles, CA 90024.

■ **Late Precambrian Tectonics and the Dawn of the Phanerozoic**, October 18–23, 1992, Death Valley, California. Information: Ian W. D. Dalziel, Institute for Geophysics, University of Texas, Austin, TX 78759-8345, (512) 471-6156, fax 512-471-8844; Andrew H. Knoll, The Botanical Museum, Harvard University, Cambridge, MA 02138, (617) 495-9306;

and Eldridge M. Moores, Dept. of Geology, University of California, Davis, CA 95616, (916) 752-0352 or 752-0350, fax 916-752-6363.

1992 Meetings**February**

6th International Symposium on Landslides, February 10–14, 1992, Christchurch, New Zealand. Information: ISL 1992 Secretariat, c/o Guthreys Pacific Ltd., P.O. Box 22-255, Christchurch, New Zealand; fax 643-790-175; telex: NZ4243 Guthreys.

U.S. Geological Survey 8th Annual McKelvey Forum on Energy Resources, February 18–20, 1992, Houston, Texas. Information: Christine Turner, USGS, Box 25046 MS 939, Federal Center, Denver, CO 80225; (303) 236-1561.

First South Asia Geological Congress—GEOSAS-I, February 23–27, 1992, Islamabad, Pakistan. Information: Hilal A. Raza, GEOSAS-I Secretary General, Hydrocarbon Development Institute of Pakistan, P.O. Box 1308, Islamabad, Pakistan; phone 9251-823690 or 821417; telex 5516 HDIP PK; fax 9251-828773.

GSA South-Central Section Meeting, February 24–25, 1992, Houston, Texas. Information: Hans G. Avé Lallemand, Dept. of Geology and Geophysics, P.O. Box 1892, Rice University, Houston, TX 77251; (713) 527-4889.

Society for Mining, Metallurgy, and Exploration Annual Meeting, February 24–27, 1992, Phoenix, Arizona. Information: Meetings Department, SME, P.O. Box 625002, Littleton, CO 80162; (303) 973-9550; fax 303-979-3461.

American Society of Photogrammetry and Remote Sensing—American Congress of Surveying and Mapping Annual Meeting, February 29–March 5, 1992, Albuquerque, New Mexico. Information: Registration Coordinator, ASPRS/ACSM, 5410 Grosvenor Lane, Suite 100, Bethesda, MD 20814-2122; fax 301-493-8245.

March

21st Computer Simulated Mineral Exploration Workshop, March 3–30, 1992, Fontainebleau, France. Information: L. Zanone, Ecole des Mines de Paris, CCGM-IGM, 35, rue Saint-Honoré, 77305 Fontainebleau Cédex, France; phone (33 1) 64 69 49 30; telex 694 736 F; fax (33 1) 64 69 47 01.

Circum-Pacific Council for Energy and Mineral Resources Symposium, Sustainable Development: Energy and Mineral Resources and the Environmental Impact of Their Utilization in the Circum-Pacific Region, March 9–12, 1992, Bangkok, Thailand. Information: Mary Stewart, Circum-Pacific Council, 5100 Westheimer, Suite 500, Houston, TX 77056; fax 713-622-5360.

■ **Hydrocarbon Contaminated Soils and Groundwater: Analysis, Fate, Environmental and Public Health Effects and Remediation**, March 9–12, 1992, Long Beach, California. Information: Martha Barrett, P.O. Box

312, Amherst, Massachusetts 01004; (413) 549-5561.

■ **11th Annual Symposium on Caribbean Geology: Caribbean Volcanoes—Past and Present**, March 11–15, 1992, Mayagüez, Puerto Rico. Information: Alan Smith, Dept. of Geology, University of Puerto Rico, P.O. Box 5000, Mayagüez, Puerto Rico 00709-5000; (809) 265-3845; fax 809-265-2880.

■ **GSA Southeastern Section Meeting**, March 18–20, 1992, Winston-Salem, North Carolina. Information: Paul D. Fullagar, Dept. of Geology, CB 3315 Mitchell Hall, University of North Carolina, Chapel Hill, NC 27599-3315; (919) 962-0677.

AGU Chapman Conference on Climate, Volcanism, and Global Change, March 23–27, 1992, Hilo, Hawaii. Information: Stephen Self, Dept. of Geology and Geophysics, University of Hawaii at Manoa, Honolulu, HI 96822; or Richard P. Turco, Dept. of Atmospheric Sciences, University of California, Los Angeles, CA 90024-1565.

Second Conference on Earthquake Hazards in the Eastern San Francisco Bay Area, March 25–28, 1992, Hayward, California. Information: Sue Ellen Hirschfeld, Dept. of Geological Sciences, California State University, Hayward, CA 94542; (415) 881-3486.

GSA Northeastern Section Meeting, March 26–28, 1992, Harrisburg, Pennsylvania. Information: Donald M. Hoskins, Pennsylvania Geological Survey, Dept. of Environmental Resources, P.O. Box 2357, Harrisburg, PA 17105; (717) 787-2169.

■ **40th National Science Teachers Association Meeting**, March 26–29, 1992, Boston, Massachusetts. Information: NSTA, 1742 Connecticut Ave., NW, Washington, DC 20009-1171; (202) 328-5800.

Structural Styles in the Southern Midcontinent, March 31–April 1, 1992, Norman, Oklahoma. Information: Kenneth S. Johnson, Oklahoma Geological Survey, University of Oklahoma, 100 East Boyd, Rm. N-131, Norman, OK 73019; (405) 325-3031.

April

XVII General Assembly of the European Geophysical Society, April 6–10, 1992, Edinburgh, Scotland. Information: EGS Office, Postfach 49, 3411 Katlenburg-Lindau, Germany; phone (49) 5556-1440; fax 49-5556-4709; telex 965564 zil d; E-mail SPAN: LINMPI::EGS; EARN: U0085@DGOGWDG5.

1992 SEPM Permian Basin Section Annual Fieldtrip, Paleokarst, Karst-related Diagenesis, and Reservoir Development: Examples from Ordovician-Devonian–Age Strata of West Texas and the Mid-Continent, April 9–11, 1992. Information: Magell Candelaria, Arco Oil & Gas Co., P.O. Box 1610, Midland, TX 79702; (915) 688-5254; fax 915-688-5756.

American Association of Petroleum Geologists Southwest Section, April 12–14, 1992, Midland, Texas. Information: West Texas Geological Society, P.O. Box 1595, Midland, TX 79702; (915) 683-1573.

1992 International High-Level Radioactive Waste Management Conference, April 12–16, 1992, Las Vegas, Nevada. Information: James Tulenko, Attn: TRANSACTIONS Office, American Nuclear Society, 555 N. Kensington Avenue, La Grange Park, IL 60525.

Fifth Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP), April 26–29, 1992, Oakbrook, Illinois. Information: Mark Cramer, 11100 E. Dartmouth Ave., Suite 190, Aurora, CO 80014; (303) 752-4951.

GSA North-Central Section Meeting, April 30–May 1, 1992, Iowa City, Iowa. Information: Raymond R. Anderson, Iowa DNR, Geological Survey, University of Iowa, 123 N. Capital St., Iowa City, IA 52242; (319) 335-1575.

May

First Canadian Symposium on Geotechnique and Natural Hazards, May 6–9, 1992, Vancouver, British Columbia. Information: Organizing Secretary, Geohazards '92, 970 Burrard St., Vancouver, BC V6Z 1Y3, Canada; (604) 663-1651; fax 604-663-1940.

Institute on Lake Superior Geology Annual Meeting, May 7–9, 1992, Hurley, Wisconsin. Information: Albert B. Dickas, 203 Administration, University of Wisconsin–Superior, Superior, WI 54880; (715) 394-8311; fax 715-394-8107.

Third Goldschmidt Conference, May 8–10, 1992, Reston, Virginia. Information: Bruce R. Doe, U.S. Geological Survey, 923 National Center, Reston, VA 22092; (703) 648-6205; fax 703-648-6191.

Lower Palaeozoic of Ibero-America (International Conference, IGCP-IUGS/UNESCO) and International Workshop: Natural Resources of the Circum-Gondwanan Lower Palaeozoic, May 8–12, 1992, Mérida, Spain. Information: Juan Carlos Gutiérrez-Marco, Instituto de Geología Económica, Facultad de Ciencias Geológicas, 28040-Madrid, Spain; fax 34-1-5439162.

■ **15th Annual Symposium on Systematics and Process**, May 9, 1992, Chicago, Illinois. Information: Vivian Ploense, Collections and Research, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496; (312) 922-9410, x416.

GSA Cordilleran Section Meeting, May 11–13, 1992, Eugene, Oregon. Information: A. Dana Johnston, Dept. of Geological Sciences, University of Oregon, Eugene, OR 97403-1272; (503) 346-5588. (Abstract deadline: January 21, 1992.)

GSA Rocky Mountain Section Meeting, May 13–15, 1992, Ogden, Utah. Information: Sidney R. Ash, Dept. of Geology, Weber State University, Ogden, UT 84408-2507; (801) 626-6908. (Abstract deadline: January 29, 1992.)

International Congress on Technology and Technology Exchange, May 13–15, 1992, Evry, France. Information: Janet Weisgerber, (412) 391-2913, or Ruby Glasgow, (412) 795-5300, 7125

Saltsburg Rd., Pittsburgh, PA 15235-2297; fax 412-795-5302.

Pan-American Current Research on Fluid Inclusions (PACROFI IV), May 22–24, 1992, Lake Arrowhead, California. Information: Michael A. McKibben, Department of Earth Sciences, University of California, Riverside, CA 92521-0423; (714) 787-3444; fax 714-787-4324. (Abstract deadline: March 1, 1992.)

The Euramerican Coal Province: Controls on Tropical Peat Accumulation in the Late Paleozoic, May 24–27, 1992, Wolfville, Nova Scotia, Canada. Information: John H. Calder, Nova Scotia Dept. of Mines and Energy, P.O. Box 1087, Halifax, Nova Scotia B3J 2X1, Canada; (902) 424-5364; fax 902-424-0528; or Martin R. Gibling, Dept. of Geology, Dalhousie University, Halifax, Nova Scotia B3H 3J5, Canada; (902) 494-2355.

Project PANGEA (GSGP) Research Workshop, May 24–29, 1992, Lawrence, Kansas. Information: Project PANGEA, P.O. Box 5061, Station A, Champaign, IL 61825-5061; (217) 333-2076.

Geological Association of Canada/Mineralogical Association of Canada Joint Annual Meeting, May 25–27, 1992, Wolfville, Nova Scotia, Canada. Information: Wolfville '92, Gary Sonnichsen, Acadia University, Wolfville, Nova Scotia B0P 1X0, Canada; (902) 542-1902; fax 902-542-1454; E-mail: WFVILL92@ace.acadiu.ca. (Abstract deadline: January 15, 1992.)

Third International Conference on Engineering, Construction and Operations in Space, May 31–June 4, 1992, Denver, Colorado. Information: Stein Sture, SPACE 92 Technical Co-Chairman, Dept. of Civil, Environmental, & Architectural Engineering, University of Colorado, Boulder, CO 80309-0428; (303) 492-7651; fax 303-492-7317.

June
33rd U.S. Symposium on Rock Mechanics, June 8–10, 1992, Santa Fe, New Mexico. Information: Wolfgang R. Wawersik, Geomechanics Division 6232, Sandia National Laboratories, Albuquerque, NM 87185; (505) 844-4342; fax 505-844-7354.

6th Symposium on the Geology of the Bahamas, June 11–15, 1992, Bahamian Field Station, San Salvador, Bahamas. Information: Donald T. Gerace, Executive Director, Bahamian Field Station, Ltd., P.O. Box 2488, Port Charlotte, FL 33949.

First Thematic Conference on Remote Sensing for Marine and Coastal Environments, June 15–17, 1992, New Orleans, Louisiana. Information: Nancy J. Wallman, ERIM/Marine Environment Conference, P.O. Box 134001, Ann Arbor, MI 48113-4001; (313) 994-1200, x3234; fax 313-994-5123; telex 4940991 ERIMARB.

American Association of Petroleum Geologists Annual Meeting, June 21–24, 1992, Calgary, Alberta, Canada. Information: George Eynon, General Chairman, Bow Valley Industries, Ltd., P.O. Box 6610, Postal Station D, Calgary, Alberta T2P 3R7, Canada; (403) 261-6100;

or AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101; (918) 584-2555.

Interpraevent 1992—Protection of Habitat against Floods, Debris Flows and Avalanches, June 29–July 3, 1992, Berne, Switzerland. Information: Interpraevent 1992, c/o Bundesamt für Wasserwirtschaft, Postfach 2743, CH-3001 Berne, Switzerland.

July
7th International Symposium on Water-Rock Interaction, July 13–22, 1992, Park City, Utah. Information: Yousif Kharaka, Secretary-General, U.S. Geological Survey, MS 427, 345 Middlefield Road, Menlo Park, CA 94025; (415) 329-4535; fax 415-329-5110.

Society for Industrial and Applied Mathematics Annual Meeting, July 19–24, 1992, Los Angeles, California. Information: SIAM Conference Dept., 3600 University City Science Center, Philadelphia, PA 19104-2688; (215) 382-9800; fax 215-386-7999; E-mail: siamconfs@wharton.upenn.edu. (Abstract deadline: January 6, 1992.)

International Committee for Coal Petrology 44th Meeting, July 20–24, 1992, University Park, Pennsylvania. Information: Alan Davis, Penn State University, 205 Research Bldg. E, University Park, PA 16802; (814) 865-6544; fax 814-865-3573.

Society for Organic Petrology, 9th Annual Meeting, University Park, Pennsylvania, July 23–24, 1992. Information: Jim Hower, Center for Applied Energy Research, 3572 Iron Works Pike, Lexington, KY 40511; (606) 257-0261; fax 606-257-0302.

Northeastern Science Foundation—History of Earth Sciences Society Meeting on the History of Geology, July 29–August 1, 1992, Troy, New York. Information: Gerald M. Friedman, Northeastern Science Foundation, P.O. Box 746, Troy, NY 12181-0746; (518) 273-3247; fax 518-273-3249.

August
XVII Congress of International Society For Photogrammetry and Remote Sensing, August 2–14, 1992, Washington, D.C. Information: XVII ISPRS, Congress Secretariat, P.O. Box 7147, Reston, VA 22091-7147; (703) 648-5110.

10th International Conference on Basement Tectonics, August 3–7, 1992, Duluth, Minnesota. Information: Richard Ojakangas, Dept. of Geology, University of Minnesota, Duluth, MN 55812; (218) 726-7238; fax 218-726-6360.

13th Caribbean Geological Conference, August 10–14, 1992, Pinar del Rio, Cuba. Information: Grenville Draper, Florida International University, Geology Dept., University Park, Miami, FL 33199; (305) 348-3572; fax 305-348-3877; Bitnet: DRAPER@SERVAX.

Second International Conference on Asian Marine Geology, August 19–22, 1992, Tokyo, Japan. Information: Shin'ichi Kuramoto, Ocean Research Institute, University of Tokyo, 1-15-1, Minamidai, Nakano-ku, Tokyo, 164 Japan; phone 03-3376-1251; fax 03-3375-6716; telex 25607/ORIUT; E-mail: kuramoto@tansei-

cc.u-tokyo.ac.jp or kuramoto@jpnoriut-bitnet. (Abstract deadline: March 31, 1992.)

29th International Geological Congress, August 24–September 3, 1992, Kyoto, Japan. Information: Secretary General, IGC-92 Office, P.O. Box 65, Tsukuba, Ibaraki 305, Japan; phone 81-298-54-3627; fax 81-298-54-3629; telex 3652511 GSJ J.

IAS/SEPM Research Conference on Carbonate Stratigraphic Sequences: Sequence Boundaries and Associated Facies (Emphasis on Outcrop and Processes Studies), August 30–September 3, 1992, La Seu, Spain. Information: Toni Simo, Dept. Geology and Geophysics, University of Wisconsin, 1215 W. Dayton St., Madison, WI 53706; (608) 262-5987; fax 608-262-0693; E-mail: simo@geology.wisc.edu; or Mark Harris, Dept. Geosciences, University of Wisconsin, P.O. Box 413, Milwaukee, WI 53201; (414) 229-5452; or Evan Franseen, Kansas Geological Survey, 1930 Constant Ave., Lawrence, KS 66047; (913) 864-5317.

International Conference on Large Meteorite Impacts and Planetary Evolution, August 31–September 2, 1992, Sudbury, Ontario, Canada. Information: B. O. Dressler, Ontario Geological Survey, 77 Grenville St., 9th Floor, Toronto, Ontario M7A 1W4, Canada; (416) 965-7046; fax 416-324-4933.

September
International Conference on Arctic Margins, September 2–4, 1992, Anchorage, Alaska. Information: David Steffy or Dennis Thurston, U.S. Minerals Management Service, 949 E. 36th Ave., Anchorage, AK 99508; (907) 271-6553; fax 907-271-6805. (Abstract deadline: February 1, 1992.)

5th International Symposium on Seismic Reflection Profiling of the Continental Lithosphere, September 6–12, 1992, Banff, Alberta, Canada. Information: R. M. Clowes, Lithoprobe Secretariat, 6339 Stores Road, University of British Columbia, Vancouver, BC V6T 1Z4, Canada; (604) 822-4202; fax 604-822-6958; or A. G. Green, Geological Survey of Canada, 1 Observatory Crescent, Ottawa, Ontario K1A 0Y3, Canada; fax 613-992-8836.

International Symposium on the Geology of the Black Sea Region, September 7–11, 1992, Ankara, Turkey. Information: ISGB Sekreterliği, MTA Genel Müdürlüğü, 06520 Ankara, Türkiye; phone (90)-(4)-223 69 27; fax 90-(4)-222 82 78. (Abstracts deadline: March 1, 1992.)

The Transition from Basalt to Metabasalt: Environments, Processes, and Petrogenesis, September 9–15, 1992, Davis, California. Information: Peter Schiffman, Dept. of Geology, University of California, Davis, CA 95616; (916) 752-3669; E-mail: PSchiffman@UCDavis.edu.

3rd International Conference on Plasma Source Mass Spectrometry, Durham, England, September 13–18, 1992. Information: Grenville Holland, Dept. of Geological Sciences, The University Science Laboratories, South Road, Durham DH1 3LE, England; phone 091-374-2526.

4th International Conference on Paleocyanography, September 21–25, 1992, Kiel, Germany. Information: ICP IV Organizing Committee c/o GEOMAR, Wischhofstrasse 1-3/Bldg. 4, D-2300 Kiel 14, Germany.

23rd Annual Binghamton Geomorphology Symposium: Geomorphic Systems, September 25–27, 1992, Oxford, Ohio. Information: Bill Renwick, Dept. of Geography, Miami University, Oxford, OH 45056; (513) 529-1362; E-mail: BRENWICK@MIAMIU.BITNET, or Jonathan Phillips, Dept. of Geography, East Carolina University, Greenville, NC 27858; (919) 757-6082; E-mail: GEPHILLI@ECUVM1.BITNET.

American Institute of Professional Geologists Annual Meeting, September 27–October 1, 1992, Lake Tahoe, Nevada. Information: Jon Price, AIPG, P.O. Box 665, Carson City, NV 89702; (702) 784-6691.

October
Association of Engineering Geologists, Annual Meeting, October 2–9, 1992, Long Beach, California. Information: John W. Byer, 444 "A" East Broadway, Glendale, CA 91205; (818) 549-9959; fax 818-242-2442.

2nd International Congress on Energy, Environment and Technological Innovation, October 12–16, 1992, Rome, Italy. Information: Secretaria CPA: Comisión de Promoción Académica, Facultad de Ingeniería, Universidad Central de Venezuela, Edif. Decanato, Caracas 1050, Venezuela; phone 58-2-6627538/7612; fax 58-2-6627327.

American Institute of Hydrology Conference: Interdisciplinary Approaches in Hydrology and Hydrogeology, October 17–22, 1992, Portland, Oregon. Information: AIH, 3416 University Ave. SE, Minneapolis, MN 55414-3328; (612) 379-1030.

Geological Society of America Annual Meeting, October 26–29, 1992, Cincinnati, Ohio. Information: GSA, Meetings Dept., P.O. Box 9140, Boulder, CO 80301; (303) 447-2020; fax 303-447-1133. (Abstract deadline: July 8, 1992.)

November
28th Annual Conference and Symposia: Managing Water Resources During Global Change, November 1–5, 1992, Reno, Nevada. Information: Raymond Herrmann, NPS, WR-CPSU, WRD, Colorado State University, Ft. Collins, CO 80523; (303) 491-7825.

Joint Meeting of the Clay Minerals Society and the Soil Science Society of America, November 1–6, Minneapolis, Minnesota. Information: Jerry Bigham, Dept. of Agronomy, Ohio State University, Columbus, OH 43210; (614) 292-2001.

Send notices of meetings of general interest, in format above, to Editor, *GSA Today*, P.O. Box 9140, Boulder, CO 80301.

More Educational Charts Wanted for MCH Series

Jim Clark, GSA Marketing Manager

When most people think of GSA's Map and Chart series, they think of geologic maps, cross sections, bathymetric charts, and other hard-science items. Such works do, of course, make up much of the series, and are vital to the science. Surprisingly, however, they are not the best sellers.

That distinction belongs to items designed for educational purposes. Examples include all-time best seller, *Summary of Sedimentary Deposits*, D. Spearing's 1975 seven-sheet set designed for classroom use (MCH008); the DNAG time scale—the 1984 wall-sized chart (MCH050) and the notebook (CTS001) and wallet sizes (CTS003); and Gregory Wessel's 1986 *The Geology of Plate Margins* (MCH059), a chart that organizes and displays graphically the types of plate boundaries and provides summary descriptions of geologic features associated with each.

The need for these types of items in our Map and Chart series is evident from their continuing popularity. These examples demonstrate that new information, although welcome, is not a requirement for a successful map or chart. More important is consolidation and distillation of data already available, and ingenious presentation of those data in forms useful to students: wall charts, notebook formats, or items for the pocket, wallet, or purse. There is even a large market for 10- to 20-minute videos that can be produced and priced reasonably.

As with all educational aids, the most successful are those that make learning and retention easier; that simplify, clarify, and provide clear images that are easy to recall when needed.

If you have a project in mind that might fit in this group, GSA would like to hear about it. Outline your idea clearly, include any sketches, and write to GSA Map and Chart Editor, P.O. Box 9140, Boulder, CO 80301-9140. ■

Change of Address

The business office of the Cushman Foundation for Foraminiferal Research (an Associated Society of GSA) has a change of address effective January 1, 1992.

New Address:

Frederick Collier, Cushman Foundation for Foraminiferal Research,
c/o Dept. of Invertebrate Paleontology, Museum of Comparative Zoology,
Harvard University, 26 Oxford Street, Cambridge, MA 02138



U.S. Geological Survey 8th Annual V.E. McKelvey Forum on Energy Resources

30 Oral Presentations
53 Poster Presentations

- Gulf Coast reservoirs
- Basin evolution
- Paleoclimate & rhythms
- Sequence stratigraphy
- Source rocks
- Oil field growth
- Fractured reservoirs
- Computer applications
- Diagenetic studies
- Coal & coalbed methane

**Short Course: "Recent Advances in Plate
Tectonics and Continental Crustal Evolution"**
by Warren Hamilton

Houston, Texas
February 18-20, 1992

Technical Program
Christine Turner, USGS
(303) 236-1561

Registration Information
Jan W. Kernan, BAI, Inc.
(301) 588-4177

January BULLETIN and GEOLOGY Contents

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The Geological Society of America

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GSA ANNUAL MEETINGS

■ 1992

GSA Annual Meeting, Cincinnati, Ohio
October 26-29



General co-chairmen: Raphael Unrug and J. Barry Maynard

Field trip chairmen: Thomas Berg and John Rupp

Technical Program chairmen: Nicholas Rast and Roy Kepferle

For information call the GSA Meetings Department, (303) 447-2020

■ 1993

GSA Annual Meeting, Boston, Massachusetts
Hynes Convention Center, October 25-28

Chairman: James W. Skehan, S. J.

Call for Field Trip Proposals: Please contact the field trip chairmen listed below

John T. Cheney
Dept. of Geology
Amherst College
Amherst, MA 01002
(413) 542-2233 (Dept.)

J. Christopher Hepburn
Dept. of Geology and Geophysics
Boston College
Chestnut Hill, MA 02193
(617) 552-3640 (Dept.)

■ FUTURE

Cincinnati	October 26-29	1992
Boston	October 25-28	1993
Seattle	October 24-27	1994
New Orleans	November 6-9	1995
Denver	October 28-31	1996
Denver	October 25-28	1999

For general information on technical program participation (1992 or beyond) contact: Sue Beggs, Meetings Manager, GSA headquarters.

GSA SECTION MEETINGS

■ 1992

South-Central, Houston, Texas
Rice University, February 24-25

Hans G. Avé Lallemant, Dept. of Geology and Geophysics, P.O. Box 1892, Rice University, Houston, TX 77251; (713) 527-4889

Southeastern, Winston-Salem, North Carolina
Stouffer-Winston Plaza, March 18-20

Paul D. Fullagar, Dept. of Geology, CB 3315 Mitchell Hall, University of North Carolina, Chapel Hill, NC 27599-3315; (919) 962-0677

Northeastern, Harrisburg, Pennsylvania
Harrisburg Hilton, March 26-28

Donald M. Hoskins, Pennsylvania Geological Survey, Dept. of Environmental Resources, P.O. Box 2357, Harrisburg, PA 17105; (717) 787-2169

North-Central, Iowa City, Iowa
University of Iowa, April 30-May 1

Raymond R. Anderson, Iowa DNR, Geological Survey, University of Iowa, 123 N. Capital St., Iowa City, IA 52242; (319) 335-1575

Cordilleran, Eugene, Oregon
Eugene Hilton Conference Center, May 11-13

A. Dana Johnston, Dept. of Geological Sciences, University of Oregon, Eugene, OR 97403-1272; (503) 346-5588

Rocky Mountain, Ogden, Utah
Ogden Park Hotel, May 13-15

Note date change

Sidney R. Ash, Dept. of Geology, Weber State University, Ogden, UT 84408-2507; (801) 626-6908

Foundation to Fund Matching Student Travel Grants

The GSA Foundation will award matching grants up to a total of \$3500 each to the six GSA Sections. The money, when combined with equal funds from the Sections, will be used to assist students traveling to the 1992 GSA Annual Meeting in Cincinnati in October and to 1992 Section meetings.

1991 GSA SHORT COURSE NOTES FOR SALE



A limited supply of short course notes is available from some of the courses presented at the San Diego Annual Meeting. Prices range from \$5 to \$25 per copy. Credit cards are gladly accepted.

Available titles and prices:

Concepts, Strategy, and Software for Practical	
3-Dimensional Contaminant Transport Modeling	\$10.00
Description and Analysis of Fluid-Mineral	
Equilibria Using the SUPCRT91 Software Package	\$ 9.00
Assessing the Mobility of Chemicals in the Vadose Zone	\$ 5.00
Computer-aided Illustration in Geology	\$15.00
Earthquakes and Earthquake Preparedness/Slides	\$19.00
Hydrogeologic and Environmental Applications	
of Stable Isotopic Systems	\$10.00
Contaminant Hydrogeology:	
Practical Monitoring, Protection, and Cleanup	\$25.00

Edna A. Collis, Meetings Department, 1-800-472-1988

Reminders

CALL FOR NOMINATIONS

Officers and Councilors

The GSA Committee on Nominations requests your help in compiling a list of GSA members qualified for service as officers and councilors of the Society. The committee requests that each nomination be accompanied by basic data and a description of the qualifications of the individual for the position recommended (vice-president, treasurer, councilor).

Nominations for 1993 officers and councilors must be received at GSA headquarters no later than **FEBRUARY 15, 1992**. Please send nominations and backup material to the Administrative Department, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

Penrose and Day Medals, and Honorary Fellowship

Nominations for GSA's Penrose and Day Medals and for Honorary Fellowship in the Society are due at headquarters by **FEBRUARY 1, 1992**.

For procedures and additional information, please refer to the October 1991 issue of *GSA Today*, or call headquarters at (303) 447-2020.

Send your nominations and required backup material to the Administrative Department, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

Young Scientist Award (Donath Medal)

The Young Scientist Award was established in 1988 to be awarded to a young scientist (35 or younger during the year in which the award is to be presented) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. The award, consisting of a gold medal called the Donath Medal and a cash prize of \$10,000, was endowed by Dr. and Mrs. Fred A. Donath.

For the year 1992, only those candidates born on or after January 1, 1957, are eligible for consideration. In choosing candidates for the Young Scientist Award, scientific achievement and age will be the sole criteria. Nominations for the 1992 award must include

- biographical information,
- a summary of the candidate's scientific contributions to geology (200 words or less),
- a selected bibliography (no more than 10 titles),
- supporting letters from five scientists.

Nominations for the 1992 Young Scientist Award must be received at GSA headquarters by **FEBRUARY 1, 1992**. For procedures and additional information, please refer to the October 1991 issue of *GSA Today*, or call headquarters at (303) 447-2020.

Distinguished Service Award

The GSA Distinguished Service Award was established by Council in 1988 to recognize individuals for their exceptional service to the Society. GSA Members, Fellows, Student Associates, or, in exceptional circumstances, GSA employees may be nominated for consideration. Any GSA member or employee may make a nomination for the award. Awardees will be selected by the Executive Committee, and all selections must be ratified by the Council. Awards may be made annually, or less frequently, at the discretion of Council. This award will be presented during the Annual Meeting of the Society. Nominations and any supporting information may be addressed to Executive Director, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

Deadline for nominations for 1992 is **MARCH 1, 1992**. ■

Published on the 1st of the month of issue. Ads (or cancellations) must reach the GSA Advertising office 1 month prior. Contact Advertising Department (303) 447-2020, 1-800-472-1988, fax 303-447-1133.

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Opportunities for Students	\$0.00	\$1.35
Code number: \$2.75 extra		

Agencies and organizations may submit purchase order or payment with copy. Individuals must send prepayment with copy. To estimate cost, count 54 characters per line, including all punctuation and blank spaces. Actual cost may differ if you use capitals, centered copy, or special characters.

To answer coded ads, use this address: Code # ----, GSA Advertising Dept., P.O. Box 9140, Boulder, CO 80301-9140. All coded mail will be forwarded within 24 hours of arrival at GSA Today office.

Positions Open

SEDIMENTOLOGIST / PALEONTOLOGIST

The University of Pittsburgh at Johnstown, a 4-year, degree granting institution, invites applications for an anticipated tenure-track position at the Assistant Professor level beginning fall 1992. This would be a full-time, eight month appointment. Teaching duties would include paleontology, sedimentation/stratigraphy, historical geology and selected non-lab introductory geology courses. Secondary interest in oceanography and/or meteorology would be welcome. Applicants should have a Ph.D. with a strong commitment to excellence in undergraduate teaching and field-oriented student research, and dedication to continued professional growth and development.

Women and minorities are encouraged to apply. Please send a letter of application, resume, and the names, addresses, and telephone numbers of three references to Dr. Uldis Kaktins, Chairman, Department of Geology and Planetary Sciences, University of Pittsburgh at Johnstown, Johnstown, PA 15904. Review of applications will begin February 15, 1992, and the search will remain open until the position is filled.

UPJ is an equal opportunity/affirmative action employer.

PRINCETON UNIVERSITY DEPARTMENT OF GEOLOGICAL AND GEOPHYSICAL SCIENCES

SEDIMENTARY AND AQUEOUS GEOCHEMISTRY
A tenure-track appointment at the Assistant Professor level in laboratory, field, and theoretical studies of natural aqueous and sedimentary environments with emphasis on processes and global systems. Appointee may participate in, add strength to, and benefit from paleoclimate studies in the Department and in the Atmospheric and Oceanic Sciences Program, as well as numerical modeling of porous-media and surface flow in the Program in Water Resources.

Send curriculum vitae, statement of research interests, and the names, addresses, and phone numbers of at least three references to John Suppe, Chairman, Department of Geological and Geophysical Sciences, Princeton University, Princeton NJ 08544-1003, (609) 258-4100, FAX (609) 258-1274. Applications will be considered as received, with no formal deadline. Princeton University does not discriminate against individuals on the basis of personal beliefs or characteristics such as political views, religion, national or ethnic origin, race, color, sex, sexual orientation, age, marital status, veteran status or disabilities unrelated to job or program requirements.

HYDROLOGIST/ASSISTANT PROFESSOR — TENURE TRACK

The Department of Geosciences of Rutgers University at New Brunswick, New Jersey invites applications for a tenure track position in hydrogeology at the assistant professor level, anticipated to begin September 1992. Candidates must have a Ph.D., a demonstrated ability to mount a successful research program and a strong interest in graduate and under-

graduate level teaching. Adjunct areas of expertise might include: aqueous geochemistry, surficial processes and sedimentation, remote sensing, groundwater flow modeling, magma flow modeling, fluid flow in basins, surface and or bedrock aquifers. Research interaction with other faculty members in Quaternary geology, basin analysis, subsurface stratigraphy, geochemistry or geophysics is desirable. Teaching will include a required major course in hydrogeology and graduate courses in hydrogeology.

Applicants should submit curriculum vitae, a brief statement of research and teaching interests, and three letters of reference to Robert E. Sheridan, Chair Search Committee, Department of Geological Sciences, Rutgers University, Busch Campus, New Brunswick, NJ 08903. Rutgers University is an equal opportunity/affirmative-action employer.

HYDROGEOLOGIST, ASSISTANT PROFESSOR COLLEGE OF WILLIAM AND MARY

The Department of Geology at the College of William and Mary invites applications for a one year appointment, subject to renewal, as Assistant Professor beginning August 1992. Teaching responsibilities will include hydrogeology and other undergraduate geology courses. Research involvement with undergraduates is expected. Ph.D. required. Review of applications to begin January 15 and to continue until position is filled. Send resume, transcripts, and three letters of reference to Kenneth F. Bick, Chair, Department of Geology, College of William and Mary, Williamsburg, VA 23187-8795. The College of William and Mary is an equal opportunity/affirmative action employer. Women and minorities are strongly encouraged to apply.

PALEONTOLOGIST DIRECTOR OF THE PALEONTOLOGICAL RESEARCH INSTITUTION ITHACA, NEW YORK

The Paleontological Research Institution of Ithaca, N.Y., invites applications for Director. We seek a Ph.D. with dynamic personality who can meet the public and interact with members and sponsors. The Director will have recognized research skills, editorial ability sufficient to maintain the present high quality of publications, and have the ability to manage a business office with a small staff. The upper level of experience is open-ended. Salary will be competitive, and commensurate with experience. Propose starting May, 1992, but date is flexible.

PRI is a privately endowed institution whose goals are to facilitate paleontological research and education. PRI's resources include its building, its research library, and collections that are particularly rich in Devonian fossils from New York and Tertiary mollusks and foraminifera from the Gulf of Mexico and Caribbean regions. PRI publishes two major paleontological series, *Bulletins of American Paleontology* and *Palaeontographica Americana*.

Interested applicants should submit a vita, letter of application describing yourself and letters from three references by March 1, 1992, to: PRI Search Committee, c/o James Sorauf, Department of Geological Sciences, S.U.N.Y. Binghamton, Binghamton, New York, 13902-6000.

PRI is an affirmative action, equal opportunity employer.

VISITING FACULTY MEMBER, GEOLOGY

Visiting Faculty Member/Miami University/Department of Geology. Applications are invited for a full-time, visiting faculty member to teach introductory-level courses in Physical Geology and Geology of the U.S. National Parks during the 9-month 1992-1993 academic year. The successful candidate must have prior experience in effective teaching of lecture courses in a university setting. The anticipated teaching load is 3-4 courses per semester; the position carries no service or research responsibilities.

A Master's degree (for appointment as a Visiting Instructor) or a Ph.D. (for appointment as a Visiting Assistant Professor) in Geology or Geophysics is required. Review of applications began in November, 1991 and will continue until the position is filled. Candidates should submit a letter of application that discusses teaching interests, a resume, transcripts of all college work, and three letters of recommendation to: Dr. Maryellen Cameron, Department of Geology, Miami University, Oxford, Ohio 45056. Women and minority candidates are encouraged to apply. Miami University offers equal opportunity in employment and education (M/F/H).

MARINE GEOLOGIST

Assistant professor, tenure track, Ph.D., start fall 1992. Research interest in aspect of coastal processes, geophysics or paleontology, to involve advanced undergraduates. Teach marine geology and advanced courses in specialty, in rapidly expanding preprofessional undergraduate marine science program. Participate periodically in interdisciplinary general education program. Send resume, undergraduate and graduate transcripts, three recommendation letters by January 30 to Dr. John Ferguson, Eckerd College, P.O. Box 12560, St. Petersburg, FL 33733. EOE.

LOW TEMPERATURE GEOCHEMISTRY GRAND VALLEY STATE UNIVERSITY

Applications are invited for an entry-level, tenure-track faculty position in low temperature geochemistry at Grand Valley State University, Allendale, Michigan, starting August 1992. Ph.D. must be in hand at the time of appointment. We are anxious to attract a person who is committed to teaching excellence and participation in a strong undergraduate geology program. Research that engages students and enriches teaching is also important.

The successful candidate will be responsible for teaching undergraduate courses in the area of specialization, related areas and elementary courses. In

addition, the faculty member will advise students, share departmental duties, and encourage student research participation. Continued professional growth through research and scholarly activities is essential. Opportunities are abundant for water-related research in western Michigan and will be encouraged. Familiarity with computers and analytical equipment is important.

The starting salary is open and is commensurate with qualifications and experience.

The successful candidate will be joining an existing faculty of five in a program of 55 geology/earth science majors.

To apply, send a letter including a vita and the names, addresses and phone numbers of three references to: Dr. Thomas E. Hendrix, Chairman, Department of Geology, Grand Valley State University, Allendale, MI 49401.

Applications will be accepted through March 1, 1992 or beyond that date until the position is filled.

Grand Valley State University is an Equal Opportunity, Affirmative Action Employer.

ASSISTANT PROFESSOR - HYDROGEOLOGY STATE UNIVERSITY OF NEW YORK, COLLEGE AT OSWEGO

The Department of Earth Sciences at the State University College at Oswego, invites applications for a tenure-track position at the assistant professor level beginning fall of 1992. The successful candidate is expected to teach general education courses in geology as well as Hydrology and other courses which may include Environmental Geology, Geomorphology, and/or Geochemistry. In addition to teaching, this successful candidate will be expected to continue scholarly development and research.

Our department offers a B.A. and B.S. in Geology and a B.S. in Geochemistry in cooperation with the Department of Chemistry. The candidate should have a Ph.D. by December 1992. Send letters, resume and transcripts with three letters of recommendation by February 3, 1992 to Dr. Alfred J. Stamm, Acting Chair, Department of Earth Sciences, State University of New York, College at Oswego, New York, 13126.

Affirmative Action/EEO Employer

HYDROGEOLOGY & NEOTECTONICS SEISMOTECTONICS AT FLORIDA INTERNATIONAL UNIVERSITY

The Department of Geology invites applications for the following tenure-track positions to be filled at assistant or associate professor level. Ph.D. or equivalent required for either position, or expected at the time of the appointment.

Hydrogeology. This is a twelve-month joint appointment with half-time teaching/research assignment in the Department of Geology and a half time research appointment in the Drinking Water Research Center. Candidates will be expected to develop rigorous, externally-funded research programs. Miami is located on a highly productive coastal carbonate aquifer close to an environmentally sensitive area. Opportunities exist for close cooperation with the Everglades National Park and other federal and state agencies.

Neotectonics/Seismotectonics (Subject to available funding). This is a regular nine-month teaching/research appointment in the Department of Geology. We seek an individual interested in neotectonics or seismotectonics who can interact with existing programs in tectonics/structure and/or physical volcanology in the Caribbean and Latin America. The successful candidate will be expected to teach aspects of tectonics and structural geology.

Closing date for both positions is February 20, 1992. Candidates should send a complete resume, statement of teaching and research interests, transcripts and at least three letters of recommendation to Dr. Grenville Draper, Department of Geology, Florida International University, Miami, FL 33199.

Florida International University of part of the State University System of Florida and is an equal opportunity/affirmative action employer. Women and minorities are especially encouraged to apply.

VISITING PROFESSOR/LECTURER

Visiting professor/lecturer positions available (up to six months appointment) in the Geology Department, Institute of Technology in Bandung, Indonesia. Subjects include geological/geochemical basin modeling and cross section balancing techniques. Responsibilities include teaching graduate level courses and supervising graduate students/research program. Applicants should submit a resume, proposed course outline/length, and time-frame of availability to Dr. C. Wu, P.O. Box 260442, Plano, TX 75026-0442.

PRINCETON UNIVERSITY DEPARTMENT OF GEOLOGICAL AND GEOPHYSICAL SCIENCES STRUCTURAL GEOLOGY, TECTONICS, AND TECTONOPHYSICS

A tenure-track appointment at the Assistant Professor level will complement existing strengths in low-temperature structural geology, structural and tectonophysical modelling, metamorphic geology, and planetary structural geology. Areas of interest include high or low temperature structural geology; laboratory, theoretical or field studies of brittle or ductile processes; tectonics within both continents and oceans; neotectonics; planetary deformation.

Send curriculum vitae, statement of research interests, and the names, addresses, and phone numbers of at least three references to John Suppe, Chairman, Department of Geological and Geophysical Sciences, Princeton University, Princeton, NJ 08544-1003, (609) 258-4100, FAX (609) 258-1274. Applications will be considered as received, with no formal deadline. Princeton University does not discriminate against individuals on the basis of personal beliefs or characteristics such as political views, reli-

JOI/USSAC Distinguished Lecturer Series

The JOI/U.S. Science Support Program associated with the international Ocean Drilling Program is pleased to announce the second annual JOI/USSAC Distinguished Lecturer Series. The speakers for the 1992 - 1993 season are:

Janet Haggerty, University of Tulsa

The Cretaceous Through Cenozoic History of the Atolls and Guyots of the West Central Pacific

J. Casey Moore, University of California, Santa Cruz

Investigating the Plumbing of Accretionary Prisms with the *JOIDES Resolution*, *Alvin*, and a Rock Hammer

Warren Prell, Brown University

Evolution of the Indian Ocean Monsoon: Results from ODP Drilling and Climate Modeling

Robert Zierenberg, U.S. Geological Survey

Seafloor Hydrothermal Systems on the Gorda and Juan de Fuca Ridges: Implications for the Formation of Massive Sulfide Deposits

James Kennett, University of California, Santa Barbara

Cenozoic Climate Change: Paleoceanography and Event Stratigraphy

Susan Humphris, Woods Hole Oceanographic Institution

Hydrothermal Systems of the Mid-Atlantic Ridge

JOI/USSSP funding will cover the speakers' travel expenses. The deadline for applications is April 3, 1992. For more information please contact:

Mary Reagan

Joint Oceanographic Institutions, Inc.
1755 Massachusetts Ave., NW, Suite 800
Washington, DC 20036
phone (202) 232-3900, fax (202) 232-8203

gion, national or ethnic origin, race, color, sex, sexual orientation, age, marital status, veteran status or disabilities unrelated to job or program requirements.

ENVIRONMENTAL GEOSCIENTIST AMHERST COLLEGE

The Department of Geology is seeking applications for a temporary faculty position at the level of assistant professor. The term of appointment will be one year (1992-93) with the possibility for a second year, (1993-94). Possible fields of expertise include: hydrogeology, geomorphology, and/or environmental geochemistry. Although a Ph.D. is desirable, those near completion of their Ph.D. are encouraged to apply.

Candidates should have a strong interest in undergraduate teaching as well as research interests that can incorporate undergraduate students. Teaching responsibilities will include two introductory level environmental geology courses and one upper level course in the candidate's specialty. There are opportunities to teach in interdisciplinary programs.

Submit a resume, three letters of recommendation, and a brief statement of your research interests to: Prof. Edward Belt, Department of Geology, Amherst College, Amherst, MA 01002-5000, tel: (413) 542-2712. Review of applications will begin January 31, 1992, but applications will be accepted until a pool of qualified candidates is identified.

Amherst College is an equal opportunity/affirmative action employer. Women and minorities are particularly encouraged to apply.

Services & Supplies

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JOURNAL BACK ISSUES SOUGHT. The Phoenix International Development Foundation, through the United Nations, seeks donations of the *Journal of Geological Education* for use by developing Asian country. Sixteen sets of issues from 1985 to present are desired, partial sets accepted. The Foundation is also looking for multiple sets of *Scientific American* and *National Geographic* for the same period. If you can offer a donation, please call Judy at 301/654-0850.

Opportunities for Students

Graduate Fellowships/Dartmouth College. Applications are invited from students who intend to pursue a Ph.D. or M.S. degree in Earth Sciences. Dartmouth Fellowships are available for up to 5 years with a starting stipend of ~\$1000 per month plus a full tuition scholarship. Dartmouth offers outstanding research facilities in a rural New England setting. Some of the areas of active research include clay mineralogy, environmental geochemistry, geodynamics and continental deformation, hydrogeology, igneous and metamorphic petrology, ore deposits, remote sensing, stable and radiogenic isotope geochemistry, and stratigraphy and sedimentation. Field-based projects are carried out at localities throughout the world. Application deadline is February 1, 1992. Requests for additional information and application materials should be made to: Chair, Earth Sciences, Dartmouth College, 6015 Sherman Fairchild Hall, Hanover, NH 03755-3571 or by E-mail to joel.blum@dartmouth.mac.edu.

Summer Research Program for Undergraduates at Columbia University's Lamont-Doherty Geological Observatory. Eight students will be selected to participate in 10-week long research program using Ocean Drilling Program (ODP) cores, well-logs and seismic profiles. Current sophomore and junior science majors who are citizens or permanent residents of the U.S. are eligible. Students will receive \$2,200 stipend and housing. Some money is available to defray cost of travel between home institution and Lamont. Program is sponsored by JOI-U.S. Science Support Program associated with ODP. Application deadline is March 1, 1992. For further information contact: Dr. Suzanne O Connell, Program Coordinator, Dept. of Earth and Environmental Sciences, Wesleyan University, Middletown, CT 06457. Tel. (203) 347-9411 ext 2044, Fax (203) 343 3903.

NASA Planetary Biology Internships. The Marine Biological Laboratory Woods Hole Massachusetts, invites applications from graduate students and senior accepted to graduate programs for awards of \$2000 plus travel to participate in research at NASA centers and collaborating institutions for approximately 8 weeks. Typical intern programs include: global ecology, remote sensing, microbial ecology, biomimicry, and origin and early evolution of life. Application deadline: 1 March 1992. For information/ applications, contact: Lorraine Olendzenski, Planetary Biology Internship, Department of Botany, University of Massachusetts, Amherst, MA 01003. email: PBI@botany.umass.edu An Equal Opportunity/Affirmative Action Employer.

Ocean Drilling Summer Research Program for Undergraduates at the University of Hawaii. The School of Ocean and Earth Science and Technology (SOEST) at the University of Hawaii is accepting applications for its 1992 Ocean Drilling Summer Research Program. SOEST will host this program at

the University of Hawaii's Manoa campus in Honolulu, Hawaii where the undergraduate participants will be in residence. During the program, undergraduates from around the U.S. and its territories will participate in research, lectures and field trips relating to the science of the Ocean Drilling Program. The aim of the ODP Summer Research Program at SOEST is to introduce bright and energetic undergraduates to the science of the Ocean Drilling Program and to help prepare them to become research scholars. The program is designed to stimulate serious consideration of graduate studies and to increasing the number of women and minority students in this field. Students with a 3.0 or better grade point average will spend eight weeks engaged in research with a faculty mentor at SOEST. A faculty mentor is assigned to each student based on the student's educational background and interests. In addition, the applicants will participate in weekly lectures and in several field trips on the islands of Oahu and Hawaii. Successful applicants will receive a travel award to cover expenses to and from Hawaii, room and board for the duration of the program, and a student stipend of \$2,000. Applications must be post marked by March 1, 1992. REVISED DATES: THIS PROGRAM WILL NOW EXTEND FROM JUNE 22-AUGUST 15.

For applications contact: Craig R. Glenn, Program Coordinator, Ocean Drilling Summer Research Program, University of Hawaii, Department of Geology & Geophysics, 2525 Correa Road, Honolulu, HI 96822. Tel. 808-956-2200. Fax 808-956-2538.

STATE GEOLOGIST AND DIRECTOR WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY UNIVERSITY OF WISCONSIN-EXTENSION COOPERATIVE EXTENSION

The Wisconsin Geological and Natural History Survey, a division of University of Wisconsin Cooperative Extension, studies and maintains records on the geology, mineral resources, water resources, soils, climate, and—to a lesser degree—botanical and zoological resources of Wisconsin. The Survey's research and inventory programs enable the Survey to provide timely and objective responses to public policy questions concerning the state's natural resources and environment.

The State Geologist/Director establishes policy, directs planning, and has general supervisory and budgetary responsibilities for all Survey functions. Qualifications include: (1) Earned doctorate in geology or closely related field; established scientific record acceptable for a tenured faculty appointment on the University of Wisconsin-Madison campus; (2) Proven capabilities in leadership and administration, including program development and evaluation, budget, and personnel; (3) Strong communication and interpersonal skills.

Applications must be received no later than March 1, 1992. Submit a letter of application (statement of interest and summary of qualifications and relevant experience), a resume, and names, addresses, and phone numbers of three references to: Professor Stephen Born, Chair, Search and Screen Committee, University of Wisconsin-Extension, c/o 619 Extension Building, 432 N. Lake Street, Madison, WI 53706. An alphabetical list of all nominees and applicants, without differentiation, may be released following the closing date. For more information, please call (608) 263-1945.

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Call for Nominations

1992 John C. Frye Environmental Geology Award

In cooperation with the American Association of State Geologists, GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. The award is a \$500 cash prize from the endowment income of the GSA Foundation's John C. Frye Memorial Fund.

The 1992 award will be presented at the autumn AASG meeting to be held during the GSA Annual Meeting in Cincinnati. Members of the selection committee are Chairman Earl H. Bennett II, Idaho Geological Survey; John P. Kempton, Illinois Geological Survey; and Frank E. Kottowski, New Mexico Bureau of Mines and Mineral Resources.

Criteria for Nomination

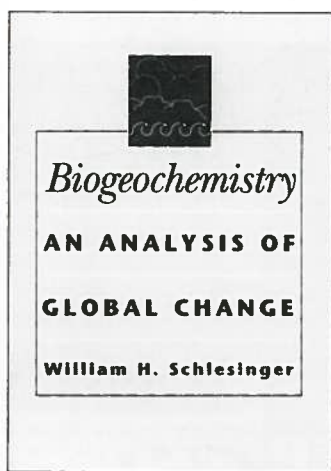
Nominations can be made by anyone, based on the following criteria: (1) paper must be selected from GSA or state geological survey publications, (2) paper must be selected from those published during the preceding three full calendar years, (3) nomination must include a paragraph stating the pertinence of the paper, (4) **nominations must be received by the Executive Director of GSA no later than March 30, 1992.**

Basis for Selection

Each nominated paper will be judged on the uniqueness or significance as a model of its type of work and report and its overall worthiness for the award. In addition, nominated papers must establish an environmental problem or need, provide substantive information on the basic geology or geologic process pertinent to the problem, relate the geology to the problem or need, suggest solutions or provide appropriate land use recommendations based on the geology, present the information in a manner that is understandable and directly usable by geologists, and address the environmental need or resolves the problem. It is preferred that the paper be directly applicable by informed laypersons (e.g., planners, engineers).

1991 Recipients Announced

Recipients of the 1991 award presented at the GSA Annual Meeting in San Diego are Richard C. Berg, Illinois State Geological Survey, and H. Allen Wehrmann and John M. Shafer, Illinois State Water Survey, for their paper "Geological and hydrological factors for siting hazardous or low-level radioactive waste disposal facilities," Circular 546 (1989), Department of Energy and Natural Resources, Illinois State Geological Survey.



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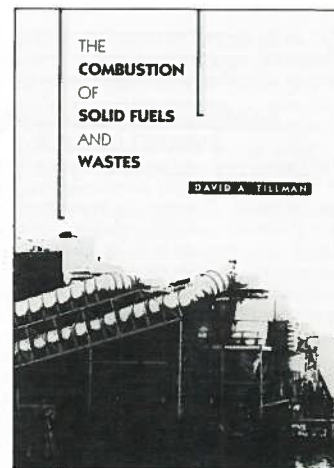
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