

GSA TODAY

A Publication of the Geological Society of America

INSIDE

- 1992 GeoVentures—Registration Open, p. 60
- 1992 Committees and Representatives, p. 62

Geological Survey of Canada Celebrates 150th Anniversary

Christy Vodden, Geological Survey of Canada,
601 Booth Street, Ottawa, Ontario K1A 0E8, Canada



The Geological Survey of Canada (GSC), one of the world's oldest scientific organizations, is celebrating its 150th anniversary this year. Throughout its long and colorful history, the Survey has played a leading role in the exploration of the Canadian landmass—not a small undertaking, considering that Canada has the largest land area and the longest coastline of any nation.

In September 1841, the Province of Canada, which encompassed the southern parts of Ontario and Quebec, passed a resolution "that a sum not exceeding £1,500 sterling be granted to Her Majesty to defray the probable expense in causing a Geological Survey of the Province to be made." The decision to undertake a geological survey rested on the realization that the development of an industrial economy in Canada would depend heavily on a viable mining industry.

The news of the planned survey reached William Edmond Logan, a Montrealer who had gained considerable fame as a geologist working in Wales. He quickly let his interest in the job be known and was appointed as the first director of the Geological Survey of Canada on April 14, 1842. During 1842, Logan laid the groundwork for the Survey by compiling all that was already known about the geology of Canada. The first field work started in 1843 with parties working between Pictou, Nova Scotia, and the Gaspé in Quebec, and between Lake Erie and Lake Huron in Ontario.

The rapid industrial advances in England since the late 18th century had shown how important coal was to economic expansion, and the search for a Canadian supply became the Survey's first priority. On the basis of information gathered during the first two field seasons, Logan was able to report that no coal deposits were to be found in what was then Canada.

Logan's early field work did, however, result in many significant discoveries. He identified for the first time several broad geologic divisions, the most important of which soon proved to be the southernmost exposed section of the great Canadian, or Precambrian, Shield—a mineral treasure chest of unflagging interest to prospectors and resource geologists to this day. Logan's work also paid handsome dividends far into the future: for example, a copper-producing area he discovered near Sherbrooke, Quebec, earned about \$165 million between 1855 and 1966.

The results of the first two years clearly demonstrated the benefits of a systematic geological survey, and the Survey's mandate was renewed. By the late 1850s the Survey was a well-rounded organization capable of conducting rigorous exploration, making maps, producing reports, and maintaining a public museum.

Logan and officers of the Survey put together the first major collections of Canadian mineral samples the world had ever seen for the famous 1851 Crystal Palace Exhibition in London, England, and later in 1855 for the Universal Exposition in Paris. The GSC collections stimulated considerable international interest in Canadian

minerals and brought personal honors, most notably a knighthood, to Logan.

One of the most important accomplishments of the Survey under Logan was the publication in 1863 of *Geology of Canada*. This acclaimed 983-page book and its hand-colored maps recorded everything known about Canadian geology. One of Canada's leading geologists of the day, Sir William Dawson, wrote: "The value of this work to Canada can scarcely be overestimated.... The practical man has all that is known of what our country produces in every description of mineral wealth; and has thus a reliable guide to mining enterprise, and a protection against imposture" (*Toronto Leader*, May 6, 1864).

Confederation in 1867 brought together the existing Province of Canada, Nova Scotia, and New Brunswick as the new Dominion of Canada; Manitoba, British Columbia, and Prince Edward Island joined within the next decade. The addition of these vast new lands dramatically increased the Survey's realm of operations. Although some information was known about the geology of the new eastern provinces, the immense territory to the west was virtually unexplored. In many regards, this task fell to the Geological Survey.

The second director, Alfred Selwyn, followed in Logan's footsteps and directed the Survey mainly from the field. As a student in Switzerland, Selwyn had become an accomplished mountain climber—a skill that proved invaluable to his extensive work in Canada's rugged new "Alpine province," British Columbia. As a condition of joining Canada in 1871, British Columbia had insisted on the construction of a railroad to link it to eastern Canada. In 1871 Selwyn, as his first task as Director of the Survey, mounted an expedition to investigate the geology and mineral resources along the proposed railroad routes.

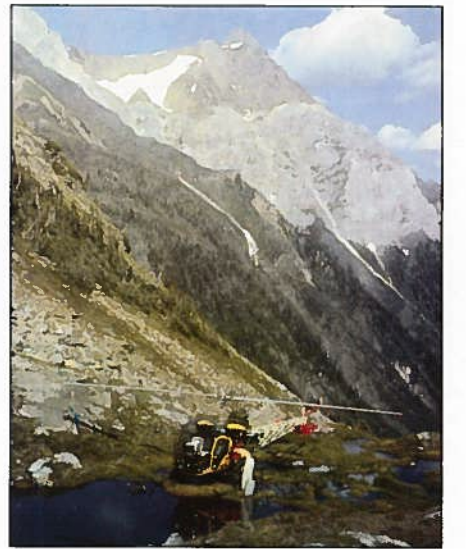
This marked the beginning of a great surge of exploratory surveys, mainly in the west and the north. It was an extraordinary challenge demanding extraordinary talents. Field work in remote uncharted wildernesses required superb frontier survival skills coupled with the eclectic scientific background necessary to record the geology, topography, flora, and fauna of the new lands being explored. Danger was a constant: J. B. Tyrrell, famous for his major fossil discoveries in Alberta, explored the vast stretches of the Barren Lands, west of Hudson Bay, which were rumored to be "swarming with cannibals." Although Selwyn's reaction to a horse eating his painstakingly gathered field notes is not recorded, a sense of humor was no doubt another valuable asset.

To carry out this far-ranging work, Selwyn built up his staff from six parties in the field in 1870 to fourteen in 1890. That same year, the Survey was made a separate department of the government—solid recognition, indeed, of its increasing importance to the growth of Canada.

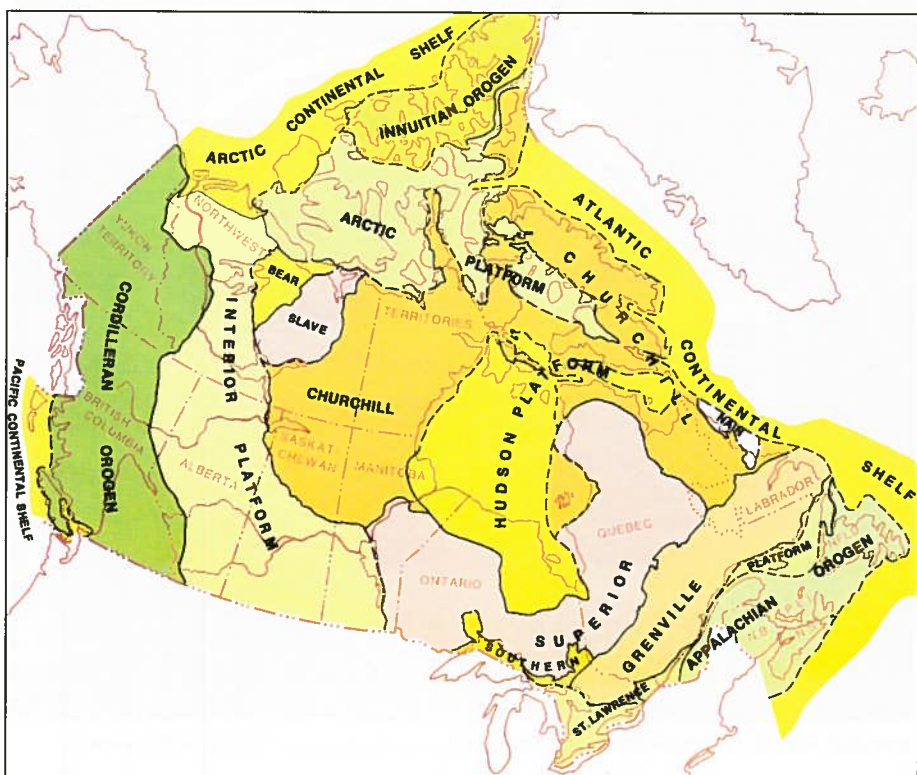
In 1895 Selwyn was succeeded by George M. Dawson. Nicknamed "Klondike Dawson," he explored the



Fording a glacial stream, St. Elias Mountains, Yukon, 1955. Photo by J. O. Wheeler, Geological Survey of Canada



Prior to the use of airplanes and helicopters, most reconnaissance work had to follow Canada's main waterways and established trails. Air-supported reconnaissance mapping has enabled the Survey to fill in many blanks in the geological map of Canada. This helicopter is setting food caches in the Selkirk Mountains, British Columbia, 1961. Photo by J. O. Wheeler, Geological Survey of Canada



Geological Provinces of Canada

Yukon nearly a decade before the famous gold discovery of 1896. In fact, the prospectors of the Gold Rush used his maps to blaze their trails, and Dawson City, the hub of the Gold Rush, is named in his honor.

The incredible field season of 1887 saw Dawson and his assistant, R. G. McConnell, exploring northern British Columbia and the headwaters of the Yukon River, during which they made an arduous circuit by separate routes, on foot and by boat, of an area of 63,200 square miles (164,320 km) that had been previously unknown except for the accounts of a few prospectors and Indians. Dawson's achievements seem even more remarkable given his physical condition. As a result of a childhood illness, he was no bigger than a boy of 12 and had weak lungs and a bent and hunched back. Dawson also carried out groundbreaking work

Geological Survey continued on p. 54

| | |
|---|----|
| Geological Survey of Canada Celebrates 150th Anniversary | 53 |
| IEE Internships | 55 |
| GSA Forum | 56 |
| Notes From the Field | 57 |
| Site Characterization— Questions to Answer, Concerns to Address ... | 57 |
| GSAF Update | 58 |
| Since You Asked | 59 |
| Congress Considers Eliminating Nonprofit Postal Discount | 59 |
| GeoVentures 1992 | 60 |
| 1992 Committees and Representatives | 62 |
| About People | 63 |
| In Memoriam | 63 |
| Meetings Calendar | 64 |
| Bulletin and Geology Contents | 66 |
| GSA Meetings | 66 |
| Classifieds | 67 |
| John C. Frye Award | 68 |

GSA TODAY March 1992 Vol. 2, No. 3

GSA TODAY (ISSN 1052-5173) is published monthly by The Geological Society of America, Inc., with offices at 3300 Penrose Place, Boulder, Colorado. Mailing address: P.O. Box 9140, Boulder, CO 80301-9140, U.S.A. Second-class postage paid at Boulder, Colorado, and at additional mailing offices. Postmaster: Send address changes to *GSA Today*, Membership Services, P.O. Box 9140, Boulder, CO 80301-9140.

Copyright © 1992, The Geological Society of America, Inc. Copyright is not claimed on content prepared by government employees within the scope of their employment. Limited permission is hereby given by GSA to photocopy any material appearing in *GSA Today* for the noncommercial purpose of scientific or educational advancement. GSA, a scholarly society, neither adopts nor supports positions of advocacy. We provide this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, or political viewpoint. Opinions presented in this publication do not reflect official positions of the Society.

SUBSCRIPTIONS for 1992 calendar year: **Society Members:** *GSA Today* is provided as part of membership dues. Contact Membership Services at (800) 472-1988 or (303) 447-2020 for membership information. **Nonmembers & Institutions:** \$36 for U.S., Canada, and Mexico; \$46 elsewhere. Contact Subscription Services (same phones). **Single copies** may be requested from Publication Sales. **Claims:** For nonreceipt or for damaged copies, members contact Membership Services; all others contact Subscription Services. Claims are honored for one year; please allow sufficient delivery time for overseas copies.

STAFF

Prepared from contributions from the GSA staff and membership.
Executive Director: F. Michael Wahl, Ph.D.
Science Editor: Eldridge M. Moores
Department of Geology, University of California, Davis, CA 95616
Forum Editor: Bruce F. Molnia
U.S. Geological Survey, MS 917, National Center, Reston, VA 22092
Managing Editor: Faith Rogers
Associate Editor: Shaun Cisneros
Production & Marketing Manager: James R. Clark
Advertising Coordinator: Ann H. Crawford
Graphics Production: Shaun Cisneros
Production Coordinator: Joan E. Manly

ADVERTISING

Classifieds and display: contact Ann Crawford (303) 447-2020; fax 303-447-1133

Printed in the U.S.A.

Geological Survey continued from p. 53

in describing the mineral riches and geology of British Columbia. A report he published in 1877 marked a milestone in interpreting the geology of western Canada. While studying the coal deposits of the Queen Charlotte Islands in 1878, he prepared a comprehensive report on, among others, the Haida Indians, and photographs he made at that time are treasured today.

Dawson was not unique in his far-ranging interests. From 1879 to 1889 the Survey was actually the Geological and Natural History Survey of Canada, and the work of many of its officers helped build the museum's collections and the country's knowledge about itself. The museum, started in the mid-1840s by the Survey's pioneering geologists, has since evolved into three distinct national institutions—the Canadian museums of Nature, Civilization, and Science and Technology.

The Survey's next director, Robert Bell, was appointed in 1901. In the tradition of the day, he had led exploration parties to all parts of Canada, ranging as far afield as the prairies of Saskatchewan, the oil sands of the Athabasca, and north to Great Slave Lake and Baffin Island. During his lifetime he saw his extensive body of field work put to a significant purpose—the planners of the third transcontinental railway, the Grand Trunk Pacific, used his reports to plan the route of the track from Quebec to Winnipeg. Under Bell's leadership, increasing attention was paid to the mineral potential of the country; Survey reports of the period looked at the nickel and copper deposits of Sudbury, the oil fields of the Gaspé and the gold deposits of Nova Scotia.

Albert P. Low succeeded Bell in 1906 and served as Director for only 18 months before being struck by severe illness. Undoubtedly his most important scientific work was his exploration, on foot and by canoe, of the Labrador Peninsula in 1894 and 1895. His report records the conditions his party faced: "Having with great difficulty gained the head of the Big River, we carried the survey down it, and in so doing had to pass for 50 miles (80 km) through a narrow gorge where it was impossible to make portages, and where the river ... formed a continuous rapid." One of Low's men drowned as a result of a canoe spill in that treacherous gorge. During these expeditions, Low discovered the vast iron ore deposits of the Labrador Trough. He immediately recognized and reported their economic potential, although development work did not begin for more than half a century.

Low's other major contribution to the scientific work of the Survey was in 1903–1904, when he was put in charge of the Canadian Government Expedition to Hudson Bay and the Arctic Islands. This marine expedition was Canada's first clear exercise of authority over its newly acquired northern lands. The steamship *Neptune* was home for 15 months to the expedition party, which included scientific staff and Northwest Mounted Police. After surveying parts of the coasts of Hudson Bay and Southampton Island, the expedition sailed to Ellesmere Island in the summer of 1904 and took formal possession of it for Canada. The flag was also raised on Beechey and Somerset islands.

In many ways, the cruise of the *Neptune* marked the end of an era for the Geological Survey. For more than 60 years, officers of the Survey had been as much explorers as geologists, preceding settlers, mining companies,

and other development into many areas of the country. Their work had also clearly helped chart the economic development of a strong and increasingly prosperous nation.

Canada had pretty well assumed its contemporary boundaries by 1905, when Alberta and Saskatchewan were given provincial status; only Newfoundland remained to be added in 1949. The population nearly doubled between 1891 and 1911, and economic development was surging. Manufacturing centers were well established, and the natural resource industries were booming. Canada's mining industry rivaled forestry and agriculture as a source of export earnings, giving it considerable political clout.

Reginald Brock was Low's successor in 1907, and under his leadership a new sort of organization took shape. He "cast in stone" a policy that made educational excellence a basic staffing requirement. All new appointees to scientific positions now had to have a doctorate degree in geology, or its equivalent. Brock also laid the groundwork for the Survey's role as a training ground for the Canadian geoscience community. Students interested in geology received guidance and practical experience through their employment as field assistants to GSC scientists.

Brock was succeeded by R. G. McConnell as head of the Department of Mines in the early days of World War I, and he chose William McInnes to head up the Survey under him. Despite strong leadership, the war years and the 1920s were a difficult period. Staff left en masse to join the war; many did not return. Ironically too, the Survey was a victim of its own excellence. Its high educational standards, coupled with low government salaries, resulted in raiding of staff by industry.

Although Survey operations were curtailed, special efforts were made to locate deposits of strategic materials. An important legacy of this period was the opening of district offices in British Columbia and Alberta. This allowed more efficient control of field work in the west and made the Survey more accessible, and hence more helpful, to local mining and petroleum interests. The Alberta office closed in 1920, not to reopen until the start of western Canada's oil boom in the late 1940s. The Vancouver office, however, has remained in operation.

William Collins took over the Survey in 1920. During the twenties, Canada was building up the mining

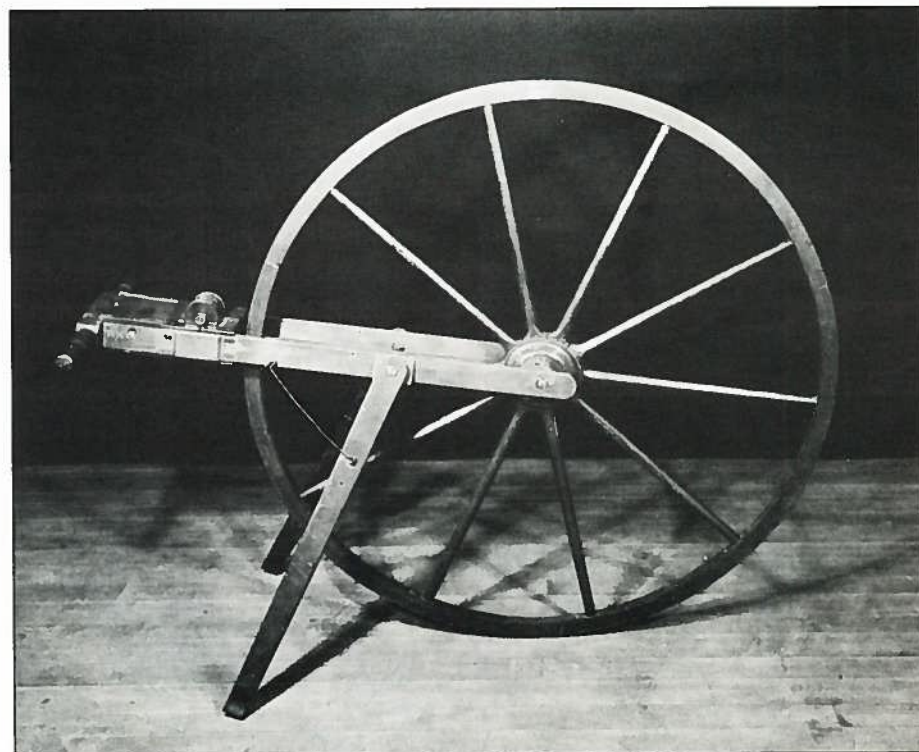
and manufacturing side of its mineral industry. Attracting capital to develop the nation's mineral resources was one of the government's top priorities. The Survey continued to stress field mapping in support of these new economic priorities, and its nation-wide mapping programs, particularly in the Precambrian Shield, were of great value to mineral exploration.

Collins himself carried out field studies in the Elliot Lake and Sudbury nickel areas of Ontario, where he made significant contributions to geological knowledge and economic development. His maps of the Elliot Lake area later proved to be of critical importance in the staking and subsequent development of what became known as the \$30 Billion Uranium Field.

As Canada entered the Great Depression, the need for mineral development work became even more pressing. The worsening economic situation, however, prevented much activity because the government was forced to make drastic cuts to its budgets. To avoid releasing staff, the Survey reduced its field activities to a mere fraction, and work was tightly focused in the vicinity of mines or areas promising new discoveries of immediate value.

Faced with an election in 1935, Prime Minister R. B. Bennett decided to follow U.S. President Roosevelt's example of massive public works schemes aimed at generating employment and stimulating the economy. As a result, the Survey received an incredible \$1 million for the 1935 field season—ten times the amount originally budgeted. Within a matter of months the Survey had to pull together a completely new field program. More than 1000 men were organized into 188 field parties, compared to the 24 sent out the previous year. Vast amounts of new equipment had to be found and purchased on very short notice. Even more difficult was the challenge of finding experienced personnel to direct the field parties, which consisted largely of men with little geological training; one Survey officer directed seven parties in addition to his own, using aircraft to maintain contact.

The extra funding had tremendous benefits. For one, field mapping increased tenfold, and valuable new data were obtained. Similarly, the employment offered during that hectic summer enabled many graduate students to continue their studies; several later joined the Survey as permanent staff. Most important, it had enabled



Odometer used by GSC founder William Edmond Logan to measure distance in flat terrain.

the Survey to indulge for the first time in the large-scale use of aircraft.

World War II brought new priorities and a booming economy driven by the demand for war materials. Such huge quantities of metals and minerals were needed to build tanks, ships, aircraft, and weapons that mines worked around the clock. The war also closed Canada's access to many strategic minerals previously purchased from other countries, and there was much urgency attached to locating domestic sources.

In view of its expertise, this crucial task was assigned to the Survey, and the search for strategic metals and minerals became the focus of all its efforts. Mercury deposits discovered by the Survey in British Columbia were rushed into production and became the largest source in the British Commonwealth. Secret investigations of radioactive minerals were also conducted for the Allied government's atomic weaponry program. Coal and oil were equally vital to the war effort and locating domestic fuel and energy sources—pre-war Canada had imported 90% of its petroleum—became another priority.

A period of peace, prosperity, and growth followed the war, and interest in Canada's mineral and energy resources grew rapidly. In 1947 a landmark oil strike south of Edmonton, Alberta, at the Leduc field marked the beginning of western Canada's oil boom. This generated unprecedented demand by industry and government for geological information about this energy-rich region. In response, the Survey opened an office in Calgary in 1950; it was replaced in 1967 with a full-scale research establishment, the Institute of Sedimentary and Petroleum Geology.

Similarly, the realization that atomic fission had a peaceful application as a source of energy led to prospecting for uranium in boom proportions in the 1950s. High priority was given to Survey field and laboratory work related to locating and evaluating radioactive deposits, especially uranium. An important side-benefit of this effort was a greatly increased knowledge of the general geology of the Precambrian Shield.

The 1950s and 1960s were a time of scientific and technological growth unimagined only a few years earlier. At the same time there was a growing awareness of the importance of science to Canada's development. The blossoming of government scientific agencies, such as the Geological Survey, was a natural offshoot.

Leadership of the Survey had passed to Walter Bell in 1950, and in 1953 George Hanson was promoted from his long-standing position of Chief Geologist to the Director's chair. His successor, James Merritt Harrison (1956–1964), brought to the Survey a vigorous, outward-looking leadership that was in perfect harmony with the times.

Unhindered by the economic restraint of earlier years, the Survey was now able to expand its research into fundamental geological problems, outfit its laboratories with the best new technology available, and undertake ambitious field work.

In the 1950s the airplane and aerial photography were supplemented with helicopters as basic tools for geological mapping, and this increased the pace of mapping at a spectacular rate. A study on the impact of the helicopter showed that within six years, 1952 to 1958, the Survey had mapped about half as much of Canada at a reconnaissance scale as had been mapped in the previous 110 years.

During this period, the Survey mounted large-scale air-supported multidisciplinary reconnaissance operations. The most ambitious was the 1955 Operation Franklin in the Arctic. Headed by Yves Fortier, who was later to become Director of the Survey (1964–1973), the 28-person expedition, in a single field season, studied strategic locations and mapped almost 260,000 km² of the High Arctic. The results of the work triggered industry interest in northern oil and gas exploration. Aeromagnetic mapping also started at this time, and these geophysical surveys were of great value to mineral exploration. The Survey became a world leader in the development of techniques and technologies in this field, and its aeromagnetic maps were eagerly sought by mining and petroleum companies to guide their exploration programs.

In 1966 the Survey became part of a new Department of Energy, Mines and Resources which had a mandate for national energy planning. In support of this, the Survey had to produce quantitative estimates of Canada's reserves and resources of oil and gas, coal, and uranium. An inventory of Canada's metals and minerals was also required, and the Survey, working with other agencies, provided estimates of the national reserves of nickel, copper, zinc, lead, molybdenum, and iron ore.

In the early 1970s inflation began to cut deeper into budgets, and greater accountability to the taxpayer brought in more elaborate reporting procedures and a heavier administrative load for scientific staff. However, demands on the Survey from industry and government for information and expertise in support of exploration efforts and policy-making continued to increase steadily.

The 1970s witnessed the Survey's completion of the bedrock map of Canada at the reconnaissance level. The next step started immediately: to go back and revise map areas in which the information had become largely obsolete. The Survey also became heavily involved at this time in the mapping of surficial deposits. Results were used to evaluate the environmental impact of development in fragile areas like the Arctic.

Also starting in the 1970s, international debate centering on ownership of the oceans' resources required the Survey to provide geoscientific information necessary to support Canada's claims to an offshore "economic zone." Canada's offshore boundaries eventually extended 200 miles (320 km) from the coast (or beyond, to the edge of the continental shelf). After this immense area was, in effect, added to the Survey's field of operation, marine research groups were established on both coasts: the Atlantic Geoscience Centre at Dartmouth, Nova Scotia, and the Pacific Geoscience Centre on Vancouver Island. Another major offshore initiative stemmed from growing pressure to secure energy supplies and from indications that the offshore contained valuable resources. In response, the government charged the Survey in 1984 with establishing a knowledge base from which the oil and gas potential of the offshore regions and the Arctic could be determined. The work, carried out under the Frontier Geoscience Energy Program, is now firmly entrenched as part of the Survey's responsibilities.

Greater accountability to the taxpayer and increasingly complex administrative demands were continuing trends through the 1980s. Coupled with government spending restraint and high inflation, the Survey was

Institute for Environmental Education Announces New Internship Program For Advanced Students

Although employment opportunities for geologists in mineral and petroleum exploration and production have decreased in recent years, those in environmental areas have increased significantly. Employment with environmental and geotechnical companies that provide a broad range of services in environmental engineering and urban geology offer new challenges for recent graduates in the earth sciences. In addition, many large chemical and petroleum companies and government agencies at all levels need personnel trained in geology who can become conversant with environmental regulatory requirements.

In an effort to inform student geoscientists of these opportunities and to help meet the increasing needs of industry and government, the GSA Institute for Environmental Education has initiated a new internship program. The program will coordinate the placement of advanced students in limited-term positions of supervised training in environmental practice prior to completion of their degrees. Although many participants will choose to intern during the summer, some academic programs will permit undergraduate and beginning graduate students to intern during a school term.

The internships will provide an opportunity for the student to evaluate possible interests in working in geoenvironmental science, and will also provide insight into specific areas of knowledge that are particularly valuable in pursuing those interests. The selected work environments will expose the interns to activities that both utilize and complement their academic training and that provide guidance for additional coursework when they return to school to complete their degrees.

To assist in getting the internship program off to a good start, students and professionals (both in academe and in environmental practice) who are interested in participating or supporting the program are encouraged to contact the Institute of Environmental Education to indicate this interest. Students should provide a brief summary of their training to date, availability, and possible interests. Academics should provide information about departmental programs as these relate to applied geoscience, and the nature of any similar work programs in which the department or institution has previously participated. Professionals in environmental practice should briefly describe the possible opportunities for interns in their organization, and the nature of any similar work programs in which the organization has previously participated.

Please send the statement of interest and requested information to Fred A. Donath, Executive Director, Institute for Environmental Education, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, or fax 714-366-0601.

often restricted to meeting short-term objectives to accommodate rapidly changing priorities. The Survey adapted by moving more and more into cost-sharing, cooperative ventures that involved the participation of other governments, industry, and universities at both national and international levels.

In April 1986, the Earth Physics Branch of Energy, Mines and Resources was merged with the Survey. This added a major geophysical arm that includes Canada-wide seismology and geomagnetic observatory networks and systematic gravity surveys. The following year the Polar Continental Shelf Project, an Arctic logistics organization, became administratively linked with the Survey.

By the early 1990s it became clear that the Survey's core geological mapping programs had been eroded over the past two decades in the face of other priorities. In response, the Survey took a lead role in developing a new National Geoscience Mapping Program (NATMAP). Very much a national cooperative effort, the program involves federal, provincial, and territorial surveys as well as Canadian universities, private industry, and other interested groups. Its aim is to improve the quality, relevance, and completeness of bedrock and surficial geologic maps and to coordinate mapping activities of different organizations.

The computerized Geological Survey of the 1990s is, of course, very different from the one established by Sir William Logan 150 years ago. Never-

theless, there are similarities. The mining and petroleum industries continue to be major clients, and mapping the geology of Canada remains a primary concern. Of increasing importance is research linked to environmental questions. The Survey continues to attract gifted scientists and staff who share a unique esprit de corps and provide an irreplaceable source of expertise.

A century-and-a-half after Logan set out on his first field trip, the immense task of a comprehensive geological examination of Canada is still not complete. Today, however, we recognize that the task may never end. As new theories and needs emerge, and as new technologies are rapidly developed, the surveying of Canada's onshore and offshore will challenge scientists for many decades to come. And as the Geological Survey of Canada continues to accept new responsibilities and to develop new areas of expertise, its contribution to the next 150 years of Canada's development should be as important, colorful, and exciting as in the past. ■

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.

ISSUE: Environmental Issues— Population, Resources, and Credibility

Two senior Fellows of GSA raise concerns about the stewardship and future of our planet.

PERSPECTIVE 1: Population and the Environment

Norman D. Newell, American Museum of Natural History, New York (Much of the statement presented here was included in Newell's response upon being awarded the Society's Penrose Medal at the 1990 Annual Meeting.)

My love affair with geology began more than 70 years ago when I was eight. My father, a dentist, introduced me to geology by way of his old Chamberlain and Salisbury college textbook, telling me of the wondrous history of our planet and inspiring me to make my own explorations. Later, as a biological geologist, I learned that the physical environment has always provided the stage on which the drama of life is played—that Earth and its life have evolved together and are inseparable.

Among childhood memories of my Kansas village are horses and buggies, unpaved streets, and homes without plumbing or central heating. At that time, before our present environmental crisis, we were still a developing nation, and things, while not so comfortable, were simpler. But I am not going to reminisce further about the past. Instead, I shall talk about the future and a subject that seems increasingly important to me: the population explosion.

The human population was about 1.5 billion when I was born, tripling now to more than 5.3 billion. It is expected to grow by one billion per decade, reaching at least 8.5 billion by 2025, a date which many of you will live to see. How many of us believe the world could then, with continued environmental degradation, adequately support so many? Nobody has yet been able to place an absolute limit on the capacity of Earth to provide everyone with an existence of modest quality. I think the environment is trying to tell us that we have or will soon have exceeded that limit.

I would like to share some thoughts with you as earth scientists and environmentalists. We are, if anyone is, stewards of planet Earth, and we must share the responsibility for its future. As many of you know, I have long been interested in past and present environments. In 1987, Leslie Marcus and I found that for more than 25 years the increase of carbon dioxide in the atmosphere has almost precisely tracked the growth of the human population, with a correlation above 0.99. We view this as strong evidence that the present rate of this increase is caused by the sum of human activities of many kinds: the burning of wood

and fossil fuels, commercial development, the destruction of forests, the poisoning of the atmosphere and water, desertification, and the loss of soils. It was this work that led to my increased concern about the perils of runaway population growth.

The good news is that the increased awareness of the environmental crisis is producing positive responses. The first Earth Day in 1970 and subsequent Earth Days have been catalysts leading to the Clean Air and Water Acts and the creation of the Environmental Protection Agency, which may soon become a cabinet-level secretariat.

The close relationship between population pressures and general environmental degradation is now becoming a subject for world conferences. For example, in 1989 the United Nations Fund for Population Activities (UNFPA) issued a report about a meeting held in Amsterdam, at which some 90 nations were represented. This report concluded that the annual budget needed for population counseling and assistance must be increased from the present \$250 million to \$9 billion by the year 2000.

The United States was only an observer at the Amsterdam conference, because we have been isolated from the UN Population Fund since the 1984 meeting in Mexico City, when the White House withdrew U.S. support. This was a gross miscalculation of world need and U.S. responsibility. Quite predictably, this action brought an agonized complaint from the rest of the world. The United Nations did not then, nor does it now, condone compulsory family planning.

A recent Economic Report from the White House cites the cost of an anti-greenhouse 20% cut in carbon dioxide as somewhere between \$800 billion and \$3.6 trillion, a conclusion calculated to block any further consideration. Even if these figures are taken seriously, we could still accomplish as much, or more in the long run, with annual contributions of a few billion dollars from us to the United Nations Population Fund.

The population and environmental problem cannot be solved, or even ameliorated, while the United States drags its feet. Sustained action on a worldwide basis requires informed and profound changes in public attitudes. I am happy that such changes are now beginning to take place, and we are working towards the sustainability of global resources.

I suggest that existing inexpensive and convenient contraceptives of choice (including oral medications) should be made universally accessible to those who want them, *without governmental interference*. Only then can

population pressures be reduced to a level at which Earth's resources can provide and maintain a decent standard of living for everyone. The tragedy of millions of unwanted children—tragic for the children, the families, and society—must be reduced.

In our culture, it has been traditional to condemn hedonism and sexual promiscuity. Never wholly successful, these standards are now losing ground in an age in which sexual innuendos—and more explicit pornographic expressions—are used in television, commercial advertising, musical lyrics, pop art, and books. It is not surprising that young people, easily intrigued by thoughts of forbidden pleasures, frequently yield to temptation at a very early age.

While most of us deplore this degeneration, we must realize that there are many who, through no fault of their own, do not receive an adequate education in morality and social responsibility. It is for these groups that we *must* provide choices. The Center for Population Options claims that teenage child-bearing now costs the American public many billions of dollars in welfare and Medicaid benefits, housing subsidies, and day care.

But the opponents of worldwide family planning are many and powerful. They include political leaders who think that sovereign power and influence depend on large populations. Then, there are developers and business people who equate economic health principally with simple population growth. This has been the normal assumption of modern society, but it must now be replaced by sustainable growth, which is a very different thing.

Uninformed or thoughtless religious conservatives do not adequately weigh the costs of population increase, because they regard contraception as interference with the will of God. And finally, there are those of us reluctant to make financial or other sacrifices now on behalf of our children and unknown future generations.

We might recall that with less than 5% of the world's population, we Americans require 25% of the petroleum and a lion's share of the other resources needed to support our life style. This simply cannot continue! The resources are not sufficient. The consequences of those self-centered views should weigh heavily on our consciences.

Attitudes worldwide will have to change if we are to curb our population and achieve an acceptable ecological balance. We have entered a new era in human history when having babies is no longer solely the private concern of the family, church, or government, nor even primarily a social matter. Each individual makes a certain minimum demand for environmental resources. We all have a fundamental environmental responsibility that affects the habitability of planet Earth, our home.

I now submit that with the widespread anxiety about the deteriorating environment, the time is right, and the general public is ready for us to participate in a vigorous lobbying campaign to persuade our hesitant and reactionary government to join in cooperative efforts to achieve control of runaway population numbers. Interest in conservation and recycling is gaining momentum, but these are only first aid, they are not cures.

The Geological Society of America and its individual members provide a cross section of American environmental science, and we should make ourselves heard by our government. Through our educational efforts we can support enlightened programs in public schools and nongovernmental family-planning organizations on the relation between the population explosion and the degradation of our environment. We could, for example, combat the mistaken, organized zealots who boycott those corporations which give charitable contributions to family planning organizations. I leave you with this appeal!

PERSPECTIVE 2: Credibility

John Van N. Dorr II, USGS, retired, Bethesda, Maryland

Too many of our professional and environmental societies do not recognize a basic problem of our present and future—that of reconciling the necessity of getting raw materials for our exploding population while still maintaining a decent standard of living and environment. To forget or ignore this problem, or to approach it in a doctrinaire manner, is also to destroy our credibility. Few national environmental organizations have kept their eyes on fundamental issues. Do we really want to save an owl or do we want to save our ancient rain forests? Do we want to supply those goods on which our civilization depends from our own natural resources or do we wish to shut off all resource development? Can we resist the temptation to exaggerate in order to frighten the audience?

As an example, consider the May-June 1991 issue of *International Wildlife*, in which, on page 26, J. D. Hair states: "If the Administration and the petroleum industry prevail, the coastal plain of Alaska's ANWR will be converted into one vast oil platform." The fact is that an area far smaller than the coastal plain would be disturbed. Not only will most of the coastal plain be nonproductive under the most optimistic hypotheses, but the modern drilling technology used in the Prudhoe Bay area will leave undisturbed a major part of the productive zones. Nobody who has seen the Prudhoe Bay operation could believe Hair and the other nay-sayers on this, or the other exaggerated statements made by officials of many environmental organizations. Such statements destroy our credibility.

The basic fact is that our rapidly expanding population, national (50,000 plus per week) and worldwide, must have ever-increasing quantities of commodities (petroleum, natural gas, coal, and raw materials from mines and quarries) to keep us and our children alive and with a reasonable standard of living. To meet this challenge, we must (1) halt population growth, (2) increase energy efficiency, (3) increase recycling efficiency, and (4) improve our education system. We must assign true costs instead of commercial costs to the goods we consume. In short, we must change our wants and conserve our resources, human and material.

Forum continued on p. 57

Mapping in Honduras

Quadrangle mapping at the 1:50,000 scale is being carried out by a unique program in Honduras. The Peace Corps is supplying the geologists, the Dirección de Minas e Hidrocarburos is providing drivers and vehicles, and the Instituto Geográfico Nacional is printing the maps and making airphotos and topographic maps available. The government agencies in Honduras have insufficient resources to employ geologists for mapping. For many years, U.S. universities such as Texas, LSU, and Wesleyan provided mappers, usually Ph.D. or M.S. students. Honduras still welcomes cooperative programs of this type and will still try to provide logistic support.

It is unusual and possibly unique for the Peace Corps to have a geologic mapping program, but Honduras has the largest Peace Corps contingent in the world and vast areas of unmapped geology, so the combination is natural. Mapping has been concentrated in the populated region between and around Tegucigalpa and San Pedro Sula. Volunteers try to finish two quadrangles during their two-year service in Honduras. The mapping is detailed and excellent, and it is mapping for the sake of mapping, not as a sideline to developing a Ph.D. thesis. I was very impressed by the accuracy and utility of the maps. In addition to the quadrangles, volunteers often make detailed maps for specific Peace Corp programs, where geologic expertise is needed.

The Peace Corps geologists I met were all fresh out of school, looking for some experience, broadening their horizons, and thinking about going back to school for a Ph.D. Some have entered graduate school and are back in Honduras, working on Ph.D. problems that they discovered as volunteers. This continuity bodes well for the future of geology in Honduras.

There are only two or three volunteer-geologists serving at any given time. There is no office or title, but they pick up their mail at Peace Corps

headquarters in Tegucigalpa. They are easy to find and eager to share their knowledge of Honduras, geological and otherwise. I recommend that any-one planning field work in Honduras get in touch with this informal but talented group of young geologists.

Michael J. Carr
Rutgers University

Cretaceous Submarine Debris-Flow Outcrops

I have discovered unrecorded spectacular Cretaceous submarine debris-flow outcrops exposed in river cliffs near Parksville, eastern Vancouver Island, which display the following transported components in a Cretaceous silty shale matrix: (1) many randomly orientated angular clasts of Cretaceous shale up to several feet across, some showing plastic deformation of bedding; (2) great quantities of rounded, polished pebbles of argillite, indicative of high-energy deposition such as a storm beach; probably Triassic source; (3) clasts of Cretaceous sandstone with plant fragments, coaly layers and thin-shelled fresh and brackish water pelecypods with affinities to delta or prodelta environments; (4) Cretaceous clay-ironstone nodules, some with fossil plants. Various downslope transport sedimentation indications are present. Occasional Campanian ammonites were found. The shale matrix and shale clasts contain Cretaceous foraminifera, but I was unable to establish indications of relative depth environments. As I am now retired, and, in any case, am not a sedimentologist *sensu stricto*, I do not wish to undertake a detailed study myself. However, I am available to demonstrate the outcrops at any time. Access is relatively easy, without restrictions.

Alan McGugan
1157 Rolmar Crescent, RR2, Cobble Hill
British Columbia, VOR 1L0, Canada ■

Forum continued from p. 56

The physical nature of Earth places the ultimate restraints on human activity. Rapidly growing population and constantly increasing per capita demands already are endangering the future of human society. Professional and environmental organizations must assume a broader role for themselves than the narrow and sometimes trivial focus on single species and isolated terrains. They must educate people to understand that limitations *do* exist, describe *honestly* what those limitations are, and help plan for a *sustainable* future. Resources will have to be developed intelligently and conservatively to avoid chaos and disaster as policies to control population and reorder priorities are put in place. This will take years if not decades.

The news is not all bad. Many companies are at last investing large sums and devoting much intellectual energy to finding solutions to environmental problems, resulting in solid, if at times unspectacular, progress. The environmental organizations that started the process would now contribute most by recognizing and supporting those companies that are contributing to that progress and exposing the steadily diminishing number of

companies that are following the 19th century negative ethic. The ones we praise would support our causes—blind criticism drives the good ones into the opposition.

The loss of our credibility means the loss of elections and causes. If professional and environmental organizations respond with a knee-jerk *NO!* to any effort to meet the basic needs of our society instead of trying to work things out so that the environment is protected, our public will increasingly reject what conservationists consider to be the really important fundamental problems.

As geologists, we are also environmentalists. We should be active as mediators in arriving at a constructive solution to this problem and many others. Where are the hydrologists and water geologists in the present controversy over wetlands?

I am now too old (81+) to think of trying to organize a concerted effort to remedy past mistakes, but I hope that someone in our profession, which has a proud past in the service of our country and civilization, will pick up the gauntlet and do what needs to be done. By so doing, we will also create new and broader opportunities for our profession. ■

Site Characterization— Questions to Answer, Concerns to Address



Kenneth B. Taylor
1991–1992 GSA Congressional Science Fellow

Science seeks truth. Policy seeks decisions. Science in public policy is fact gathering in support of decision-making. During my fellowship year, I will be working for Senator Harry Reid (D—NV) on issues concerning the Yucca Mountain High-level Nuclear Waste Repository Project. This article attempts to frame the many issues in the highly divisive site characterization, a process that should ideally follow the scientific method and not be politicized.

At present, Yucca Mountain, Nevada, is the only site that is authorized by Congress to undergo a detailed examination or site characterization to determine its suitability for the geological disposal of high-level radioactive waste. More than \$1 billion has already been spent in this effort. This is a first-time project, much like the building of the Panama Canal, and there is no blueprint for how best to characterize and possibly license a geologic repository.

The Yucca Mountain Project has been fraught with controversy from the start. The unfortunate selection in 1987, by Congress, of *only* the Nevada site to be characterized, assured that local residents would scream the choice was based solely on politics. Once the federal regulations concerning the characterization were promulgated by three federal agencies, a Quality Assurance program agreeable to the Nuclear Regulatory Commission had to be implemented, if any of the scientific results from characterization were to be used in the licensing phase of the facility. State permits, lawsuits and countersuits, even an appeal to the U.S. Supreme Court, have caused the slow start of the project. With the granting of permits, it now appears that much of the site work must be delayed until next year because of budget constraints. Adding to the mix are a series of “info-mercials” about nuclear waste that are now appearing in Nevada and which have scientists serving as pundits for the nuclear industry.

Site characterization does *not* mean site selection. Many opponents to the project do not agree with this assertion and argue that work done by the Department of Energy (DOE) is directed only to qualifying, not disqualifying the site. Successful characterization—i.e., the answering of all relevant questions—could result in the certainty that this site *is not* an acceptable place for the waste. Success means a complete examination, not necessarily selection.

In the opinion of several members of the Nuclear Waste Technical Review Board (NWTRB), an independent advisory body, there is no evidence at present to disqualify the site; but underground characteriza-

tion has not even begun, and there are many fundamental questions that have yet to be answered. Characterization means study; it does not mean construction. In its *Fourth Report to Congress*, the NWTRB recommended that DOE consider using the smaller 16' to 20' tunnel diameters in the ramps and exploratory tunnels at the site, rather than the 25' diameter currently proposed.

Yucca Mountain characterization is a long-term project in which geology is playing a crucial role. Questions concerning such issues as ground-water migration, earthquake risk, and volcanic hazards must be answered before the site can be fully characterized. In many instances, constraints of time and money mean that some of the questions cannot be answered with complete certainty. By regulation, the waste should remain isolated from the environment for 10,000 years, but there can be great uncertainties in extrapolating data that far into the future.

In our pursuit of truth, scientists search for answers to their questions. For the Yucca Mountain Project, scientists are only now identifying the scope of questions. The answers lie several years in the future. As a profession, we can take pride in the necessity of our field in the site evaluation process. The public needs science to address facts, and scientists to educate the public about the risk and problems, as well as the understanding and safety, such a project entails.

In characterization, scientists will have to go beyond the body of facts, into a region where differences of opinion can occur because of the multiple interpretations of data. In research, questions lead to answers, which in themselves lead to other questions. In the complete and open discussion of all characterization issues, the differences can be resolved or, at least, areas for additional work can be identified.

Should one oppose site characterization? One should not if the characterization is critical examination of the site, in which concerns about health and safety are addressed above all others. If, on the other hand, the characterization is only an obligatory step in site construction, and the site has been pre-selected already, science is being used to justify politically generated public policy. ■

Kenneth Taylor is the GSA Congressional Science Fellow for 1991–1992. He is serving in the office of U.S. Senator Harry Reid (D—NV). He can be reached at (202) 224-6996. The one-year fellowship is funded by GSA and the U.S. Geological Survey.

Robert L. Fuchs

McGill Fund Established

Carol G. McGill has established a fund in memory of her husband John T. McGill, who died in 1987. The fund, to be called the Carol G. and John T. McGill Fund, will provide money for scholarships, research grants, and awards in engineering geology.

Jack McGill was a distinguished geologist whose scientific career at the University of California in Los Angeles and the U.S. Geological Survey spanned 35 years. Although Jack McGill was born in Tennessee in 1921, his architect father moved the family to Los Angeles shortly thereafter. His choice of a career in geology was undoubtedly stimulated by the terrain of the hills around Los Angeles, where from an early age he collected flora, fauna, rocks, and minerals. Jack's college studies began at UCLA in 1939, in engineering, but the earlier influence of the Hollywood Hills was too strong to overcome, and from a freshman geology course he moved decisively into the beginnings of a geological career. Following graduation and a commission as an ensign in the U.S. Navy, he married Carol Gay, a fellow student, and departed for active duty aboard a destroyer in the South Pacific. His active military career drew to a close in Tokyo Bay with the Japanese surrender ceremony, but his association with the Navy continued until 1967 when he retired as a reserve captain.

After the war, Jack McGill began graduate study at UCLA, receiving his M.S. degree in 1948 and a Ph.D. in 1951. Subsequent to graduation, he joined the USGS and worked for many years on engineering geology problems in the Los Angeles basin and on the geomorphology of that area. Ultimately his USGS career led him to Denver, where he became Chief of the USGS Branch of Engineering Geology. Much of his work involved supervision of research projects around the country, in coordination with state agencies and various universities.

In 1974 he stepped down as chief of engineering geology and returned to his landslide research in the Los Angeles basin. When the Teton Dam failed, Jack McGill was a key figure in studying that area, synthesizing the complex geology, and developing the relevant engineering geology framework. Following the Teton Dam investigation, Jack returned to his California

work and completed previously planned maps and reports before his retirement in 1983. The culmination of this study was USGS Map I-1928, published in 1989 for which he was awarded the 1989 Claire P. Holdredge Award from the Association of Engineering Geologists for an outstanding contribution to geology.

Jack McGill was active in professional societies, including GSA, the Association of Engineering Geologists, the International Association of Engineering Geology, AGU, and the Seismology Society of America. He devoted considerable time and commitment to both the Association of Engineering Geologists and the Engineering Geology Division of GSA, to the benefit of both organizations.

The Carol G. and John T. McGill Fund is expected to grow to \$100,000 over a five-year period. GSA members and others wishing to contribute to this fund in memory of a highly respected and accomplished geologist are asked to send their gifts to the Foundation.

McGill Contribution Kicks Off GSA Foundation Pooled Income Fund

Carol McGill has made an initial contribution to the GSA Foundation Pooled Income Fund, in conjunction with the establishment of the Carol G. and John T. McGill Fund. The Pooled Income Fund is similar to a mutual fund. The contributor receives regular income from the fund during his or her lifetime, following which the donor's share of the fund is transferred directly to the Foundation.

The GSA Foundation Pooled Income Fund is a good way for a GSA member to obtain retirement income and at the same time make a gift to GSA in support of its ongoing programs. At the time of the gift, the donor receives a charitable deduction for income tax purposes, the amount of which is determined by the donor's life expectancy and the expected income from the fund. Monthly income is distributed to the donor out of the earnings of the fund.

In making this kickoff gift, Carol McGill told the Foundation, "I am very happy to be a founding participant in



John T. McGill

the Foundation's Pooled Income Fund for two reasons. First, the creation of a memorial fund honoring Jack and his scientific accomplishments in geology has deep meaning to our family. Second, I hope that this action will encourage others to utilize the Pooled Income Fund as both an investment for retirement purposes and a long-term contribution to the programs of GSA."

Further information about the GSA Foundation's Pooled Income Fund can be obtained by calling or writing the Foundation office at GSA headquarters in Boulder, Colorado.

Biggs Fund Renamed

The Donald L. Biggs Memorial Fund was established in 1990 by his widow, Carolyn Biggs, and family members and friends, including Lawrence Wu of the Illinois Survey. The purpose of this fund is to support and enhance geoscience awareness and the education of young people. Annual income from the fund is used to finance activities of SAGE. The balance in the Biggs Fund now exceeds \$5600, and it is expected that the first use of income for SAGE will take place this year.

Recently Carolyn Biggs died, and at the request of the family the fund has been renamed the Donald L. and Carolyn N. Biggs Excellence in Education Fund. The purpose remains unchanged. Gifts in memory of Carolyn Biggs are being received by the Foundation.

GSA members wishing to honor the memory of the Biggs' and to support the excellent work underway in GSA's SAGE programs are asked to send contributions designated for this fund to the Foundation office. ■

Donors to the Foundation, December 1991

Birdsall Fund
Margaret S. Woyski

Century Challenge
Raymond Burke
Elizabeth Ann Burton
H. Allen Curran
Michael C. Dix
Margaret J. Guccione
Thomas D. Hamilton
Robert Glenn Johnson
W. Hilton Johnson
John W. Rold
Robert C. Stephenson
Andrew J. Tomlinson
Robert C. Whisonant

DNAG
Gordon P. Eaton
Gertrude Hawley*
(in memory of David Hawley)
Larry A. Jackson
James E. Werner

Engineering Geology Division Award
Robert W. Fleming

History of Geology Award
Robert H. Dott, Jr.*

Hydrogeology Division Award
Alan R. Dutton
Steven P. Esling
John F. Mann, Jr.*

GEOSTAR FUNDS

Antoinette Lierman Medlin Award
Roger and Carol Austin*
Harvey E. Belkin
Lucy McCartan
Jack H. Medlin*
Christopher Wnuk*

Donald L. Biggs Memorial Fund
Joseph and Joan Bruns*
M. Robert Dawson
Virginia L. Riggert

Building Expansion
Roy M. Huffington*

Allan V. Cox Student Scholarship
Philip H. Abelson*
Robert S. Coe
Stephen A. Kirschw

Lawrence L. Malinconico, Jr.
Michel P. Semet

Doris M. Curtis Memorial Fund
Freeman Foote*
Christina Lochman-Balk*
F. Michael Wahl*

John T. Dillon Alaska Scholarship
Carl S. Benson
John C. Crowell*
Warren B. Hamilton
Ronald A. Harris
Lincoln Hollister*
David L. Kimbrough
Shirley A. Liss*
Stephen F. Mack
Charles G. Mull
Donald R. Nichols
Douglas C. Pasley, Jr.
Sandra Phillips*
(in honor of John Evan Decker)

John C. Frye Environmental Award
Ruth H. Frye*
Wallace W. Hagan
Thomas F. Raftar, Jr.
Robert F. Walters

GEOSTAR
Severn P. Brown*
Robert P. Bryson
Kenneth W. Ciriacks*
John P. Crawford*
John C. Crowell*
Gordon P. Eaton*
Garth R. Edwards
Duane A. Eversoll
Walter D. Gardner
Robert D. Hatcher, Jr.*
Lowell D. Hilpert*
John B. Ivey
Haydn H. Murray*
Floyd R. Nave
Jack E. Oliver*
Elaine R. Padovani*
Douglas C. Pasley, Jr.
John W. Rold
Michael L. Sargent
George C. Soronen
James B. Thompson, Jr.*
Robert G. Wiese, Jr.*
Ronald Willden*
Michael B. Winter
Hiromitsu Yamagishi

Institute for Environmental Education
ARCO Foundation, Inc.*
Robert W. Deininger
Thomas D. Hamilton
Norman D. Newell
Ellen D. Smith

J. Hoover Mackin Award
Robert R. Curry
Deborah R. Harden
Donald L. Lamar
Peter D. Rowley*

Minority
Fred Barnard*
Charles A. Baskerville
Michael L. Fellows*
Christina Lochman-Balk*
Robert A. Matthews
William D. Rose, Jr.
Steven Slaff

Operating
Robert S. Dietz
Jane L. Forsyth
Mason L. Hill*
Thompson M. Stout
Koike Toshio

Penrose Conferences
Dorothy A.W. Phinney

Publications
Richard Arnold Davis

Research
John T. Andrews
Donald D. Biederman
Alton Brown*
Kenn O. Cartier
J. Campbell Craddock
Christopher M. Dail
Ra Naye B. Dreier
W. G. Ernst
John A. Fagestrom
Fred W. Farwell
William O. Field, Jr.*
Donald M. Fisher
David M. Fountain
Charles R. Givens
Robyn Hannigan
William R. Holman
Joseph M. Hull
Douglas L. Inman
Stephen A. Kish*
Helen M. Lang*
Curtis R. Manley
Stephen Marshak
Jeffrey A. May
Robert J. McLaughlin

Betsy L. McLeod
James S. Mellett
Elaine R. Padovani
Jeffrey A. Parsons
Douglas C. Pasley, Jr.*
Elmer D. Patterson
Paul Dean Proctor
Shirley A. Rawson
Robert C. Rettke
Allan F. Schneider*
Gary B. Sidder
Mark Steltenpohl*
Karen L. Wetmore

SAGE
ARCO Foundation, Inc.
H. Allen Curran
William H. Dennen
Pamela Hallock-Muller
Karen S. Hee
Lynn E. Johnson
R. David Kendrick
Marathon Oil Company*
Mary Metzler
Barbara H. Murphy
B. J. Oburn
J. Michael O'Neill
Joanne R. Ouellette
Robert P. Sharp
Arthur A. Socolow
Holly J. Stein
Robert C. Stephenson
John R. Wilson

Unrestricted
Paul A. Bailly*
Victor R. Baker*
David F. Barnes
Thomas Beard
Edward S. Belt*
Joseph W. Berg, Jr.*
Somdev Bhattacharji
Francis S. Birch
Arthur A. Bookstrom
William C. Bradley
Willi K. Braun
Martin L. Bregman
John A. Breyer
Baylor Brooks*
William P. Brosge*
Richard J. Callaway*
John R. Castano
William S. Cordua*
Henry W. Coulter*
Whitman Cross II
Edward C. De La Pena
Thomas W. Dibblee, Jr.
Ernest Dobrovolny
Wendell A. Duffield
David E. Dunn*
Michael R. Fisher
Robert E. Fox*
Virgil A. Frizzell, Jr.*
Julian R. Goldsmith
Richard P. Goldthwait*
Paula A. Gural
Danny K. Hagans
Robert B. Hall
Douglas H. Hamilton
Pembroke J. Hart*
Stephen J. Herdman
Catherine J. Hickson
Larry A. Jackson
James E. Kline
Willard C. Lacy
Morris W. Leighton*
Robert M. Lewy
Richard Liddicoat*
Charles J. Mankin*
Jay Glenn Marks
Larry G. Mastin
Garry Maurath
James W. McDougall
Shinjiro Mizutani
Robert H. Moench*
Marie Morisawa*
Glenn L. Mooney
John H. Moses
Louis Moyd*
William R. Muehlberger*
W. Bradley Myers
James T. Neal*
Henry F. Nelson*
James F. Olmsted*
Douglas C. Pasley, Jr.
David A. Phoenix
Douglas W. Rankin*
Paul R. Seaber
Glenn L. Shepherd
Jack A. Simon*
(Cady Award)
Laurence L. Sloss*
George L. Smith
Donald A. Swanson*
Frank A. Swenson
William A. Thomas*
Laurence G. Trudell
Adam R. Wasem*
John W. Webb
Robert T. White
James E. Wilson*
M. Gordon Wolman*
Leland W. Younker
Frederick P. Young, Jr.

Women in Science
Corolla K. Hoag
Aine A. Joyce-Hasham
Robert B. MacNaughton

*Second Century Club—gifts of \$100 or more.

GEO STAR
Supporting The Advancement of Research

GSA Foundation
3300 Penrose Place, P.O. Box 9140
Boulder, CO 80301 • (303) 447-2020

___ Enclosed is my contribution in the amount of _____ for the Carol G. and John T. McGill Fund in support of engineering geology and geomorphology.

___ Enclosed is my contribution in the amount of _____ for the Donald L. and Carolyn N. Biggs Excellence In Education Fund in support of SAGE.

PLEASE PRINT

Name _____

Address _____

City/State/ZIP _____

Phone _____

Congress Considers Eliminating Nonprofit Postal Discount

Jim Clark, Production and Marketing Manager

The elimination of reduced postage rates for nonprofit organizations is the goal of two bills recently introduced in both houses of Congress: in the Senate, Bill Bradley, D—NJ, has introduced S.1846; in the House, Marty Russo, D—IL, has introduced H.R.3680.

Both bills propose to eliminate the postal subsidy for nonprofit organizations in an attempt to reduce the postal deficit. If the bills are successful, nonprofit organizations (charitable, scholastic, etc., including GSA and many other earth science societies) will be paying the same second-class postal rates as commercial magazines, and the same third-class rates as thousands of commercial third-class bulk mailers of so-called junk mail. The question of a postal subsidy for nonprofits is widely referred to as the "revenue foregone" issue.

If passed, this legislation will have broad impact on the sciences by substantially increasing the cost of mailing scientific journals, books, maps, and related publications. Some smaller organizations may be forced out of the publishing business altogether, and larger publishers will have to find funds to cover the increased costs. The added

cost to GSA for *Bulletin, Geology,* and *GSA Today* is estimated at between \$8000 and \$10,000 annually, costs the Society will have to bear in one way or another. The total added cost will be even higher when books and other Society mailings are included.

The historic reason for the postal subsidy for nonprofit organizations is that they serve the public good through their charitable and scholastic works. In essence, they profit the public at large, not private interests. Federal legislation and regulation has ensured that the nonprofits regularly pass rigid tests of their activities.

If Congress eliminates the discount rates for nonprofit organizations, it will be disregarding the considerable services to society that nonprofits perform. It would be ironic if this longstanding public support for nonprofits were eliminated in the same year that the U.S. Postal Service (the one with the deficit) has decided to fund charities, such as the 1992 U.S. Olympics, at the multimillion-dollar level.

We urge each of you to contact your legislative representatives immediately and express your opinions on these bills. ■



Landforms of the Conterminous United States—A Digital Shaded-relief Portrayal, *GSA Today*, November 1991

Since You Asked

GSA headquarters has received several inquiries regarding the image Landforms of the Conterminous United States—A Digital Shaded-relief Portrayal that was printed in the November 1991 issue of *GSA Today*. You can get a full-size, black and white version of the map (approximately 42" x 56") by sending your written request and \$5 (check or money order—credit cards are not accepted) to: U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO 80225, (303) 236-7477 or 800-435-7627.

Two other versions are available commercially. The first is similar to the one in the November 1991, *GSA Today*, but it includes interior drainage and physical feature type printed in black and shades of grey. Version two is a hypsometrically-tinted, color map, similar to the relief state maps for which Raven Maps is well known. This version includes elevation bands, state lines, roads, and towns, all county seats, and some other regionally important places. The two versions are designed to work as a pair. Each sells for \$35 plain or \$60 laminated, plus \$5 shipping. Contact Raven Maps and Images, 34 N. Central, Medford, OR 97501, (503) 773-1436. ■

Applications Sought for Senior and Postdoctoral Research Associateships

The National Research Council announces the 1992 Resident, Cooperative, and Postdoctoral Research Associateship Programs for research in the sciences and engineering to be conducted on behalf of 30 federal agencies or research institutions whose 115 participating research laboratories are located throughout the United States. The programs provide opportunities for Ph.D. scientists and engineers of unusual promise and ability to perform research on problems largely of their own choosing yet compatible with the research interests of the sponsoring laboratory.

Approximately 300 new full-time Associateships will be awarded on a competitive basis in 1992 for research in chemistry; earth and atmospheric sciences; engineering and applied sciences; biological, health, and behavioral sciences and biotechnology; mathematics; space and planetary sciences; and physics. Most of the programs are open to both U.S. and non-U.S. nationals, and to both recent Ph.D. degree recipients and senior investigators.

Awards are made for one or two years, renewable to a maximum of three years; senior applicants who have held the doctorate at least five years may request a shorter period. Annual stipends for recent Ph.D.s for the 1992 program year range from \$27,750 to \$42,000 depending upon the sponsoring laboratory, and will be appropriately higher for senior Associates.

Financial support is provided for allowable relocation expenses and for limited professional travel during duration of the award. The host laboratory provides the Associate with programmatic assistance including facilities, support services, necessary equipment, and travel necessary for the conduct of the approved research program.

Applications to the National Research Council must be postmarked no later than April 15 and August 15, 1992. Initial awards will be announced in July and November, respectively.

Information on specific research opportunities and participating federal laboratories, as well as application materials, may be obtained from: Associateship Programs (GR430/D2), Office of Scientific and Engineering Personnel, National Research Council, 2101 Constitution Avenue, N.W., Washington, DC 20418; fax 202-334-2759.

LOGITECH

Geological

Sample

Preparation

Systems

for every need:

- thin sections...
- ultra-thin sections...
- inclusion specimens...
- coals...
- soils...
- concretes...
- core samples...
- paleontological specimens...
- archaeological material...
- calcified tissue...

...and every budget

To find out more, contact:

Struers Inc
26100 First Street
Westlake, Ohio 44145 USA

Telephone: (216) 871 0071
Telefax: (216) 871 8188
Telex: 985275

GEOVENTURES 1992—Registration Open

(reach for the phone or fax today)

GeoVentures are a special benefit created for members, but are open also to guests and friends. GeoVentures is the overall name for adult educational and adventure experiences of two kinds: GeoTrips or GeoHostels. Both are known for expert scientific leadership. Fees for both are low to moderate (relative to the length of time and destination) and include lodging and meals as designated. The venues, however, are quite different.

Choose from two types of GSA GeoVentures

| | <i>GeoHostels</i> | <i>GeoTrips</i> |
|--------------------------------|--|---|
| Length | 5 days | 1 to 4 weeks |
| Cost | Under \$500 | Over \$1000 |
| Site | College campuses or resort towns, North America | Worldwide |
| Time of year | Summer | Anytime |
| Traveling | Limited. Possible one or two 1/2-day field trips | Daily change of site |
| Ground Transportation | Provided by participants | Provided by GSA |
| Physical Requirements | None | May be physically demanding |
| Education | 1/2-day daily classroom programs plus 1-2 field excursions | Informal, outdoor field instruction |

For details on the 1992 GeoVentures, call your GeoVentures Coordinator today: 1-800-472-1988 or (303) 447-2020.



Photo courtesy of Jay Temple, Grand Canyon Trip, 1991

GSA GEOTRIP

Grand Canyon Educational Adventure

A Spring Educational Adventure: Rafting, Hiking, and Camping
Eight Days, Seven Nights on the River
Lee's Ferry to Pierce Ferry—250 Miles of River Ride
April 25–May 3, 1992

Scientific Leaders

Stan Beus, Northern Arizona University
Ivo Luchitta, U.S. Geological Survey, Flagstaff

Program Schedule

April 25, Saturday Travel day from home to Las Vegas
April 26, Sunday Depart Las Vegas for arrival at Lee's Ferry
April 27–May 3,
Monday through Sunday .. River days
May 3, Sunday Take-out Pierce Ferry (Lake Mead) for bus trip
back to Las Vegas
May 4, Monday Travel day from Las Vegas to home

Fee

Cost: \$1390—\$100 less for GSA members.
Minimum age: 18. Limit: 35 persons.
Register Before March 15—save \$50
GSA Members \$1240
Guests and Nonmembers \$1340

Fee includes tent, sleeping bag, and pad; meals; dry bags; waterproof river guidebook; geologic reading materials; comfortable transportation to and from Las Vegas and the Grand Canyon; and, of course, the companionship of expert and engaging scientific leaders.

Please make your decision early—this trip is filling quickly. **Total balance is due now**, and is 50% refundable through March 26, but **nonrefundable after March 26**. A \$20 processing fee applies to all cancellations.

Science and adventure in one glorious
experience of a lifetime for the spirited and adventurous.



Photos courtesy of Bob Evans, Galapagos Islands, 1991



GSA GEOTRIP

Galapagos Islands and Ecuador

Co-sponsored by American Association for the Advancement of Science
July 5–15, 1992

Scientific Leaders

William S. Wise, University of California, Santa Barbara, is a volcanic petrologist with extensive experience with volcanoes, magma evolution, and island formation.

In addition to being a GSA Fellow, he is an able and experienced trip leader.

The professional field naturalist accompanying the trip is Cynthia Manning, a field biologist familiar with tropical environments, currently a resident of Quito. In addition, scientists from the Darwin Research Station will provide informal lectures.

The purpose of this trip is to explore the remote and scientifically fascinating Galapagos Islands and the Andean highland of Ecuador. This geologic and natural history expedition offers an exceptional opportunity to experience the unique flora and remarkably approachable fauna of these islands, together with expanding awareness of the ongoing geological processes in the eastern Pacific region.

Co-sponsor: American Association for the Advancement of Science. GSA is offering this unique opportunity in co-sponsorship with AAAS in order to provide an opportunity for members of both scientific communities to travel and learn together. This educational excursion is to one of the most extraordinary locations on Earth; it is a place to remember—a trip of a lifetime.

Itinerary. Days 1 and 2 will be spent traveling to and getting familiar with Quito, which sits in an Andean valley at 9300 feet. Days 3 through 9 will be spent exploring eight of the Galapagos Islands, stopping at Plaza Island, Hood Island, Santa Cruz Island (home of the Darwin Research Station), Floreana, Barrington, Tower Island, Tagus Cove, Punta Espinosa, James and Bartholomew Islands. The day lectures on the geology of the region will be combined with field excursions to the habitats of marine iguanas, rare waved albatross, flamingos, red-footed and masked boobies, and many other exotic species. Between hikes there will be ample time for snorkeling in coves, with the strong possibility of sighting sea lions.

Daily Transport. Motorcoach is the mode of transport in Ecuador, but the exploration between islands is aboard the *Isabela II*, the newest (and many say best) of the ships serving these islands. The air-conditioned, 162' motorboat provides comfort and convenience. It has a maximum of 34 cabins, which all face outside and have twin or double beds (no bunk beds), and each has a private bath. Three full, excellent meals are served daily aboard ship. A skiff takes small groups ashore for morning and afternoon field exploration of between one and two hours each.

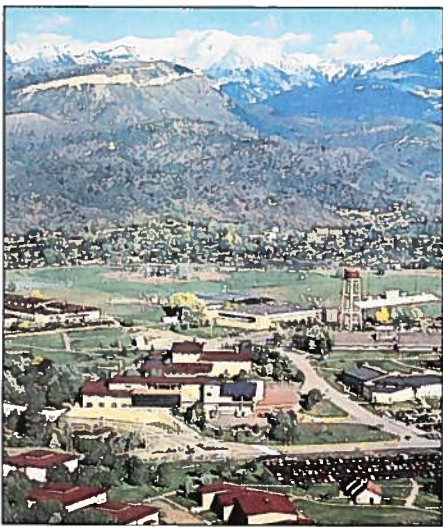
Expedition Cost. The land cost for GSA members is \$3290 U.S. plus airfare. The nonmember fee is \$3390. *If a guest has previously traveled on a GSA GeoTrip, the nonmember \$100 additional fee will be waived.* We find the price to be quite reasonable compared to similar offerings. In addition, Betchart Expeditions, Inc., has earned an excellent reputation with other scientific groups. The fee includes double occupancy lodging in Quito and aboard the *Isabela II*; transfers and ground transportation; meals as indicated, including three meals per day aboard the *Isabela II*; entrance fees; baggage handling; leadership; and reading materials.

The expedition fee does not include airfare; some meals (estimated cost to participants is \$40); tips to Galapagos guide or boat crew; any personal items such as alcoholic beverages, laundry, snorkeling equipment, phone calls, snacks, personal insurance, or foreign airport departure taxes.

Airfare and Airline Ticketing. Airfare roundtrip from Miami to Quito is currently \$734 plus tax based on an excursion fare with Ecuatoriana Airlines. All air bookings and ticketing will be handled by Betchart Expeditions Inc., (800) 252-4910. **PLEASE NOTE:** All expedition members will fly as a group; limited independent travel arrangements are available. Airfares are subject to change, and are generally lowest when booked early.

Single Accommodations. Single rooms are available for an additional \$125 in Ecuador and \$650 in the Galapagos. If you do not have a roommate or we cannot assign you one, you must pay the extra cost of a single. (The single fee is exceptionally high because the second space in the cabin could be purchased by another full-paying traveler.)

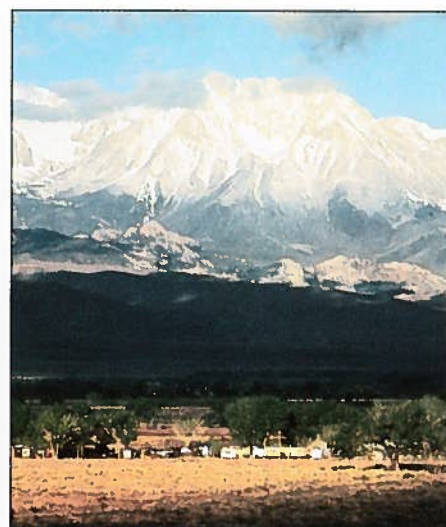
Registration, Deposits, and Payments. Registration is open to everyone, but **GSA Members will be given preference. Full payment due March 1.** This amount goes directly to the Ecuadorian provider after March 1 and is nonrefundable unless your place is resold; then, a \$100 processing fee will apply. Minimum age: 18. Limit: 30 persons. **Spaces are still available, but please call today.**



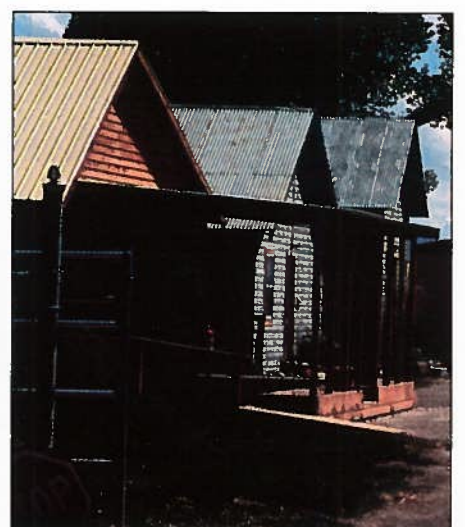
San Juan Mountains and Fort Lewis College, Durango, Colorado. Courtesy of Fort Lewis College



Animas River Valley and Narrow Gauge Train, Silverton, Colorado. Courtesy of Ken Kolm



White Mountains, Bishop, California. Courtesy of White Mountain Research Station



Field Cabins, Bishop California. Courtesy of White Mountain Research Station

GSA GEOHOSTEL

Geology of the Southwestern San Juan Mountains

Fort Lewis College, Durango, Colorado
Five Days and Six Nights: June 27–July 2, 1992

Scientific Leaders

Kenneth E. Kolm and Gregory S. Holden, Colorado School of Mines

The Durango townsite was the terminus to the ice age Animas River glacier, largest to drain the San Juan icefield. Fort Lewis College sits 300 feet above the town on the remnant of an outwash terrace. Views of the mountain peaks and down the valley are impressive. Rocks of the area record a geologic history from Precambrian crystalline basement, through deposition of a Paleozoic and Mesozoic sedimentary sequence, to culmination in Tertiary volcanism, caldera formation and mineralization, all deeply eroded and exposed during Neogene uplift.

A combination of classroom lectures and daily field trips will emphasize the geology of the area from Precambrian to present with discussions of hazards and resource issues. We will visit Mesa Verde National Park, ride the Durango and Silverton Narrow Gauge Railroad, and visit the high peaks. Local activities available outside of class include golfing, hiking in spectacular scenery, touring ghost towns, and rafting.

Program Schedule

June 27, Saturday Welcoming get-together
June 28–July 1, Sunday
through Wednesday Morning classes and field trips
July 2, Thursday Full-day field excursion and farewell party

Fee and Deposit

Cost: \$325 for GSA Members. Nonmembers \$25 more.
\$75 deposit is due with your reservation, which is refundable until April 1; less \$20 processing fee.

Total balance due: May 1

Minimum age: 21 years. Limit: 30 persons.

Fee includes classroom programs and materials, train ride to Silverton, Colorado, on the Narrow Gauge Railroad, lodging (double occupancy, dormitory suites), breakfast, welcoming, and farewell events. **Not included** are transportation to and from Colorado, transportation during non-class hours, meals or other expenses not specifically included.

GSA GEOHOSTEL

Geology and Natural History of Eastern California

White Mountain Research Station, Bishop, California
Five Days and Six Nights: July 25–July 30, 1992

Scientific Leaders

Clemens A. Nelson, University of California, Los Angeles, Emeritus
Bruce A. Blackerby, California State University, Fresno

The town of Bishop lies between the eastern scarp of the Sierra Nevada and the equally impressive White-Inyo Range, which is often referred to as "God's Country." The White Mountain Research Station, used by the University of California campuses for their field camps, is located four miles from Bishop at the base of the White Mountains. The geologic diversity includes complexly folded and faulted Precambrian and Paleozoic rocks, plutonic and metamorphic rocks of the Sierra, the young volcanic rocks of Long Valley and the Inyo and Mono Craters, abundant evidence of glaciations—and recent earthquake activity. The natural history of this scenic region also encompasses petroglyphs, the ancient bristlecone pines, and the tufa towers of saline Mono Lake.

Program Schedule

July 25, Saturday Welcoming get-together
July 26–29, Sunday
through Wednesday Morning classes and field trips
July 30, Thursday Full-day field excursion and farewell party

Fee and Deposit

Cost: \$325 for GSA Members. Nonmembers \$25 more.
\$75 deposit is due with your reservation, which is refundable until April 1; less \$20 processing fee.

Total balance due: May 1

Minimum age: 21 years. Limit: 30 persons.

Fee includes classroom programs and materials, field excursions; lodging in barrack style dormitories; breakfast and lunch each day; welcoming and farewell events. **Not included** is transportation to and from California (Reno makes a good airport destination with travel by car to Bishop); transportation during non-class hours; meals or other expenses not specifically included.



GEOVENTURES REGISTRATION FORM

Please keep in mind that the GeoVentures fill quickly and it is best to make a decision early.

If you would like to send a deposit to hold your reservation, please pay by check or credit card, which will be used only for this deposit. (Future charges will be authorized by you first.) You will receive further information and a confirmation of your registration within one week after your reservation.

Cancellation

Each GeoVenture has its own set of cancellation dates which will be sent out to registrants and provided in response to phone queries.

Name _____
Institution/Employer _____
Mailing Address _____
City _____ State _____ Country _____ ZIP _____
Business Phone () _____
Home Phone () _____
Guest Name _____
GSA Member # _____

| | Payment Per Person | No. of Persons | Total Paid |
|---------------------------------------|----------------------|----------------|------------|
| GT921 — Galápagos and Ecuador GeoTrip | Full payment due now | _____ | _____ |
| GT922 — Grand Canyon GeoTrip | Full payment due now | _____ | _____ |
| GH921 — Durango, Colorado, GeoHostel | \$75 (Deposit) | _____ | _____ |
| GH922 — Bishop, California, GeoHostel | \$75 (Deposit) | _____ | _____ |
| TOTAL | | | _____ |

I've enclosed no money, but I'm interested. Please send more information.
 VISA MasterCard Diners Club/Carte Blanche American Express
Credit Card # _____ Exp. Date _____
Signature _____

Mail Registration Form and check or credit card information to:
1992 GSA GeoVentures, GSA Meetings Department,
P.O. Box 9140, Boulder, CO 80301
Non-U.S.-based registrants are encouraged
to use GSA's fax number: 303-447-1133

Call today for more information: (303) 447-2020 or 1-800-472-1988

1992 GSA Committees and Representatives

Committees are the key to GSA's accomplishments in promoting the science of geology. Committee members and representatives contribute their expertise and experience to all areas of GSA endeavor. Listed here are those currently serving the Society and the science as committee members and as GSA representatives to other scientific groups.

Executive Committee

E-an Zen—Chairman and President; Robert D. Hatcher, Jr.—Vice-President; Raymond A. Price—Past President [serving for Doris M. Curtis (deceased)]; Robert L. Fuchs—Treasurer; Arden L. Albee—Council Member-at-Large

Audit Committee

William L. Fisher—Chairman, 1990–1992; John M. Sharp, Jr., 1991–1993; Genevieve Atwood, 1992–1994; Carel Otte, 1992; Peter T. Flawn, 1991–1994; Ex officio: Robert L. Fuchs

Committee on Committees

Charles J. Mankin—Chairman; John E. Costa; Priscilla C. Grew; Fernando Ortega-Gutiérrez; Paul C. Ragland; Peter Robinson

Committee on the Arthur L. Day Medal Award

John F. Sutter—Chairman, 1992; Don L. Anderson, 1990–1992; Donald L. Turcotte, 1990–1992; Donald H. Lindsley, 1991–1993; Judith A. McKenzie, 1991–1993; Richard M. Mitterer, 1992–1994; Walter D. Mooney, 1992–1994

Committee on Education

David A. Stephenson—Chairman, 1992–1994; Shirley M. Brown, 1990–1992; A.R. (Pete) Palmer, 1991–1992; JoAnn P. Mulvany, 1991–1993; Elisabeth C. Schwarzman, 1991–1993; Linda Knight, 1992–1994; Frank Zuerner, 1992–1994; Section Representatives: Dorothy L. Stout (Cordilleran); William D. Nesse (Rocky Mountain); Lawrence A. Wiedman (North-Central); Larry G. Enochs (South-Central); Arthur M. Hussey II (Northeastern); John R. Wagner (Southeastern); Ex officio: Robert D. Hatcher, Jr., Vice-President; Conferees: Edward E. Geary, Coordinator for Educational Programs; Laure Wallace, USGS Educational Coordinator

Committee on Geology and Public Policy

Brian E. Tucker—Chairman, 1990–1992; William L. Fisher, 1990–1992; Philip Oxley, 1990–1992; David L. Gross, 1991–1993; Bruce B. Hanshaw, 1991–1993; Thomas M. Usselman, 1991–1993; Donald C. Haney, 1992–1994; Carroll Ann Hodges, 1992–1994; John (Jack) C. Schmidt, 1992–1994; Past Congressional Science Fellows: Elizabeth M. Robinson, 1990–1992; Daniel R. Sarewitz, 1991–1993; Craig W. Schiffrics, 1992–1994

Committee on Honorary Fellows

Carl Kisslinger—Chairman, 1990–1992; Anthony J. Naldrett, 1990–1992; Robin Brett, 1991–1993; Martin A. Schuepbach, 1991–1993; Richard W. Allmendinger, 1992–1994; J. G. Liou, 1992–1994

Committee on Investments

Anthony Reso—Chairman, 1990–1992; Robert E. Folinsbee, 1992; Carel Otte 1990–1992; Samuel S. Adams, 1992–1994; Brian J. Skinner, 1992–1994; Ex officio: Robert L. Fuchs, Treasurer

Committee on Long-Range Planning

E-an Zen—Chairman and President; Robert D. Hatcher, Jr.—Vice-President; Raymond A. Price—Past President; Robert L. Fuchs—Treasurer; Arden L. Albee—Council Member-at-Large; R. Allan Freeze, 1990–1992; James W.H. Monger, 1990–1992; Genevieve Atwood, 1992; Ian D. MacGregor, 1992–1994; Ex officio: Charles J. Mankin, Chairman, GSA Foundation Trustees; Bruce A. Blackerby, Sections Representative

Committee on Membership

Martin L. Stout—Chairman, 1991–1993; Richard F. Madole, 1992; Fred J. Menzer, 1990–1992; Daniel A. Textoris, 1991–1993; Charles B. Sclar, 1992–1994; Edmund G. Wermund, Jr., 1992–1994

Committee on Nominations

Maria Luisa B. Crawford—Chairman; Mark D. Barton; Robert N. Farvolden; Paul D. Fullagar; Anthony W. Walton; Robert S. Yeats

Committee on Penrose Conferences

Arthur W. Snoko—Chairman, 1990–1992; Henry Spall, 1990–1992; Randall R. Parrish, 1991–1993; Mark T. Brandon, 1992–1994; J. Duncan Kerppe, 1992–1994

Committee on the Penrose Medal Award

Gordon P. Eaton—Chairman, 1992; John O. Wheeler, 1990–1992; Jack E. Oliver, 1991–1993; Neil D. Opdyke, 1991–1993; Hal J. Gluskoter, 1992–1994; Carol Simpson, 1992–1994; William A. Thomas, 1992–1994

Program Committee

Richard W. Berry—Chairman, 1991 JTPC Chairman; Nicholas Rast, 1992 JTPC Chairman; Heinrich D. Holland, 1993 JTPC Chairman; Mark S. Ghiorso, 1994 JTPC Chairman (term begins at summer 1992 JTPC meeting); Councilmembers: Marie E. Morisawa, 1992; John M. Sharp, Jr., 1991–1993; Karen L. Prestegaard, 1992–1994; Ex officio: F. Michael Wahl, Executive Director; Sue S. Beggs, Meetings Manager; Edward E. Geary, Coordinator for Educational Programs

Committee on Publications

Arden L. Albee—Chairman, 1990–1992; Joanne Bourgeois, 1990–1992; Robert M. Easton, 1990–1992; Fernando Ortega-Gutiérrez, 1992–1994; John E. Costa, Editor, *Bulletin*; Arthur G. Sylvester, Editor, *Bulletin*; David M. Fountain, Editor, *Geology*; Henry T. Mullins, Editor, *Geology*; Richard A. Hoppin, Editor, *Memoirs and Special Papers*; David Schleicher, Editor, *Maps and Charts*; Bruce F. Molnia, Forum Editor, *GSA Today*; Eldridge M. Moores, Science Editor, *GSA Today*; Conferee: F. Michael Wahl, Executive Director

Committee on Research Grants

Stephen G. Wells—Chairman, 1991–1993; Darryll T. Pederson, 1992; Howard W. Day, 1990–1992; Molly Fritz Miller, 1991–1993; Raymond V. Ingersoll, 1992–1994; Ben A. van der Pluijm, 1992–1994; NSF Conferee: Thomas O. Wright

Committee on Short Courses

Kevin Burke—Chairman, 1990–1992; James M. Coleman, 1990–1992; Samuel B. Upchurch, 1991–1993; Richard G. Craig, 1991–1993; Maria Luisa B. Crawford, 1991–1993

Treatise on Invertebrate Paleontology Advisory Committee

Richard Arnold Davis—Chairman, 1989–1992; Ronald R. West, 1991–1994; F. Michael Wahl, Executive Director

Committee on the Young Scientist Award (Donath Medal)

Robert N. Ginsburg—Chairman; 1991–1993; Donald J. DePaolo, 1990–1992; James W.H. Monger, 1990–1992; Robert H. Dott, Jr., 1991–1993; Sharon Mosher, 1992–1994; Frank S. Spear, 1992–1994

Ad Hoc Committee on Minorities and Women in the Geosciences

A. Wesley Ward, Jr.—Chairman; Charles A. Baskerville; Diana F. Elder; Louis A. Fernandez; David A. Lopez; Jane E. Nielson; Ravindra P. Sinha

Ad Hoc Blue Planet Committee

William S. Fyfe—Chairman; Fred A. Donath; William L. Fisher; Robert D. Hatcher, Jr.; Susan Kieffer; Raymond A. Price

GSA Member of the AGI Member Society Council

Robert D. Hatcher, Jr., Vice-President

GSA Member of the AGI Education Advisory Committee

Edward E. Geary, Coordinator for Educational Programs

GSA Member of the AGI Geosciences Advocacy Program Advisory Committee

M. Gordon Wolman, 1991–1994

GSA Representatives to AAAS

Section E—Geology and Geography: J. Thomas Dutro, Jr., February 16, 1991–February 15, 1994; Section W—Atmospheric and Hydrospheric Sciences: John G. Weihaupt, February 16, 1991–February 15, 1994

GSA Representatives to North American Commission on Stratigraphic Nomenclature (NACSN)

Paul R. Seaber, 1989–1992; Peter R. Vail, 1990–1993; G. B. Morey, 1991–1994; Donald L. Baars, 1992–1995, Representative-elect (term begins during the fall 1992 NACSN meeting in Cincinnati)

GSA Delegate to Circum-Pacific Council

Robert L. Fuchs, May 2, 1984–

GSA Representatives to Joint ASCE-GSA-AEG Committee on Engineering Geology (American Society of Civil Engineers)

John D. Rockaway, July 1, 1990–June 30, 1993; Jeffrey R. Keaton, July 1, 1991–June 30, 1994

GSA Representative to U.S. National Committee on Tunneling Technology

Richard E. Gray, July 1, 1986–June 30, 1992

GSA Representative to U.S. National Committee on Scientific Hydrology

David A. Stephenson, 1990–; Bruce B. Hanshaw (alternate)

GSA/AASG Selection Committee for the John C. Frye Memorial Award in Environmental Geology (Association of American State Geologists)

Earl H. Bennett II—Chairman, AASG representative; John P. Kempton, GSA representative, 1990–1992; Frank E. Kottlowski, AASG representative ■

Gregg Ranch Foundation Offers Research Grants in '92

The Gregg Ranch Foundation, a nonprofit public benefit organization has been established in honor of Rodney Gregg of Yreka, California. Gregg has assisted and encouraged geologists and geology students doing research in the eastern Klamath Mountains for over 50 years. The historic Gregg Ranch, located in the upper Scott Valley near the town of Gazelle, is the location of some of the oldest rocks in northern California (570 Ma: Cambrian).

Beginning in 1992, the Foundation is offering modest research grants to geology students doing research in the Klamath Mountains or adjoining geologic provinces. Students interested in applying for such a grant should request a research grant application form from the Gregg Ranch Foundation at 4920 Woodland Ave., Lincoln, NE 68516. Proposals for 1992–1993 must be postmarked by *March 15, 1992*; awards will be announced by *May 1, 1992*.

Persons wishing to honor Rodney Gregg or to help support research in the Klamath Mountains may send their contributions to the Gregg Ranch Foundation at the address above.

About People

URS Consultants, Inc., recently announced the addition of GSA Member **Lance Duncan** as senior project manager, Anchorage, Alaska.

Fellow **Donald C. Haney**, Kentucky Geological Survey, has been elected president of the American Geological Institute.

Fellow **Vincent Matthews** has been named president of Penn Virginia Resources Corporation, Duffield, Virginia.

Member **Arnold Woods**, Conoco, Inc., was elected secretary of the Wyoming Geological Association for 1992.

In Memoriam

Harold J. Buddenhagen
Grants Pass, Oregon
December 15, 1991

B. J. Collette
Utrecht, Holland
November 11, 1991

John Tilton Hack
Washington, D.C.
December 15, 1991

John W. Handin
College Station, Texas
December 18, 1991

John W. Harsharger
Tucson, Arizona
October 10, 1991

Norman L. Hatch, Jr.
Bethesda, Maryland
November 30, 1991

Charles W. Merrill, Jr.
Juneau, Alaska

Paul C. Tychsen
Superior, Wisconsin

Alvin Van Valkenburg, Jr.
Tucson Arizona

T.J.C. Verbeek
Ontario, Canada

College Asks for Journal Back Issues

The Mesa State College (Colorado) Geology Department library needs journals relating to ground water and engineering geology. The college now offers courses in these subjects, but the library lacks funds to purchase back issues of journals. Many students are deprived of these journals for their research projects or term papers. If you have back issues of any ground-water or engineering geology journals and are willing to donate these items, please send them to: John V. Tomlinson Library, Mesa State College, P.O. Box 2647, Grand Junction, CO 81502.

Additional inquiry can be made by contacting Julia Woods, Library Director, at the above address, or telephone (303) 248-1862.

1993-1994 Competition Opens for Fulbright Scholar Awards

The Fulbright Scholar Program for 1993-1994 includes some 1000 grants for research, combined research and lecturing, or university lecturing in over 120 countries. Opportunities range from two months to a full academic year. Nearly one-third of Fulbright grants are targeted for research, and many lecturing awards offer research opportunities; multicountry research is also possible. Virtually all disciplines and subfields participate. Many offerings throughout the program allow scholars to propose their own lecturing or research projects.

The basic eligibility requirements for a Fulbright award are U.S. citizenship and Ph.D. or comparable professional qualifications. For lecturing awards, university or college teaching experience is expected. Language skills are needed for some countries, but most lecturing assignments are in English. Applications are encouraged from professionals outside academe and from independent scholars. Fulbright seeks good teachers as well as active researchers.

June 15, 1992, is the deadline for Australasia and South Asia; it's August 1 for Africa, Asia, Europe, Latin America, the Middle East, and Canada. Other deadlines are in place for special programs.

Application materials are available beginning March 1, 1992. For further information and applications, call or write the Council for International Exchange of Scholars, 3007 Tilden Street, N.W., Suite 5M, Box NEWS, Washington, DC 20008-3009. Telephone: (202) 686-7877.

NEW SPECIAL PAPERS from GSA

GEOLOGY OF THE POINT SUR-LOPEZ POINT REGION, COAST RANGES, CALIFORNIA: A PART OF THE SOUTHERN CALIFORNIA ALLOCHTHON

by C. A. Hall, Jr., 1991

Delineates the Southern California allochthon of Western California. Specific subject matter includes plate tectonics, regional geology of western California, San Andreas, Sur, Proto-San Andreas faults, accreted or suspect terranes, late Mesozoic and Cenozoic Stratigraphy of north-central coastal California. Includes many maps of the region.

SPE266, 44 p., 2 pocket plates, ISBN 0-8137-2266-7, \$17.50

TECTONIC SETTING OF FAULTED TERTIARY STRATA ASSOCIATED WITH THE CATALINA CORE COMPLEX IN SOUTHERN ARIZONA

by W. R. Dickinson, 1991

Discusses the stratigraphy, sedimentology, and tectonic setting of sedimentary assemblages related genetically to the evolution of a classic cordilleran metamorphic core complex.

SPE264, 114 p., 1 pocket plate, ISBN 0-8137-2264-0, \$38.75

THE MECHANISMS OF RECENT VERTICAL CRUSTAL MOVEMENTS IN CAMPI FLEGREI CALDERA, SOUTHERN ITALY

by J. J. Dvorak and G. Mastrolorenzo, 1991

Three components of ground movement are discussed: (1) a broad, regional subsidence related to opening of the Tyrrhenian Sea; (2) episodic uplift, confined to Campi Flegrei, an explosive caldera, caused by shallow intrusion of magma; and (3) localized subsidence within Campi Flegrei, possibly caused by removal of ground water and compaction of volcanic sediments. Evidence also is presented for 0.5-m rise in sea level during the past 2,000 years.

SPE263, 54 p., ISBN 0-8137-2263-2, \$22.50

GLACIAL MARINE SEDIMENTATION; PALEOCLIMATIC SIGNIFICANCE

edited by J. B. Anderson and G. M. Ashley, 1991

Volume focuses on paleoclimatic interpretation of glacial marine strata. Descriptions include wide range of glacial marine sedimentary environments and climatic settings.

SPE261, 240 p., indexed, ISBN 0-8137-2261-6, \$47.50

STRATIGRAPHY, DEPOSITIONAL ENVIRONMENTS, AND SEDIMENTARY TECTONICS OF THE WESTERN MARGIN, CRETACEOUS WESTERN INTERIOR SEAWAY

edited by J. D. Nations and J. G. Eaton, 1991

Eleven papers examine the stratigraphy, biostratigraphy,

depositional environments, paleoecology, and sedimentary tectonics across terrestrial, nearshore, and marine deposits along the southwestern margin of the Cretaceous Western Interior Seaway.

SPE260, 240 p., 1 microfiche card, indexed,

ISBN 0-8137-2260-8, \$42.50

GEOLOGY OF TITANIUM-MINERAL DEPOSITS

by E. Force, 1991

The geology of titanium-mineral deposits crosses the entire purview of geology, from Precambrian to Holocene and from anorthosites to beach sands. This is the first integrated treatment of the subject, analyzing the basic geologic processes that produce deposits of each type, then relating them in a geochemical-cycle framework. Practical applications to exploration for this metal of the future abound, so this should be an important and useful guide for the titanium industry.

SPE259, 120 p., ISBN 0-8137-2259-4, \$28.75

GEOLOGY AND HYDROGEOLOGY OF THE TEAYS-MAHOMET BEDROCK VALLEY SYSTEM

edited by W. N. Melhorn and J. P. Kempton, 1991

The papers in this volume support the contentions that (1) the classic preglacial "Teays" likely did flow to the present Erie lowland; (2) a western "Mahomet" valley developed independently across Illinois during the pre-Illinoian; and (3) the linkage of these two ancestral systems was accomplished during glacial times by a series of episodic diversions. The hydrogeologic framework described provides insight into the value of the contained groundwater resources.

SPE258, 136 p., ISBN 0-8137-2258-6, \$36.25

TECTONIC HISTORY OF THE BERING SEA AND THE EVOLUTION OF TERTIARY STRIKE-SLIP BASINS OF THE BERING SHELF

by D. M. Worrall, 1991

Focuses on the tectonic development of the Bering Shelf and surrounding regions in late Mesozoic through Cenozoic time. In addition to surface geologic data and wells, extensive seismic reflection data throughout the region obtained from petroleum industry sources is used.

SPE257, 126 p., 4 pocket plates, ISBN 0-8137-2257-8, \$42.50



The Geological Society of America

1-800-472-1988 • Publication Sales

P.O. Box 9140 • Boulder, CO 80301 • (303) 447-2020 • fax (303) 447-1133

GSA Penrose Conferences

March 1992

■ **POSTPONED UNTIL 1993: 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.

May 1992

The Origin and Evolution of the Coast Mountains, British Columbia, Yukon, and Alaska, May 16–22, 1992, Bowen Island, British Columbia. 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; 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 (on sabbatical in Cambridge, UK); Eldridge M. Moores, Dept. of Geology, University of California, Davis, CA 95616, (916) 752-0352 or 752-0350, fax 916-752-6363.

1992 Meetings

March

21st Computer Simulated Mineral Exploration Workshop, March 3–30, 1992, Fontainebleau, France. Information: L. Zanone, Ecole des Mines de Paris, CGGM-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; 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.

■ **American Association of Petroleum Geologists—SEPM Pacific Sections**, April 29–May 1, 1992, Sacramento, California. Information: Rich Boyd, Capitol Oil Corp., 1545 River Park Dr., #501, Sacramento, CA 95815, (916) 929-4141, fax 916-929-4534.

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.

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.

International Congress on Technology and Technology Exchange, May 13–15, 1992, Evry, France. Information: Janet Weisgerber, (412) 391-2913; 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, Dept. of Earth Sciences, University of California, Riverside, CA 92521-0423, (714) 787-3444, fax 714-787-4324.

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; 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.acadiau.ca.

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, and 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.

■ **Neotectonics—Recent Advances**, June 16–17, 1992, London. Information: C. Vita-Finzi, Dept. of Geology, University College, Gower Street, London WC1E 6BT, England, fax 071-388-7614.

Geology of the Taconic Orogen: A Sesquicentennial Field Conference, June 20–21, 1992, Shoreham, Vermont. Information: Paul A. Washington, P.O. Box 242, Shoreham, VT 05770, (919) 733-1330.

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; 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.

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, July 23–24, 1992, University Park, Pennsylvania. 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.

■ **Phanerozoic Basins of Southwestern Gondwana: Tectonics, Stratigraphy, and Seismic Expression**, August 12–16, 1992, Santa Cruz, Bolivia. Information: Ramiro Suarez Soruco, Casilla 727, Santa Cruz, Bolivia, fax 591-3-34-6472; A. J. Tankard, Petro-Canada, P.O. Box 2844, Calgary, Alberta, T2P 3E3, Canada, (403) 296-5808, fax 403-296-5875.

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; Mark Harris, Dept. Geosciences, University of Wisconsin, P.O. Box 413, Milwaukee, WI 53201, (414) 229-5452; 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.

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; 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.

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.

■ **Federation of Analytical Chemistry and Spectroscopy Societies Annual Meeting**, September 20–25, 1992, Philadelphia, Pennsylvania. Information: FACSS, P.O. Box 278, Manhattan, KS 66502, (301) 846-4797. (Deadline for submission of titles and preliminary 100-word brief: March 4, 1992.)

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; 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.

■ **SEPM Midcontinent Section Annual Meeting: Paleosols, Paleoweathering Surfaces and Sequence Boundaries**, October 9–11, 1992, Knoxville, Tennessee. Information: Steven G. Driese, Dept. of Geological Sciences, University of Tennessee, Knoxville, TN 37996-1410, (615) 974-2366, fax 616-974-2368.

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 Symposium: 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, 1992, 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.



**GSA
HATS**

The GSA hat comes in dark blue corduroy, embroidered with the Society's name. *One size fits all.* Limited quantities available. Allow three weeks for delivery. Please, no phone orders.

Clip and Mail to GSA Meetings Dept.
P.O. Box 9140, Boulder, CO 80301

Name _____

Address _____

City _____

State/ZIP _____

Phone _____

Total hats @ \$9.50 ea. \$ _____

Add shipping & handling \$ 1.50

TOTAL AMOUNT DUE: \$ _____

Make checks payable to:
Geological Society of America
Remit in U.S. funds only

March BULLETIN and GEOLOGY Contents

Are you missing out? If you're not a *Bulletin* or *Geology* subscriber, you may miss the articles listed below. But it's not too late, you can still subscribe and receive all 1992 issues, even if you've already paid your 1992 dues. Just call Membership Services today at 1-800-472-1988.



The Geological Society of America

BULLETIN

Volume 104, Number 3, March 1992

CONTENTS

- 253-254 Tribute to Doris M. Curtis, 1991 GSA President
Raymond A. Price
- 255-266 Prevolcanic extensional Seaman breakaway fault and its geologic implications for eastern Nevada and western Utah
Wanda J. Taylor and John M. Bartley
- 267-279 Magnitudes and implications of peak discharges from glacial Lake Missoula
Jim E. O'Connor and Victor R. Baker
- 280-302 Basement-cover relations, Sevier orogenic belt, northern Utah
W. Adolph Yankee
- 303-315 Shallow-burial diagenesis of deep-water carbonates, northern Bahamas: Results from deep-ocean drilling transects
George R. Dix and Henry T. Mullins
- 316-328 Origin and chemical evolution of the 1360 Ma San Isabel batholith, Wet Mountains, Colorado: A mid-crustal granite of anorogenic affinities
Robert L. Cullers, Tom Griffin, M. E. Bickford, and J. Lawford Anderson
- 329-345 The Chaparral shear zone: Deformation partitioning and heterogeneous bulk crustal shortening during Proterozoic orogeny in central Arizona
Steffen G. Bergh and Karl E. Karlstrom
- 346 Bulletin Information
- 347-377 Medals and Awards for 1991
- 378 Bulletin Information

GEOLOGY

VOLUME 20
NO. 3
P. 193-288
MARCH 1992

- 195 Late Holocene slip rate and recurrence of great earthquakes on the San Andreas fault in northern California
Tina M. Niemi, N. Timothy Hall
- 199 Catastrophic wave erosion on the southeastern coast of Australia: Impact of the Lant tsunamis ca. 105 ka?
R. W. Young, E. A. Bryant
- 203 Image of the Moho across the continent-ocean transition, U.S. east coast
W. Steven Holbrook, Edmund C. Reiter, G. M. Purdy, M. N. Toksöz
- 207 Basaltic volcanism, mantle plumes, and the mechanics of rifting: The Paraná flood basalt province of South America
Dennis L. Harry, Dale S. Sawyer
- 211 Permeability changes associated with large earthquakes: An example from Loma Prieta, California
Stuart Rojstaczer, Stephen Wolf
- 215 Late Proterozoic stratigraphy and the Canada-Australia connection
Grant M. Young
- 219 Continental paleoclimates from δD and $\delta^{18}O$ of secondary silica in paleokarst chert lags
Roy Kenny, L. Paul Knauth
- 223 Paleomagnetism of the Front Range (Colorado) Morrison Formation and an alternative model of Late Jurassic North American apparent polar wander
Mickey C. Van Fossen, Dennis V. Kent
- 227 Prolific organic SiO_2 precipitation in a solute-deficient river: Rio Negro, Brazil
K. O. Konhauser, H. Mann, W. S. Fyfe
- 231 Exhumation of late Paleozoic blueschists in Queensland, Australia, by extensional faulting
Timothy A. Little, Rodney J. Holcombe, George M. Gibson, Robin Offler, Philip B. Gans, Michael O. McWilliams
- 235 CARBPLAT—A computer model to simulate the development of carbonate platforms
Hemmo Bosscher, John Southam
- 239 Deep crustal structure and tectonics in the offshore southern Santa Maria Basin, California
Craig Nicholson, Christopher C. Sorlien, Bruce P. Luyendyk
- 243 Carbon isotopic vital effect and organic diagenesis, Lower Cambrian Fordeau Formation, northwest Newfoundland: Implications for $\delta^{13}C$ chemostratigraphy
Stephen W.F. Grant
- 247 Highly alkaline lavas in a Proterozoic rift zone: Implications for Precambrian mantle metasomatic processes
H. Gaonac'h, J. N. Ludden, C. Picard, D. Francis
- 251 Evidence for local shifting of the main fault and changes in the structural setting, Kinarot basin, Dead Sea transform
Y. Rotstein, Y. Bartov, U. Frieslander
- 255 Timing of carbonate mineral precipitation and fluid flow in sea-floor basalts, north-west Indian Ocean
Stephen J. Burns, Paul A. Baker, Henry Elderfield
- 259 Mentawai fault zone off Sumatra: A new key to the geodynamics of western Indonesia
M. Diament, H. Harjono, K. Karta, C. Deplus, D. Dahrin, M. T. Zen, Jr., M. Gérard, O. Lassal, A. Martin, J. Malod
- 263 Vapor-absent melting at 10 kbar of a biotite- and amphibole-bearing tonalitic gneiss: Implications for the generation of A-type granites
Kjell P. Skjerlie, A. Dana Johnston
- 267 Reactivated tectonic boundaries and implications for the reconstruction of southeastern Australia and northern Victoria Land, Antarctica
David A. Foster, Andrew J.W. Gleadow
- 271 Diagenetic formation of bedded chert: Evidence from chemistry of the chert-shale couplet
Richard W. Murray, David L. Jones, Marilyn R. Buchholtz ten Brink
- 275 Deep crustal structure and seismic expression of the central Appalachian orogenic belt
Gregory C. Herman

Forum

- 279 Major Northern Hemisphere deglaciation caused by a moisture deficit 140 ka
Comment: Lars Forsström
Reply: R. G. Johnson
- 280 Plutonism, oblique subduction, and continental growth: An example from the Mesozoic of California
Comment: Raymond V. Ingersoll
Reply: Allen F. Glazner
- 283 Range fires: A significant factor in exposure-age determination and geomorphic surface evolution
Comment: R. I. Dorn
Reply: Paul Bierman, Alan Gillespie
- 285 Striated clast pavements: Products of deforming subglacial sediment?
Comment: David M. Mickelson, Nelson R. Ham, Jr., Lars Ronnert
Reply: Peter U. Clark

GSA ANNUAL MEETINGS



THE VOYAGE CONTINUES
From Columbus to Magellan

1992

GSA Annual Meeting, Cincinnati, Ohio
Cincinnati Convention Center, 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

J. Christopher Hepburn
Dept. of Geology and Geophysics
Boston College
Chestnut Hill, MA 02193

GSA SECTION MEETINGS

1992

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
Radisson Suite Hotel, May 13-15

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

CALL FOR PAPERS AND POSTER PRESENTATIONS MESOZOIC AND EARLY CENOZOIC DEVELOPMENT OF THE GULF OF MEXICO AND CARIBBEAN REGION

A CONTEXT FOR HYDROCARBON EXPLORATION
Thirteenth Annual GCSSEPM Foundation Research Conference
Houston, Texas
December 6-9, 1992

The 1992 GCSSEPM Foundation Research Conference will focus on the current understanding of the regional geologic, tectonic, paleogeographic and climatic evolution of the Gulf of Mexico and Caribbean Basin during the Mesozoic and Early Cenozoic and the context it provides for hydrocarbon exploration. The conference will attempt to facilitate a synthesis of data and concepts on a larger scale than has been previously attempted. The conference will include two and one-half days of 30- to 40-minute oral presentations and evening poster sessions. The presentations will be organized geographically by the indicated Program Committee members as follows: (1) Gulf of Mexico and west Florida — Richard T. Buffler (U. Texas at Austin) and Norman Rosen (MCR & Associates); (2) Mexico and Yucatan — Terry Blair (Consultant) and Carl Evans (BP America Inc.); (3) Guatemala to Panama — Burke Burkart (U. Texas at Arlington) and J. H. Rosenfeld (Amoco Prod. Co.); (4) Caribbean, Bahamas, Cuba and South Florida — Erle G. Kauffman (U. of Colorado) and P.M. Harris (Chevron); and (5) northern South America — Frank Walles (British Gas Serv. U.S.) and J.L. Pindell (Dartmouth). Authors wishing to present an oral paper or make a poster presentation should submit an abstract not exceeding 400 words for Program Committee review to one of the two Program Committee Cochairmen.

| PROGRAM COMMITTEE COCHAIRMEN | | PROGRAM DEADLINES | |
|---------------------------------|---------------------|-------------------|--|
| Christopher R. Scotese | James L. Pindell | June 1, 1992 | Abstracts due. |
| The Univ. of Texas at Arlington | Dartmouth College | July 1, 1992 | Authors notified. |
| Arlington, TX 76019 | Hanover, NH 03755 | Nov. 15, 1992 | Final manuscripts with illustrations for proceedings volume due. |
| (817) 273-2987 | (603) 646-3581 | | |
| FAX: (817) 794-5653 | FAX: (603) 646-3922 | | |

CLASSIFIED ADVERTISING

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.

| Classification | Per Line | Per line |
|----------------------------|---------------|--------------------------------|
| | for 1st month | for each add'l month (same ad) |
| Situations Wanted | \$1.75 | \$1.40 |
| Positions Open | \$4.50 | \$3.80 |
| Consultants | \$4.50 | \$3.80 |
| Services & Supplies | \$4.50 | \$3.80 |
| 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

BROOKLYN COLLEGE CITY UNIVERSITY OF NEW YORK

ENVIRONMENTAL GEOLOGIST: The Department of Geology at Brooklyn College of CUNY invites applications for an entry level assistant professor in environmental geology starting August, 1992. Applicants should have a specialization in at least one of the following: geophysical hydrogeology; environmental geochemistry; or geotechnics/engineering geology. Applicants must have a Ph.D., and will be expected to develop a strong, grant-supported research program in specialty. Responsibilities include M.A./Ph.D. thesis supervision, and teaching undergraduate and graduate courses in groundwater geology and in environmental and/or sedimentary geology. Participation in the department's expanding environmental geology program is expected. Salary: \$28,630. Application deadline: May 1, 1992. Applicants should send resume, including a statement of research interests and goals, reprints, and names of at least three referees to: Dr. J. A. Chamberlain, Jr., Chairman, Department of Geology, Brooklyn College, Brooklyn, NY 11210.

Brooklyn College/CUNY is an AA/EEO Employer M/F/H/V.

POSTDOCTORAL FELLOWSHIPS IN STRUCTURAL GEOLOGY CENTRE FOR EARTH RESOURCES RESEARCH DEPARTMENT OF EARTH SCIENCES MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Two postdoctoral positions in structural geology will be available for combined pure and applied structural geology research, commencing on or about 1 June, 1992. These positions will be offered as one-year appointments, potentially renewable for a second year. They will involve approximately half-time grant-funded research and half-time petroleum/minerals industry contract research. Both positions will involve field mapping and mesoscale structural analysis, and substantial field experience is required. One position will address topics in the foothills and front ranges of the western Canadian Cordillera; the second will involve studies of medium- to high-grade deformation

in Newfoundland & Labrador. Applicants should submit cover letter, curriculum vitae, and addresses of three references. Applications and requests for additional information should be sent to: W. Jamison, Centre for Earth Resources Research, Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, A1B 3X5.

TENURE-TRACK FACULTY POSITIONS The Pennsylvania State University

The Department of Geosciences invites applicants for tenure-track faculty positions to be filled at the rank of Assistant or Associate Professor in two areas: 1) Geophysics; and 2) Sedimentary Geology. The successful applicant will be committed to excellence, teach undergraduate and graduate courses, supervise graduate students and conduct an active sponsored research program. The successful candidate will join a dynamic department with active research over a wide spectrum of the geosciences. The Department of Geosciences is housed within the College of Earth and Mineral Sciences.

Geophysics. Preference will be given to candidates who have geophysical field experience and who can incorporate field studies into their research and teaching. The candidate's area of study should be complementary to existing departmental expertise in theoretical seismology, potential fields, tectonophysics and mineral physics. The general field of specialization is open and may consist of expertise in lithospheric-scale processes, reflection/refraction seismology, marine geophysics or exploration geophysics.

Sedimentary Geology. We seek an outstanding, highly motivated individual interested in basin-scale sedimentary geology. To complement our existing strengths, primary consideration will be given to data- or field-oriented sedimentologists/stratigraphers investigating interplay between large-scale stratigraphic and lithospheric processes, the successional relationships of global and regional stratigraphic units, and/or the geologic record of global change. Among other opportunities, faculty may participate in Penn State's Earth System Science Center, Institute for Basin Evolution and Lithospheric Dynamics, and Marine Science Center, Wallops Island, VA.

A Ph.D. is required for both positions at the time of appointment. Rank and salary are dependent on qualifications and seniority. Each applicant should submit a curriculum vitae, names of at least four references, and a statement outlining research and teaching interests to: Head, Department of Geoscience, 503 Deike Bldg., The Pennsylvania State University, University Park, PA 16802.

Applications will be accepted until 15 March 1992 or until position is filled for appointment available Fall semester, 1992.

Penn State is an equal opportunity/affirmative action employer.

STATE COASTAL CONSERVANCY REQUEST FOR QUALIFICATIONS

The State Coastal Conservancy seeks statements of qualifications from individuals and firms including small businesses, woman business enterprises, minority business enterprises and/or disabled veteran enterprises. These qualifications are being requested from qualified California firms capable of providing one or more of the following types of consulting services: land surveying and mapping; civil and hydrological engineering; geotechnical assessment; structural analyses; pre-project feasibility analyses; economic analyses; hazardous-waste investigation; wetland assessment; archaeological studies; environmental documentation and assessment under the California Environmental Services.

Contact the Conservancy, Attn: Tyronea Marshall, 1330 Broadway, Suite 1100, Oakland, CA 94612, for specific information to be included in your statement of qualifications.

GEORGE MASON UNIVERSITY

The Geology Program of George Mason University seeks candidates for a full-time visiting faculty appointment to teach introductory geology, mineralogy, igneous and metamorphic petrology, and structural geology for the 1992-1993 academic year,

pending budgetary approval. Successful candidate must have experience in effective university teaching. Ph.D. is preferred. Salary is \$27,000.

George Mason University is located within close proximity to the U.S. Geological Survey, Smithsonian Institution, Geophysical Laboratory, and numerous government and private organizations in the national capital area. Review of applications will begin March 1 and will continue until the position is filled.

Please send letter of application, curriculum vitae, and names and addresses of three referees to Rick Diecchio, Director, Geology Program, Institute for Geographical and Geological Sciences, George Mason University, Fairfax, VA 22030-4444. George Mason University is an equal opportunity/affirmative action employer and encourages women and minority candidates.

EARLHAM COLLEGE

Half-time position 1992-93 to teach three geology courses; some flexibility in teaching assignments, but at least two will be lower level. Ph.D. or A.B.D. who wants to develop teaching skills in supportive environment while completing research. Requires ability to adjust readily to small liberal arts college. Send resume, copies of transcripts, and 2 letters of recommendation to Helen Hay, Geology Department, Earlham College, Richmond, IN 47374. Screening will continue until position is filled. Earlham College is an affirmative action/equal opportunity employer.

STATE COASTAL CONSERVANCY REQUEST FOR QUALIFICATIONS

The State Coastal Conservancy anticipates a need for environmental consulting services over the next twelve months which may include planners, architects, landscape architects, engineers, geotechnical engineers, geologists, agriculture, real property appraisers, archaeologists and hydrologists.

The California State Coastal Conservancy seeks statements of qualifications from individuals and firms providing these services. The Conservancy acts to preserve, restore and enhance California's coastal resources and to solve land use problems on the coast and around San Francisco Bay. The Conservancy undertakes projects in the following areas: (1) public access (e.g., trails; bridges; whole access; parking, recreational and interpretive facilities); (2) urban waterfronts (e.g., pier restoration; commercial fishing; waterfront access; waterfront revitalization; shoreline facilities); (3) resource enhancement (e.g., restoration and enhancement of wetlands, estuaries, coastal dunes, streams, watersheds, riparian environments and endangered species habitats); (4) coastal restoration (e.g., lot consolidation; transfer of development rights; coastal land acquisition); and (5) agricultural land preservation (e.g., acquisition of interests in coastal agricultural land and resolution of agricultural problems).

No later than June 1, 1992. Please submit a statement of your firm's qualifications, experience, and capabilities to: Tyronea Marshall, State Coastal Conservancy, 1330 Broadway, Suite 1100, Oakland, CA 94612.

If further information is needed, contact Tyronea Marshall at (510) 464-4159.

Services & Supplies

6" MAP SCALES—Multiscale Products, 10558 Creston Dr., Los Altos, CA 94024.

LEATHER FIELD CASES. Free brochure, SHERER CUSTOM SADDLES, INC., P.O. Box 385, Dept. GN, Franktown, CO 80116.

6,000+ USGS PUBLICATIONS: Pro Papers, bulletins, water surveys, mining, etc. Write or call for catalog, Ptak Science Books, 1531 33rd St., N.W., Washington, DC 20007, (202) 337-2878. We also have large stock of antiquarian geological maps.

Opportunities for Students

Graduate Assistantships/Geology Department and Center for Remote Sensing and Energy Research, Texas Christian University. Assistantships are available for students working toward an M.S. degree. Possible research topics include most fields of geology, but we have several openings for students wishing to apply remote-sensing techniques

to geological mapping and exploration, environmental monitoring, and land-use planning. The department houses a state-of-the-art remote-sensing lab with computer workstations and image processing/GIS software. Financial aid includes a yearly stipend of \$7,000, full tuition waiver, and up to \$1,500 for research expenses. Contact the Graduate Advisor, Department of Geology, Texas Christian University, Fort Worth, TX 76129 (817-921-7270).

JOI/USSAC Ocean Drilling Fellowships. JOI/U.S. Science Advisory Committee is seeking doctoral candidates of unusual promise and ability who are enrolled in U.S. institutions to conduct research compatible with that of the Ocean Drilling Program. Both two-year and one-year fellowships are available. The award is \$20,000 per year to be used for stipend, tuition, benefits, research costs and incidental travel, if any. Applicants are encouraged to propose innovative and imaginative projects.

Applications are available from the JOI office and should be submitted according to the following schedule: Leg 147: Hess Deep, 5/1/92; Leg 149: Iberian Abyssal Plain, 5/1/92; Leg 150: New Jersey Sea Level, 5/1/92; Leg 151: Atlantic Arctic Gateways, 5/1/92; Leg 152: East Greenland Margin, 5/1/92; All Shorebased Research (regardless of leg), 12/1/92.

These legs will be staffed in the next few months. Students interested in participating as shipboard scientists must apply to the ODP Manager of Science Operations in College Station, TX. An application form is available in the JOI/USSAC application packet.

For more information and to receive an application packet, contact: JOI/USSAC Ocean Drilling Fellowship Program, Joint Oceanographic Institutions, Inc., 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102 (Robin Smith: (202) 232-3900).

REG REVIEW, Inc.

**STUDY AIDS
for the
CALIFORNIA GEOLOGY
REGISTRATION EXAM
and
ENGINEERING GEOLOGY
CERTIFICATION EXAM**

**REG REVIEW, Inc.
6555 Oakwood Drive
Oakland, CA 94611**

Patti Osiecki, C.E.G. Lisa Dirth, C.E.G.
(415) 852-9099 (510) 339-3771

PROJECTED DEEP BOREHOLE OPPORTUNITY IN THE ALBANY BASIN, NEW YORK April 23-24, 1992 — Albany, New York

Opportunity to finalize research proposals in geology, geophysics and geochemistry projects to be conducted in association with a proposed basement stratigraphic test drilled through overthrust Paleozoic strata. Emphasis will be on defining scientific objectives, proposing intervals to be cored and scoping downhole experiments.

Parties interested in this workshop please contact:

R. Bennett, Project Manager
1764 Walcutt Road
Columbus, Ohio 43228
(614) 876-2184

Mt. Eden Books & Bindery

Specializing in out-of-print and rare books in the GEOLOGICAL SCIENCES. Including USGS publications, general geology, mining, paleontology, geophysics, hydrology, mineralogy, etc.

FREE SEARCH SERVICE

For FREE catalog contact us at
P.O. Box 421
Mt. Eden, CA 94557
(415) 782-7723

MOVING?

Don't risk missing a single issue of *GSA Today*! If you're planning on changing your address, simply write in your new address below and mail this coupon along with your subscription mailing label (use label from this newsletter) to: GSA, Membership Services, P.O. Box 9140, Boulder, CO 80301-9140. Or you may call with your change of address information — (303) 447-2020 or 1-800-472-1988.

(North American subscribers should report address changes 6 weeks in advance; all others, three months in advance.)

PLEASE PRINT

Name _____

Address _____

City _____

State/ZIP/Country _____

Phone (during business hours) _____

If you do not wish to have this number in the Membership Directory, check here

Change my voting section to: _____



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. Kottlowski, 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.**

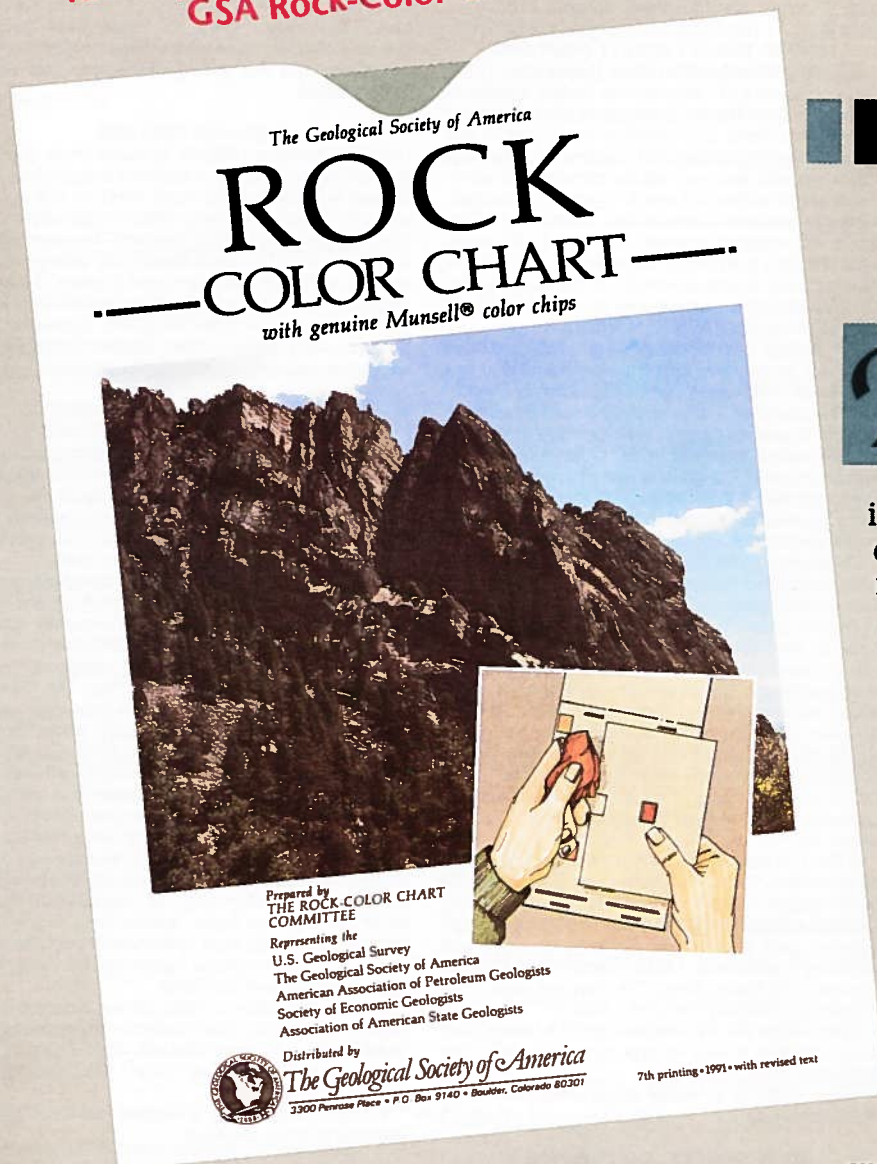
Basis for Selection

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 resolve 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.

Identify rock colors accurately with a GSA Rock-Color Chart!



This handy tool provides 115 genuine Munsell® Color Standards (chips), each with its correct ISCS-NBS* color name and unique Munsell alpha-numeric notation.

Find any rock color on the chart and the Munsell notation underneath gives you the *value* (degree of lightness), the *hue* (color), and the *chroma* (degree of saturation) for that color. Use these notations in your writing to communicate exact color information that anyone can understand.

Designed primarily for field use, the chart nevertheless indicates the range of rock colors for all purposes and is accurate for wet or dry specimens. Chiefly used to describe

medium- to fine-grained rocks, it is also helpful in working with coarse-grained rocks.

This version was manufactured for GSA by the Munsell Corporation to exacting Munsell standards for color accuracy. Printed on Munsell's special color-neutral stock, the chart includes a viewing mask. *RCC001, 16 p., \$20.00*

*Inter-Society Color Council—National Bureau of Standards.



The Geological Society of America

1-800-472-1988

3300 Penrose Place • P.O. Box 9140 • Boulder, CO 80301-9140 • 303-447-2020 • fax 303-447-1133

ISSN 1052-5173

The Geological Society of America
3300 Penrose Place
P.O. Box 9140
Boulder, CO 80301

SECOND CLASS
Postage Paid
at Boulder, Colorado
and at additional mailing offices