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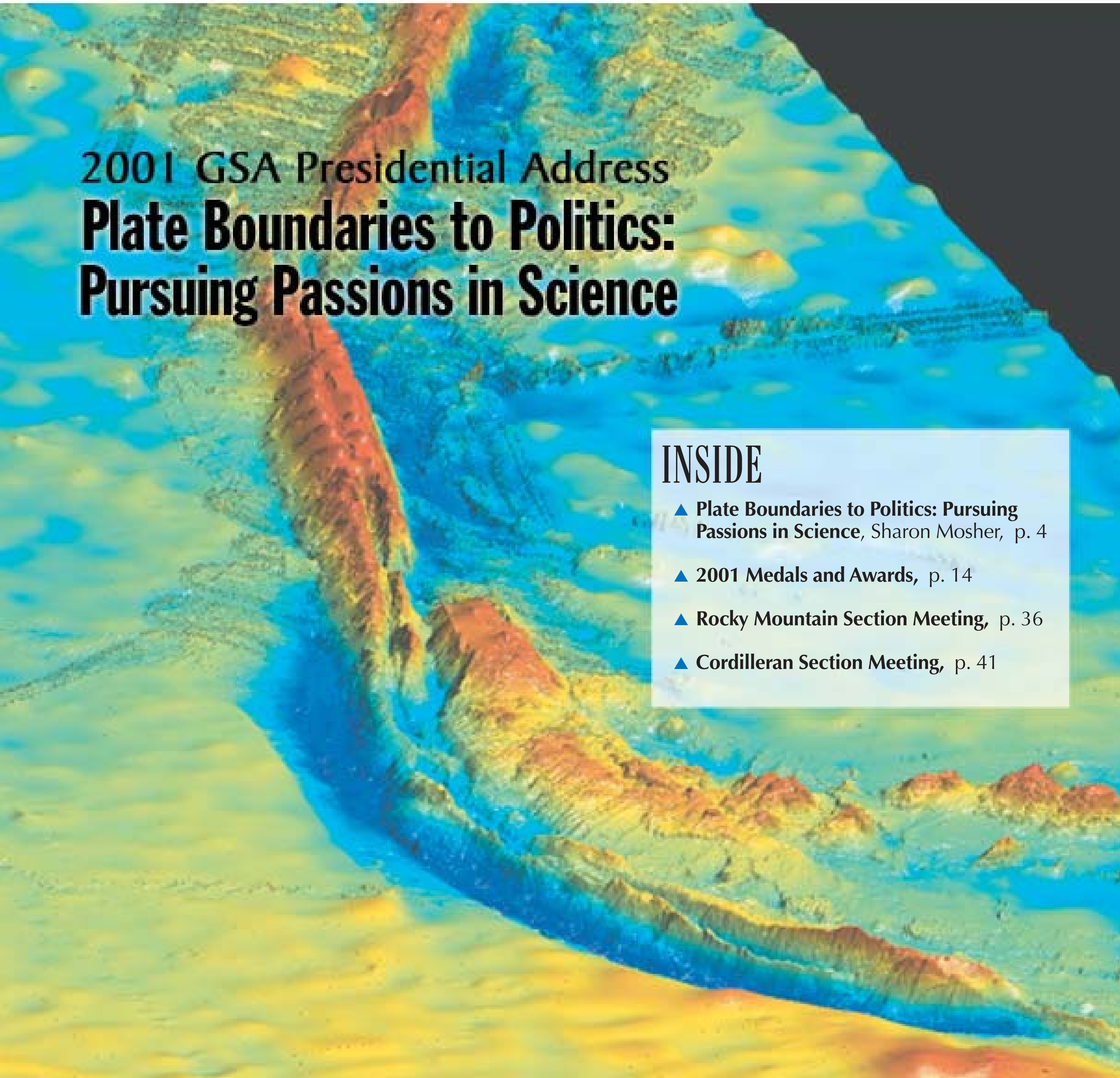

2001 GSA Presidential Address

Plate Boundaries to Politics: Pursuing Passions in Science

INSIDE

GSA TODAY

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science article

On the cover: Pacific-Australian plate boundary south of New Zealand; 3-D seafloor bathymetry. Current-day dextral transform plate boundary is located in valley on top of ridge. Image merges bathymetry predicted from gravity (Smith and Sandwell, 1997) with detailed bathymetry from shipboard cruises. (Southern third of data collected by Australian Geological Survey Organisation from R/V *L'Alantate* 2000 cruise (Bernardel et al., 2000); northern two thirds of data collected by R/V *Rig Seismic* cruise 124 in 1994 (Massell et al., 2000); note ship tracks in northern data. Imaging courtesy of Geoscience Australia (Bernardel and Symonds, 2001; Meckel et al., 2001).

2001 GSA Presidential Address
Plate Boundaries to Politics: Pursuing Passions in Science

GSA Annual Meeting, November 4, 2001, Boston, Massachusetts

Sharon Mosher, *Department of Geological Sciences, University of Texas at Austin, Austin, TX 78712, USA*

INTRODUCTION

Our passion for science, for scientific discovery, is our common bond as geoscientists: searching for answers to the unknown, solving puzzles of the natural world, exploring the last frontier—scientific discovery. It is our passions that drive us to the far reaches of the globe to work under idyllic or harsh conditions, that keep us up late at night hunched over computers till we are bleary-eyed and so stiff we can hardly move, or arguing for hours over beer long since warm and forgotten. We come to GSA meetings to share the results of our scientific passions with friends, colleagues, students, and other geoscientists, but I submit that we need to broaden our audience to include public policy makers, the public, current and future educators, the media, and other scientists, as well as students and colleagues. Here, I discuss using our scientific passions in different forums and GSA's role, starting with politics and ending with plate boundaries.

PUBLIC POLICY

Thomas Jefferson once said, "Science is my passion; politics my duty." I find it inspiring that someone so well known for his political contributions fundamentally viewed himself as a scientist. Although we need not become president of the United States, now is a critical time for us as geoscientists to follow his lead and become politically aware and active. Numerous issues of importance to us have become political issues: evolution, natural-hazard planning, energy policy, climate change, environmental protection, research funding, and geoscience education, to name only a few. All of these and more have come up before Congress or state legislatures this past year. Regardless of your views on these issues, you have a stake in their outcome. The following examples are specific to the United States, but are also valid for other countries.

We have two primary reasons for being active. (1) We have knowledge that politicians need to make informed decisions: 50% of all bills that come before Congress have a scientific or technical component; 81% of U.S. policy goals include science and technology. Every day, members of Congress make decisions that impact the scientific community, yet few ever hear from scientists before voting. (2) Many of us depend on federal or state support for research funding or employment, either directly or indirectly. We have a vested interest in being politically active.

One common concern is scientific research funding. Opinion polls show that the public supports spending money on science; interest in science is at its all-time highest level (Fig. 1A and 1B). The public loves frontiers, recognizes the economic benefits of research, and approves of merit-based funding. People know that university-based (fundamental) research opens the door to other scientific developments that may be more directly useful to the average person. Public support for better science education also is high (Fig. 1C). The public recognizes the need for a next generation of highly skilled, well-trained scientists and engineers.

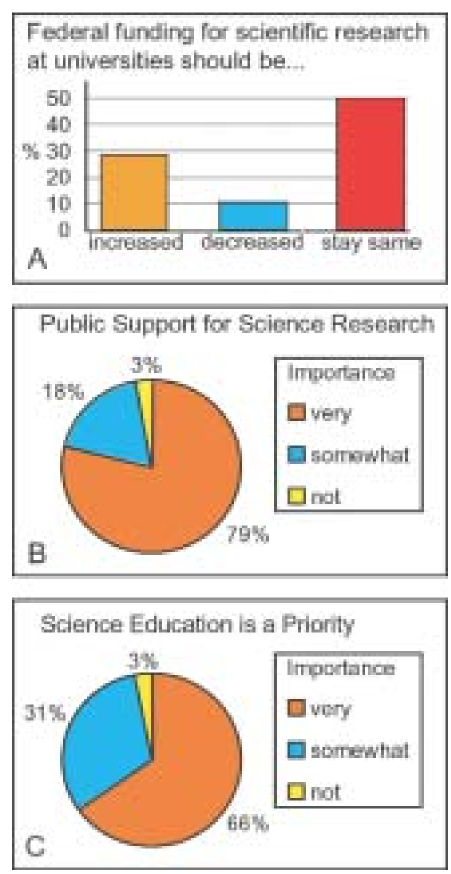


Figure 1. Results from public opinion polls. **A:** From Public Opinion Strategies, B. McInturff and E. Frontczak for The Science Coalition. **B, C**: From Research America, Aggregate 2000, Charlton Research Company.

This strong support, however, does not translate into letters, e-mails, and visits to Congress demanding increased funding! The National Institutes of Health budget has nearly doubled over the past five years because people have a personal stake in finding cures for diseases. One can strongly support university-based research funding, but it takes more than that to make people passionate enough to demand that funding be doubled over five years—that would bring us to the same level of funding we had in the 1960s. We should not feel guilty about asking for increased funding when there are so many other “real” needs in the United States; less than a nickel on every dollar goes into science and technology funding.

Individual Roles

We must bring our passion for science to public policy makers and we must make the public passionate about science so they will do so as well. What can one scientist do? Amazingly enough, congressmen listen to constituents, especially when they go home to their states or districts. Most make themselves available through town meetings or at local offices. When a scientist expresses his or her concerns about a specific issue, it makes a major impression. After all, you are a voter, and you obviously care about the issue. Visits to congressmen in Washington, D.C., or to a legislator in a state capital are effective, but local visits are said to have the most impact. The saying “All politics is local” is true. Also, one letter does matter if it is about a science issue. For social security, abortion, or other major hot-button issues, one letter doesn’t make much difference. But for science issues, Congress and the president receive so few that one or two can make a significant difference.

Other helpful actions include writing a thank-you letter to your congressman when you receive a National Science Foundation or other federal agency grant. The letter should describe briefly what you were funded to study and how the research will help with science education, and, most important, it should thank him or her for past support of science research funding. Apparently, this is effective and appreciated. Or, invite politicians and the press to a photo opportunity, such as a new lab opening or special symposium. The public approves of science, and such opportunities provide a noncontroversial venue for the politician to look good.

We also need to work together with other scientists toward common goals. If scientists present a unified message, such as across-the-board increases in research funding, we will all win. We, as a profession, are very well respected. But we must remember that we all lose when we argue amongst ourselves to see who will get the biggest piece of the pie. Within the geosciences, we need to take a broad, united approach as well. We tend to be individualistic in our approach to science, and we do not actively support large cooperative projects, such as EarthScope. We should consider what is best for the advancement of the geosciences at large. Working together to tackle large fundamental problems is critical to making major progress. Plus, it is these large research projects that increase the overall awareness of the significance of the earth sciences, which in turn generates more funding overall.

What are our reasons for not being involved in politics? A recent poll by Sigma Xi indicates that we don’t have time (74%), don’t know how (50%), don’t think it makes a difference (47%), and don’t want to do it (41%). However, few of us don’t care (25%) and even fewer think others are doing it well (15%). Thus, following Thomas Jefferson’s lead, it is up to us to do our duty both for society and for ourselves.

GSA’s Role

GSA is launching a public-policy list server (subscriber only) to provide you with information so that you know what the issues are, who to contact, and when contact would be timely. Help with effective ways to communicate will also be available. In 2002, GSA will start a public-policy speaker lecture series to try to

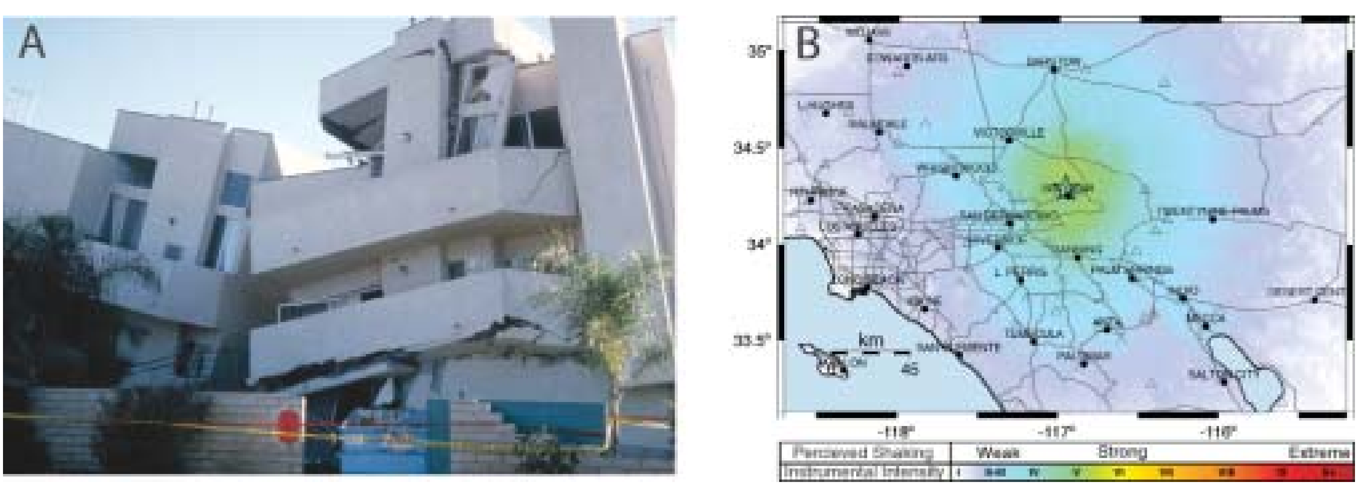


Figure 2. Earth science research addresses scientific problems and societal issues; understanding geologic processes is important for the public. **A:** Apartment building damaged during Northridge, California, 1994 earthquake. Photograph by Greg Davis. **B:** Shake maps produced from strong motion detectors are available within 5 minutes of an earthquake. These detectors provide seismologists with important scientific data and engineers with valuable intensity maps. In a major earthquake, such maps will be invaluable to emergency services dispatchers, fire, search and rescue teams, and utility companies. Big Bear Lake, California, February 10, 2001, earthquake; M 5.1. Green—most intense shaking. From TriNet Shake Map, Southern California Seismic Network.

encourage more young people to consider careers in public policy. Congressional staff members are young, and we want to increase the number of geoscientists on Capitol Hill.

EDUCATION AND OUTREACH

Education, defined in the broadest sense as education of the public, current and future educators, the media, public-policy makers, students, and other scientists, is another important forum for our scientific passions. Two primary reasons to be involved are that (1) earth science research can provide answers to major scientific and societal problems; and (2) an understanding of geologic processes helps the average citizen make informed decisions with respect to their daily lives and about scientific political issues (Fig. 2). As geoscientists, we need to learn to communicate our passion for and excitement about our science to others.

Most scientists, however, prefer to concentrate on research or professional activities and spending time on outreach or K–12 education is not even a consideration. And nearly all of us shy away from any contact with the press or public officials. We didn't get into science to do these things, and our time is precious. If we had wanted to interact with the public or politicians, we would have chosen a different profession.

We are concerned, however, when shopping malls are built on environmentally sensitive aquifers or hospitals on active faults. We are appalled when we find out what our own children are being taught—or not being taught, as is usually the case—at school. When the National Science Foundation's funding for fundamental research is cut, we hope the public and public officials will recognize that such cuts are detrimental to society and the economy. When lawmakers or voters make uninformed decisions regarding global warming, evolution, or flooding along the Mississippi, we wish someone would do something. It is up to us to educate the public. Once we do this, we will find influencing public policy makers much easier. We have the potential to make a major impact.

Individual Roles

We need to take every opportunity offered to educate the public through teaching current and future educators, through outreach initiatives, and through effective use of the media.

Figure 3. Betsiboka delta, Madagascar in 1981, 1985, 1993, showing increase in sediment supply to the delta. Over this period of time, 93% of the island was deforested. Space shuttle photographs, courtesy of NASA.

For those of us in academia, the easiest forum is a general course for nonmajors. I never had any interest in teaching nonscientists but was inspired to do so by Pete Palmer and GSA's SAGE (Science Awareness through Geoscience Education) program. About eight years ago, Gary Kocurek and I designed a course on everything a layperson needs to know to understand the world they live in and to make informed decisions. Called "Earth, Wind & Fire," it has reached more than 4,000 students. The course is different than most, and I present it here as a model of what we need to teach the general population.

In Earth, Wind & Fire, we concentrate on human interactions—the effects of geologic processes on humans and of humans on geologic processes. Hence, we cover a combination of natural hazards (volcanoes, earthquakes, landslides, flooding, coastal erosion; see Fig. 2), aquifers and hydrology, plate tectonics, evolution, environmental geology, and energy and mineral resources. We also cover climate and climate change, showing the complex interactions between the atmosphere, hydrosphere, biosphere, and geosphere. For example, when we discuss desertification, we point out its natural and human causes, how crop growth and changes in soil moisture affect local weather, how government policies contribute to desertification, and, most important, how it affects people. When we discuss deforestation, we include the effects on the atmosphere and local and long-term climate, but also the interplay with weathering and soil formation and the effects in terms of landslides and soil erosion (Fig. 3). The course is all process oriented, but geared specifically to the human element, with a reasonable dose of mitigation, prevention, prediction, and policy thrown in for good measure. We try to present a balanced approach to all these issues. Teaching a course like this is also something that all of us in academia can and should do. Trust me—it can be fun!

Your research can interest the public. Volunteer to talk to a local group such as a Rotary club or church group; give a university-sponsored outreach talk, or speak at a local school. Explain your ideas at a level that your neighbor, a teenager, or a freshman class will understand. All of the topics I listed above are of genuine interest to the average person. Talk to your neighbors, the parents of your children's friends—everyone you meet. Let people know what you do. Most people in the United States say they have never met a scientist! What do we do when we aren't at work, become invisible? Worried about the teaching of evolution? Teach children at Sunday school, the place where the ambiguities between belief and science arise. Apply your knowledge and passion wherever you can to educate.

Talking to the media is very important. The earth sciences are probably the easiest sell to the public because of the striking and newsworthy effects of geologic processes on people. The top news stories of the year generally have a geologic origin. Working with the media, we could capitalize on these to educate people on the importance of understanding geologic processes. Think how interested people are to read any news stories about space; astronomers and physicists capture the public's imagination with stories about black holes, the nature of the unidentified matter that makes up most of the universe, how fast galaxies are moving, and the implications for the origin of the universe. People would be just as fascinated about new discoveries related to seafloor spreading and magmatism and new discoveries from studies of hydrothermal vents that may help explain the origin of life and Earth's early atmosphere.

As scientists, we have problems talking to the media, the public, and public policy makers because we get caught up in uncertainties and incomplete data. By being too careful about what we say, we come off as being uncertain and are ignored. We can get around this problem by using probabilities, a concept that most of the public understands. Geoscientists have an additional problem; we think on such long time scales. If a geoscientist is asked about global warming, they may say Earth will compensate. The media pick this up, but they miss the point of how long it will take—that on a human time scale, the wait is not one we could live with.

GSA's Role

Our society should take an active leadership role in helping its members become more effective in these endeavors. Through workshops and meetings, we can be exposed to successful methods others have used to make an impact in teaching or outreach, stimulating us to do the same or to find new approaches. GSA can help us learn how and when to talk to the media. It can make sure that papers published and presented at meetings get good news coverage. GSA can also run education and outreach programs that accomplish multiple objectives we as individuals cannot achieve. GeoCorps America, which puts geologists in National Parks and National Forests, is an example of such a program.

As GSA members, we can serve as volunteers at varying levels of time commitment on outreach and education programs—just as we do for publications or meetings. And those of us who don't have the time or inclination but who understand the need can contribute financially to our society to help ensure that effective programs have adequate funding. When you get charitable solicitations to help find cures for various diseases, think about the size of the

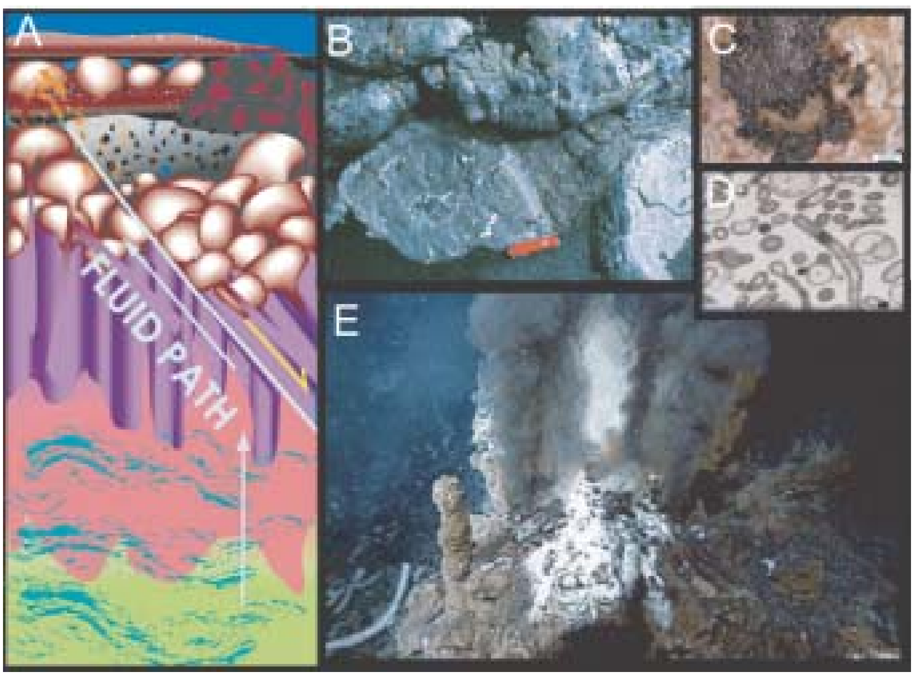


Figure 4. Oceanic spreading centers where processes of the geosphere, hydrosphere and biosphere become linked. **A:** Cross section of oceanic crust from peridotite to sediments, showing faulting of pillow lavas and sheeted dikes and localization of fluid flow that leads to hydrothermal vents. Drawing by Karah Wertz (Wertz et al., 2000). **B:** Pillow lavas. **C:** Massive sulphides (scale bar 100 μm). B,C from Macquarie Island. **D:** Chemosynthetic microbes form around high-temperature hydrothermal vents. **E:** Sulphide-rich hydrothermal vents. (D, E from NOAA Vents Program, NeMo [New Millennium Observatory]).

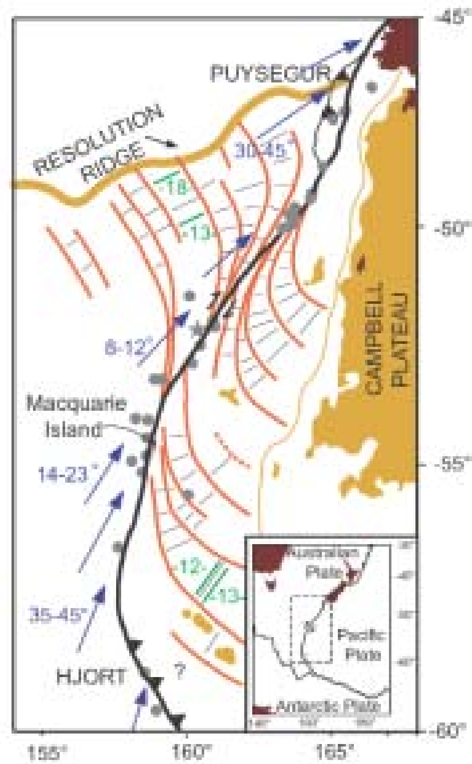


Figure 5. Present-day Pacific-Australian, dextral, transform plate boundary is also a relict spreading center. Current-day plate motion vectors (blue arrows, angles) show obliquity of motion; magnetic anomalies (green lines) young toward the boundary; fracture zones (red lines) become asymptotic to the current plate boundary; abyssal hill faults or spreading fabric (black lines) remain orthogonal to the fracture zones approaching the boundary. Gray dots—earthquake epicenters. Fracture zones and spreading fabric record oblique spreading between the rifted margins (Campbell Plateau and the Resolution Ridge). For location, see inset (dashed box). From Massell et al., 2000.

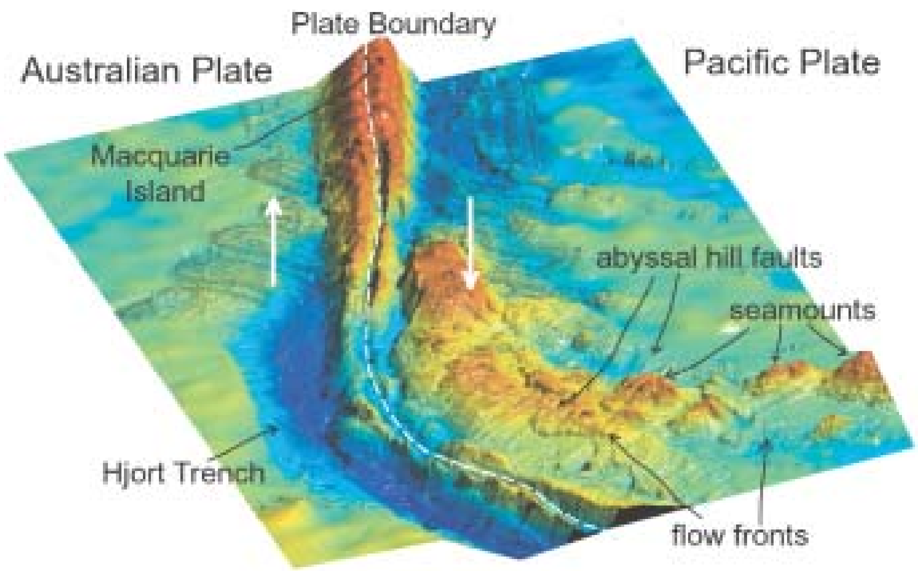


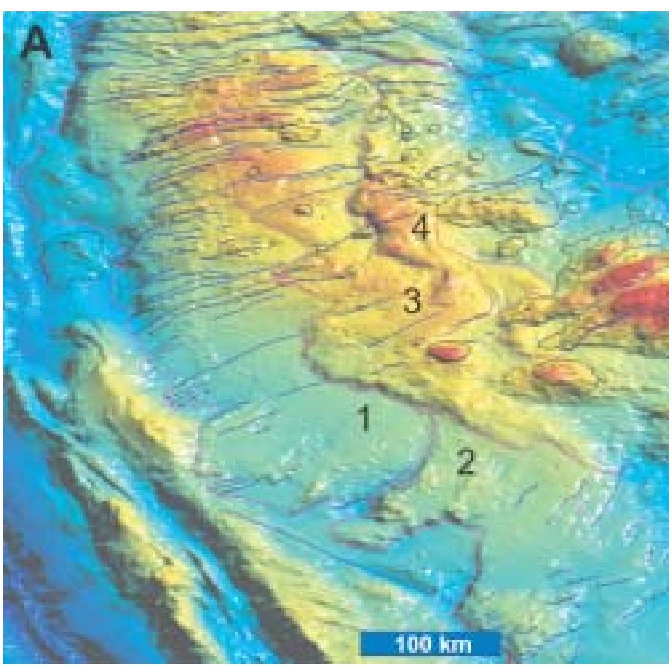
Figure 6. Pacific-Australian plate boundary south of New Zealand; 3-D seafloor bathymetry. Present-day dextral transform plate boundary is located in valley in center of ridge. Abyssal hill faults are at a high angle to plate boundary as a result of oblique spreading on relict spreading center (see Fig. 5). Note that abyssal hill faults near plate boundary cut volcanic flow fronts and seamounts (volcanoes), whereas farther from boundary (right) flows and volcanoes cover faults and are not dissected. Image merges bathymetry predicted from gravity (Smith and Sandwell, 1997) with detailed bathymetry from shipboard cruises. (Southern third of data collected by Australian Geological Survey Organisation from R/V *L'Alantate* 2000 cruise (Bernardel et al., 2000); northern two thirds of data collected by R/V *Rig Seismic* cruise 124 in 1994 (Massell et al., 2000); note ship tracks in northern data. Imaging courtesy of Geoscience Australia (Bernardel and Symonds, 2001; Meckel et al., 2001).

National Institutes for Health budget (over $20 billion for 2001), and give where your passion lies.

GSA is an ideal society to work with the public, media, educators, and public policy makers. It covers the broad range of geologic disciplines and represents both pure and applied scientists. Our members are both the exploiters and the environmentalists. But as geoscientists, we all know that exploration for mineral and energy resources is important and necessary, and we also understand the effects of this exploration and the need to protect the environment. So we as a society are uniquely poised to explain how to achieve this balanced need to the world.

INTERDISCIPLINARY SCIENCE

The joy of discovery is undoubtedly the greatest reward for pursuing our scientific passions. I have personally always had a passion for science. As a child, I started out by trying to make agates in my basement with a torn-up bicycle, an electrical motor, and a chemistry set. In graduate school, my passion was deformation by pressure solution—long before it



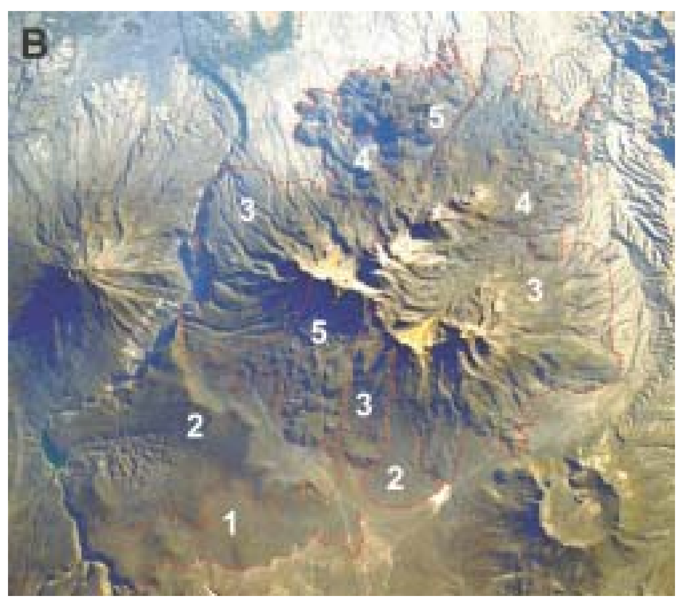


Figure 7. A: Three-dimensional seafloor bathymetry from near plate boundary (from Figure 6). Some flow fronts (red dashed lines) are cut by abyssal hill faults (blue dashed lines) whereas others cover the faults, indicating a synchronicity between volcanism and faulting. Note seamount (volcano) on far right is cut by abyssal hill faults. Numbers indicate volcanic stratigraphy with 1 being the oldest. (Meckel et al., 2001.) **B:** Volcanoes and flows from Peruvian Andes in Arequipa area. Flows show stratigraphy (numbers) similar to those observed on the seafloor. Red dashed lines—flow fronts. Space shuttle photograph STS 026-040-0-56; courtesy of NASA.

was acceptable in the United States—then on to the Alleghany Orogeny in New England when the possibility was just a twinkle in a few graduate students' eyes. Years later, my passion became polyphase folding, ductile deformation mechanisms and recrystallization processes, shear zones, and the effects of fluid flow on deformation, with several forays into brittle deformation. A common thread throughout it all was an underlying passion for strain analysis. Lately, my passion has been Grenville orogenesis along the southern margin of Laurentia, and my most recent passion is ephemeral plate boundaries.

The more I have done, the more I have realized the need to be proficient in many fields and the need for multidisciplinary research. Working in polydeformed granulite facies terranes, one needs geochemistry, geochronology, isotope geology, structural geology, and petrology of all types, and one still needs to be able to recognize sedimentary structures, depositional environments, paleoclimates, and weathering.

More important, however, is the need for interdisciplinary research, working at the interfaces between disciplines, and for cross-disciplinary research, using approaches of one discipline to tackle problems in another. I believe interdisciplinary and cross-disciplinary science have the most potential for major breakthroughs in the future. We need to explore the scientific boundaries between disciplines, both within the geosciences and without. The linkages among biological, chemical, physical, and geologic processes are becoming increasingly clear and critical to our understanding of earth processes.

The example I will use is plate boundaries, my most recent personal passion. Oceanic spreading centers are where the mantle, lithosphere, hydrosphere, and biosphere meet and processes become intertwined. Spreading rates control the structures that form ridge and abyssal hill morphology, types and shapes of magma reservoirs and chambers, and types of structures observed at transform-ridge intersections. Mantle chemistry affects that of the forming lithosphere, which affects the chemistry of the hydrothermal vent fluids. This in turn affects the biologic activity, particularly of microbes, which contributes to differences in mineralization around vents and evolution of life (Fig. 4). These upwellings affect the chemistry of the oceans and thus atmosphere and may even cause weather patterns such as the El Niño effect. Our understanding of the complex interrelationships between each of these processes has grown tremendously and highlights the need for interdisciplinary research to understand the complex interactions in these and other earth systems.

My own experience has shown me the importance of using techniques and experience from one discipline to tackle problems in another. I have been working with Mike Coffin, a geophysicist, on the dextral transform plate boundary between the Pacific and Australian plates south of New Zealand that is also a relict spreading center (Fig. 5). The seafloor contains a complete record of a transition from normal spreading to oblique spreading to transform faulting over the past 40 m.y. (Massell et al., 2000). Looking at the pattern of abyssal hill faults and fracture zones, a geophysicist immediately sees oblique spreading, whereas a structural geologist sees a giant shear zone (Fig. 5). Having spent much of my career looking at strain in shear zones, I couldn't resist doing an incremental strain analysis, if only for pure intellectual curiosity. Much to everyone's surprise, preliminary analysis shows that there is a direct relationship between the cessation of magmatism and the incremental strain history, implying a genetic relationship. This discovery has led me to propose a testable model to explain how magmatism shuts off during oblique spreading, a model that would not have arisen from more conventional approaches.

Working on this boundary has also shown me the importance of having a field perspective when looking at marine geophysical data for the seafloor. Farther south, the plate boundary curves significantly and parallels the Hjort trench, which may be undergoing incipient subduction (Fig. 6). Using marine geophysical data and new three-dimensional visualization techniques, we can explore these submarine features to better understand these transient plate boundaries. Volcanoes and lobate flow fronts, preserving a volcanic stratigraphy, are strikingly similar to those seen on land from the air (Fig. 7). Abyssal hill faults, related to earlier seafloor spreading, dissect the flows and volcanoes, similar to flows offset by rift-related faults in the East African rift zone. Some faults truncate flow fronts, and elsewhere, flows cover the faults, suggesting a synchronicity of the two processes (Fig. 7A). Away from the restraining bend along the present-day transform boundary, these features aren't faulted (Fig. 6). Such observations suggest that rather than being related to incipient subduction, or to off-axis volcanism during seafloor spreading, the volcanism is related to reactivated abyssal hill faults during transform motion in a restraining bend (Meckel et al., 2001).

Applying a field-based approach to a "virtual" field area is just the beginning. Where the boundary makes an abrupt change in strike, a sliver of oceanic crust was uplifted in situ (Macquarie Island; Figs. 5 and 6). This gives us the best of both worlds and allows us to use field data to ground truth the marine geophysical data and to combine the two data sets for an integrated picture of the evolution of this complex ephemeral plate boundary. This work is just one of many possible examples of cross-disciplinary research, illustrating the benefits of bringing the perspective of one discipline to another.

Individual Roles

We as individual scientists need to bring diverse scientific disciplines to bear on fundamental problems and work together with our colleagues to tackle problems with many different approaches and techniques. We need to broaden our horizons and consider problems outside the narrow confines of our past work. Serendipity will always be a major source of scientific advancement, but combined efforts are critical to making major progress. Geoscientists also need to forge better working relationships with fellow scientists. Many of the problems we are addressing are the same and require input from other scientific disciplines. Also, if we are insular in our science, our results will be unrecognized and unused by the larger scientific community.

GSA's Role

GSA is an ideal geoscience society to promote interdisciplinary science. It encompasses a broad range of disciplines, which encourages research at the interfaces between these disciplines as well as cross-disciplinary and multidisciplinary approaches to research. Another of GSA's strengths is its strong ties to the field, even for studies with a theoretical or laboratory focus. A fundamental part of our science involves testing our ideas and models with the reality exposed in the field. What we observe there often forces us to search for new explanations to old questions and inspires us to ask new ones. The final results of the processes we study—regardless of our methods—are revealed in the world's geology.

As geoscientists, we should pursue our scientific passions to their fullest but broaden our audience to include public policy makers, the public, current and future educators, the media, and other scientists, as well as students and colleagues. We can turn our passions for science into progress for both science and the public.

REFERENCES CITED

Bernardel, G., and Symonds, P., 2001, Seafloor mapping of the southeast region and adjacent waters—AUSTREA final report: southern Macquarie Ridge: Australian Geological Survey Organisation Record 2001/46.

Bernardel, G., Alcock, M., Petkovic, P., Thomas, S., and Levinson, M., 2000, Seafloor mapping of the southeast region and adjacent waters—AUSTREA-2 cruise report: southeast of Tasmania and southern Macquarie Ridge: Australian Geological Survey Organisation Record 2000/46.

Massell, C., Coffin, M.F., Mann, P., Mosher, S., Frohlich, C., Schuur, C.L., Karner, G., Ramsay, D., and Lebrun, J.-F., 2000, Neotectonics of the Macquarie Ridge Complex, Pacific-Australia plate boundary: Journal of Geophysical Research, v. 105, n. B6, p. 13,457–13,480.

Meckel, T.A., Mosher, S., Coffin, M.F., Bernardel, G., Alcock, M.B., Symonds, P.A., and Petkovic, P., 2001, Morphology and tectonics of the Hjort Trench, Southern Macquarie Ridge Complex, Southwest Pacific: Geological Society of America Abstracts with Programs, v. 33, n. 6, p. A-396.

Smith, W.H.F., and Sandwell, D.T., 1997, Global seafloor topography from satellite altimetry and ship depth soundings, Science, v. 277, p. 1956–1962.

Wertz, K., Daczko, N.R., Mosher, S., and Coffin, M.F., 2000, Macquarie Island's Finch-Langdon fault zone: a ridge-transform corner structure preserved along the Pacific-Australian plate boundary: Geological Society of America Abstracts with Programs, v. 32, n. 7, p. A-237.

Finances a Focus for 2002

DIALOGUE

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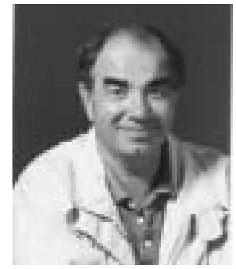


Anthony J. (Tony) Naldrett
President

Now that I have been your president for about three months, the magnitude of the job that I have taken on is slowly dawning on me. Nevertheless, I feel extremely honored by the confidence that you have placed in me and promise you that I will do everything I can to do the job properly. Of course, while he/she has most of the responsibility, the president only assumes a little of the work. In this respect, I am very fortunate that my taking over the presidency coincided with some very important new arrivals, above all that of Jack Hess as executive director.

Jack comes to GSA with a wide experience in geoscience management with the Desert Research Institute in Nevada and from two years working the political scene on Capitol Hill. He has already given me the benefit of his experience and led me to revise some of my decisions, for which I'm extremely grateful. I am also fortunate in having John Costa, who is proving to be a determined and resourceful treasurer, Clark Burchfiel, who is already contributing as vice-president, and four new councilors, Judith Parrish, Ron Clowes, David Fountain, and Richard Gray, who cover a wide range of disciplines and whose advice, along with that of councilors already in office, will be much appreciated.

I can't conclude this introductory stage of my message without saying how much I will be relying on the advice of past president Sharon Mosher. Sharon enjoyed (I hope this is the right word!) nine years of continuous service with GSA (four years on council, four years service with the Annual Program Committee, and one year as vice-president) before she took over as president. During this time, she not only revamped the GSA annual meeting technical program to make it much more interesting and in tune with the times, but she acquired an intimate knowledge of the workings of GSA at all levels—Council, committees, and headquarters—that made her uniquely equipped to cope with the problems that arose during her presidency and to establish procedures for dealing with problems during future presidencies. She made the year of her presidency a full-time job, which she crammed into the spare time that the University of Texas allowed her. Every single member of GSA owes her (and, I suspect, U. of T.) a debt of gratitude that can never be repaid.

At this stage, there seems little doubt that the greatest problem GSA will be facing over the next few years will be that of finance. Perhaps some of you are not aware that your membership dues entitle you to benefits that go far beyond what those dues can support. The remainder either comes from revenue-generating activities, such as publications, meetings, and grants, or from judicious cultivation of the investment portfolios of the Society and of the GSA Foundation. All institutions fortunate enough to have investments obtain revenue from their investment portfolio and as a working rule typically spend less than 5 percent of the total portfolio each year. Experience has shown that if expenditures do not rise above 5 percent, given the overall growth in capital markets, the value of a portfolio will increase in the long run at a rate that is above that of inflation. Of course, there are bad periods, such as the one that we are going through now, but growth during good periods more than offsets the downturns and enables a steady revenue to be enjoyed each year without punishing the portfolio unduly.

The problem is that since 1988, GSA (I'm referring to the Society, not the Foundation) has been spending more than 7 percent each year. This has been done in the support of very good causes and in response to the wishes of the membership. Examples of important initiatives GSA has helped support during this period include the *Decade of North American Geology* volumes, outreach programs, and the GSA research grants program.

The result of the enthusiastic support of initiatives like these has been that the portfolio has not grown sufficiently to be well insulated from downturns in the market. The period from 1992 to 2000 is a particularly clear example; market growth was so strong and constant that the portfolio continued to grow in a pleasing manner despite overspending. In contrast, the decrease in the market over the last two years, particularly during 2001, leaves us in a very difficult position. We have cut expenditures to the bone, but we have a wonderful series of programs, a magnificent headquarters staff to administer them, and a profile within the earth science community that no one wants to see diminished.

This then is the challenge that we—me, as your president; John, as your treasurer; your Council; and above all, Jack Hess—have to face. Under Sharon's guidance, last year's Council approved procedural changes in budgeting and financial control that should bring things under control in time. Essentially, Council required that over the next 12 years, there will be a progressive decrease of 0.5 percent each year in GSA's reliance on its investment income for the operational budget. This will be accomplished by effecting economies in our present operations and emphasizing the revenue-generating potential of our programs and projects. Twelve years from now, no operating income should be derived from the portfolio, which will then be used to fund important new initiatives. It is an unfortunate fact that spending limits mandated by previous Councils were not fully enforced. During the next few years, things MUST be different. We MUST bring our budget into line. We MUST stop the erosion of our investment portfolio.

I wish that my first message to you could be a more positive one—that I could have emphasized new programs and projects or positive modifications to old programs and projects. Many such aspects are on stream and others I will tell you about in future messages, but all are constrained by our need to reduce expenses and raise revenue, and I felt it essential to let you know now where we stand.

During this time, we look to you for understanding and for support, particularly in the areas of education, outreach, and public policy. Your support can take many forms, and I would refer you in particular to Sharon Mosher's Presidential Address that also appears in this issue. Clearly, until new revenue-generating activities have developed their full potential, we will have a tough time over the short term in continuing to provide you with the services that have been paid for in the past largely out of investment income. Be assured that all of us on Council and at headquarters will be working to the utmost of our abilities to resolve these issues.

Boston 2001:

A GEO-ODYSSEY

Boston 2001: A Geo-Odyssey was a great success. Meeting attendees enjoyed the city's famous restaurants, surprisingly good weather (a few spring-like, 60° days saw folks wearing shorts), and technical sessions and Pardee Keynote Symposia filled with cutting-edge science. Short courses and field trips went off without a hitch, and group and private alumni parties kept everyone hopping, staff and alumni alike.

Boston's Hynes Convention Center, site of the technical sessions and Exhibit Hall, provided a spacious and convenient meeting venue. For the first time, GSA provided PowerPoint-equipped laptop computers and LCD projectors in each technical session room. With the exception of a few inevitable technical glitches, the systems proved a success, and GSA hopes to continue the practice, providing funds are available.

One attendee seemed more interested in the floors than in the rooms in an only-at-GSA meeting moment. "These rocks are my Ph.D. rocks!" exclaimed GSA member Roger Suthren, who traveled from Oxford, U.K., to attend the meeting. Apparently, some of the Hynes flooring is made of Ordovician Borrowdale volcanic rocks from the U.K.'s Lake District.

During the business side of the meeting, GSA Council welcomed a new president, Tony Naldrett, vice-president, Clark Burchfiel, treasurer, John Costa, and four councilors (2002–2004), Ronald Clowes, David Fountain, Richard Gray, and Judith Totman Parrish. GSA Divisions and Associated Societies held their business meetings at the Hynes Convention Center and the Sheraton to round off the week.

2001 GSA President Sharon Mosher, right, presents Carrie E. Schweitzer with her honorable mention certificate for the Doris M. Curtis Memorial Fund for Women in Science Award, sponsored by Subaru of America, Inc.

"That's right, I'm freeeeeee," David Dunn seems to be telling Gail Ashley. Dunn retired as GSA's treasurer after serving nine years in that position. See page 34 for more on Dunn's service to GSA.

The glittering new cars parked at the booth of Subaru of America, Inc., title sponsor of the meeting, drew crowds.

Dave Stephenson talks with members at the Science and Outreach booth.

The Structural Geology and Tectonics Division honored William Dunlap, Greg Hirth, and Christian Teyssier with Best Paper Awards.

GSA Annual Meeting and Exposition

November 1–10, 2001

The Geology in Government Mentor Program was once again a success, with more than 325 students gathering for lunch and a discussion with representatives from the Association of American State Geologists, the National Park Service, the U.S. Forest Service, the U.S. Geological Survey, and the American Geological Institute.

Robert H. Dott Jr., left, winner of the 2001 Laurence L. Sloss Award (see p. 31), with Sedimentary Geology Division Past Chair Raymond V. Ingersoll.

Cecile Bromery, Bill Bromery, and Pat El-Baz at the always-well-attended Senior Fellows Reception, hosted by the GSA Foundation.

Engineering Geology Division officers. Secretary William C. Haneberg, second from right, seems to want to keep an eye on Past Chair Duane Eversoll. Probably a good idea. Others, from left, are Member-at-Large Robert H. Fakundiny, Chair Terry R. West, and Vice-Chair Judy Ehlen.

Boston, Massachusetts

Poster sessions, a main feature of the technical program, allow plenty of opportunity for discussion.

2001 Meeting Statistics

Abstracts submitted 2,772
Total number of technical sessions (including posters): 188
Total attendance: 5,321
Short courses and field trips: 25
Number of exhibit booths: 207
Number of exhibiting companies: 148

Employment Service

Number of interviews scheduled: 437
Number of applicants on-site: . . . . .160+
Number of employers using the on-site service: 40
Positions advertised included 43 in academics as well as many in consulting and petroleum.

2001 Medals and Awards

Kenneth Jinghwa Hsu

Penrose Medal

Presented to Kenneth Jinghwa Hsu

Citation by A.M. Celâl Şengör

When R.A.F. Penrose drew up the terms of his endowment for a medal to be awarded by our Society on May 17, 1926, he indicated his sole object in making the donation to be "to encourage original work in purely scientific geology." It was to be awarded for distinguished achievement in geology—terrestrial and extraterrestrial—because "The idea of the medal is to show the gradual extension of the study of geology to the Moon, and possibly to other planets." One would almost think that Penrose must have had a presentiment that one day his medal would have to be given to a certain Kenneth Jinghwa Hsu, then as yet unborn!

Ken was to greet the light of day in 1929 in a troubled part of the world. His destiny was to take him away from his fatherland right across the face of the globe on a path of glory that has led him since to become one of the greatest masters of our science.

The only son of an harmonious family with a loving mother and a stern, but equally loving father, Ken grew up in an intellectual family environment and received an excellent education in his native China. He came to this country to pursue his postgraduate studies. After graduation, Ken had the great good fortune to become a member in that legendary research team headed by King Hubbert at the Shell labs in Houston, where he became involved in research in sedimentology and the tectonics of sedimentary basins. Early on, Ken showed a rare ability to diversify into various branches of geology and to tackle problems, the solution of which required an eye for the detail and a mind for the whole. His work on the origin of sedimentary basins by crustal thinning in the late 1950s presaged the influential 1978 McKenzie model and introduced a quantitative element combined with sound geological reasoning into a field until then dominated by the nebulous geosynclinal theory.

A great misfortune befell Ken in 1964. He lost his wife Ruth (whom he had married in 1958) in an automobile accident. She was a native Swiss and had always wanted to bring up their three children in Switzerland. Fulfilling her wishes, Ken accepted an invitation from the Swiss Federal Institute of Technology in Zurich to found a chair of experimental geology in its world famous Geological Institute.

The institute into which Ken was invited was already a great locus of Alpine geology, at the time headed by the veteran Himalayan geologist Augusto Gansser. Rudolf Trümpy was the stratigrapher and Ken succeeded to the chair vacated by that many-sided, famous flysch micropalaeontologist Wolfgang Leupold. However, the work of the Zurich Institute was highly focused on the Alps. Faculty members occasionally went to the Himalayas and paleontologists had been called upon to describe fossils from such far away areas as Greenland. An illustrious tradition weighed heavily, and new ideas on modern geology—eventually to culminate in modern sedimentology and in the theory of plate tectonics—were viewed with the distrust of a long-established orthodoxy.

Ken's arrival at the Swiss Federal Institute of Technology (ETH) in Zurich brought a welcome breeze of fresh air of geological novelties to the institute. He introduced new viewpoints into old problems of Alpine geology. He tackled the carbonate and flysch sedimentation on the basis of comparisons with present-day examples. This work took him and his students from the sun-scorched sabkhas of the Persian Gulf, through the storm-ridden waters of the Atlantic aboard the *Glomar Challenger*, to the silver-clad peaks of the Alps.

ETH was transformed, in the interval of only a few years, into a world center of geological research in fields ranging from isotope geochemistry to experimental sedimentology, through limnology and Quaternary geology to rock mechanics, through structural geology to large-scale tectonics. However, Ken's involvement rapidly overflowed the boundaries of the ETH. His contributions to the JOIDES almost from the inception of the program, both as shipboard sedimentologist and co-chief, won it many glories.

Ken's greatest contributions—like all great intellectual breakthroughs in science—are what now seem to us very simple ideas. His investigation of the K-T boundary event is a fine case in point. He not only introduced a novel element into it (the cyanide argument, which, Ken's good friend Peter Wyllie pointed out to me, had been published some weeks before the Alvarez et al. 1980 *Science* paper—another Ken "first idea," as Peter put it), but treated it as a demonstration of the place of the rare event in the Huttonian-Lyellian uniformitarian view and the role and the sensitivity of the ocean chemistry on the evolution of life—in a sense resuscitating the ideas of Georges Cuvier and Eduard Suess against the "quetism" of Lyell.

Since 1977, Ken has been involved in the tectonics of his homeland. As a fellow traveler, I witnessed the way in which he completely transformed the discussions on the tectonics of South China, Inner Mongolia and Tibet by pointing out that the Palaeozoic and Mesozoic orogenic belts making up these regions had their present-day analogues in the Malay-Indonesian Archipelago and in the festooned magmatic islands and enclosed marginal basins of western Pacific. Ken boldly postulated that the Tarim and the Junggar are the last remnants of the Palaeozoic back-arc basins.

However, in China it was the teacher that shined even more brilliantly than the field investigator and tectonic theoretician. Ken repeatedly toured his long-isolated fatherland, lectured to its young geologists, taught them that there was no higher authority than the individual's own reason and powers of observation. He tore down the idols and pitilessly exposed the stifling old establishment. He pleaded for boldness in hypothesizing and mercilessness in testing the bold hypotheses. "Newton could not have been a Chinaman," he exclaimed, "for our culture lacks critical rationalism! Let us educate our young in its tenets from now on!" He carried young Chinese researchers by the dozen to his institute or sent them to the institutes of his friends the world over with a view to pulling the sleeping giant into the modern world of science. He arranged whole libraries to be shipped to China and he used his own modest means to promote many a promising youth.

I cannot here exhaust Ken's scientific and humanistic achievements, however much I overstep the bounds of the space allotted to me. They are legion. I even did not have time to touch on him as a teacher in general. He not only trained scores of highly successful undergraduate and postgraduate students but bequeathed to us all a series of wonderful and provocative textbooks, believing, as the great Russian orientalist Vassily Barthold did, it was unfair to hand students unpublished notes that are not open to the criticism of the scientific community!

I must sum up by noting with gratitude that Ken has kept the torch alight to illuminate the grand questions of geology in an age of ever-narrowing specialization and ever-isolated problems. He has told us to have confidence in human reason. He has repeatedly stressed the oneness of our planet and its environment and all his life combatted narrow-minded specialization. He reached out to the public by dedicating his valuable time to writing a number of delightful books addressed to the man in the street to introduce novel scientific ideas (the Messinian salinity crisis, Dinosaurian extinction, climate change), to present great scientific programmes largely paid for by tax money (such as the deep-sea drilling) and to resuscitate the great spirit of the Enlightenment by pumping the public opinion with the assurance and the enthusiasm of a great scientist.

The name of Ken Hsu will forever be a brilliant ornament in the annals of our Society, dedicated since more than a century ago to scientific excellence and to the siblinghood of all geologists. Both as a great scientist and as a great human being—kind, generous and compassionate—Ken is a man capable of great love and devotion, of sincere comradery and loyalty. A true citizen of the world, his life work is one of the tallest monuments to human achievement in our century.

Response by Kenneth Jinghwa Hsu

In December 1937, my mother and we children were waiting for the news of my father after the Nanking massacre. He had to stay behind while we moved to the wartime capital Chungking. Mother took out the letters she received from our father during the 1920s when he was a student in the United States. On top of the bundle was a postcard showing the administrative building of the State University of Iowa. No words were exchanged. She expected that I was going to study overseas after finishing college in China, and I did not disappoint her.

In the spring of 1952, when the Korean War was raging, the president of the United States issued an executive order that we Chinese scientists in America could not leave the country. I was finishing my Ph.D. dissertation, and the order necessitated that I sought employment in the United States. Not being a citizen, I was not eligible for employment by the government. Being an alien, I applied in vain for teaching at a university. I was told that I should not have tried because no students could understand English with a Chinese accent. Being a person of an Asiatic race, I could not find a job in an oil company either. Those were the days before the Equal Opportunity Act, and I was always told that there was no position for a person with my qualifications.

Finally, my adviser, Cordell Durrell, suggested that I should not turn in my thesis so that I could maintain the status of a graduate student and continue to work as a teaching assistant. He also got me a research grant to map the basement rocks of the San Bernardino Mountains. I spent six months in the field. When snow fell in November, I sought and found refuge in a cabin of the San Bernardino National Forest. Being a careless young man, I accidentally set the place on fire and lost all my possessions, including all my maps. I was down and out. I thought of quitting geology to write fiction, while earning a living as a dishwasher. A miracle happened: Leo Newfarmer found a job for me as a trainee in the Shell Development Company in Houston, Texas. I became a professional geologist.

In the autumn of 1964, my first wife, Ruth, who had always been homesick for Switzerland, died in an automobile accident in the United States. I was determined that I was to bring up our children in Switzerland, but geology jobs were scarce in that country. I made plans to open a Chinese laundry there when another miracle happened. Rudolf Trümpy wrote me that a new professorship had been set up at the geology department of the Swiss Federal Institute of Technology in Zurich, and the job was mine if I wanted it. I wanted the job, and I continued my career as a professional geologist.

In early summer this year, I went to Taiwan to sign a big contract for a feasibility study on installing an integrated hydrologic circuit, one of my inventions in water-technology. My invention could provide 1.6 million tons of water daily to Metropolitan Kaohsiung, and my plan, if accepted, would have made it unnecessary to construct a 142-m-high dam. I thought I was on my way to becoming a Bill Gates. Arriving at the Taipeh Airport, I was handed two faxes: one confirming that the president of the Republic was to receive me in congratulation, the other from one of his ministers telling me that the contract was to be canceled because of a government reorganization. I was devastated. Having invested eight years of effort and practically all of my savings, that disappointment was the straw that broke the camel's back. Then I received a letter from GSA notifying me of the Penrose Award. I was encouraged that I had done useful work as a professional geologist.

Each of these incidents taught me something. I was taught to love my fellow people in 1953. I was taught to love God in 1964. I was taught humility in 2001. I am grateful to my colleagues, and this most recent peer recognition has been as meaningful to me as the two miracles of a distant past.

The citationist has been kind in paying tribute to me. In fact, I feel like a conductor waving his batons to a well-drilled orchestra. I could not fiddle; I could not blow a trumpet or beat a drum. Yet beautiful music came out, in spite of me, while I was getting all the credits. I would have liked to express my gratitude to all those who have shaped my career, but there are too many. I shall mention in passing only a few deceased persons who have been most important in my life: Dave Griggs, who trained me in precision in thinking; Cordell Durrell, who enlightened me with kindness; King Hubbert, who taught me geology as a science of physical process; Jim Gilluly, who gave me self-confidence; Eric Simpson, who opened the door for me to science politics; Zhu Xia, who, alone among Chinese geologists, was not outraged by my hypothesis on "Huanan Alps"; and Kerry Kelts, my first student in Zurich, who helped and inspired me.

My childish ambition was to be a famous physicist and to get the Nobel Prize. It was fortunate that my father knew better what was good for me: He forced me against my will to be a student of geology. I now know what a wonderful choice he made for me: Geology is a most creative science.

I shall conclude my speech with an expression of deepest gratitude and appreciation to a living person: my wife Christine. She married me in 1966 when I was a wreck after the car accident that killed

Ruth. Christine helped me bring up my children, Elisabeth, Martin, and Andrew, and our child, Peter. She had to hold the fort when I was a global trotter. (Since 1970, I have spent more than 150 days a year away from Zurich.) Without her help, I would not be standing here.

Thank you, ladies and gentlemen, I am proud to receive the Penrose Award of the GSA.

Richard J. O'Connell

Arthur L. Day Medal

Presented to Richard J. O'Connell

Citation by Jerry X. Mitrovica

Identifying distinct stages in the evolution of any field, whether in the arts or in the sciences, is a subjective exercise, particularly in the absence of historical perspective. However, few geophysicists or geologists would disagree that the Theory of Plate Tectonics marks the modern age in earth sciences. In this case, Richard J. O'Connell is a giant of postmodern geophysics.

Rick's career has been characterized by fundamental contributions that lie at the interface of geophysics, geochemistry, and geology. His work has profoundly influenced our understanding of plate tectonic processes, plumes and hotspot tracks, mantle dynamics, postglacial rebound, sedimentary basin formation, and the properties of composite materials. This influence is enduring, and it is based on a remarkably broad body of work distinguished by innovation, rigor, and clarity. Furthermore, he has been a forceful advocate of a philosophy geophysicists ignore at their peril; namely, that even the most sophisticated geophysical models (and modelers!) must recognize the primacy of the geological record.

There are a number of first-rate numerical modelers within the geophysics community and a number of impressive feats of numerical simulation. However, very few, if any, geophysicists match Rick's insight into the often-subtle connections that exist between convective flow in the mantle and Earth's large-scale surface features. His influence is clearly evident in the work of generations of global geodynamicists, including those under his direct supervision, their "offspring" and many others. Indeed, in global geophysics, there appear to be only a few degrees of separation from Rick.

The ambitious scope of Rick's work began to take shape while he was a graduate student at Caltech. Working under the supervision of Gerry Wasserburg, Rick decided that he would explain the origin of intracratonic sedimentary basins. Confidence was apparently not a problem for graduate students in the late 1960s—at least at Caltech—and that, as it turned out, was a good thing. Rick was among the first to argue that these ubiquitous features of the geological record arose from loading induced by a crustal phase transformation. These ideas continue to play a central role within a debate that appears to have persisted, unabated, to the present day.

In his early career, Rick also authored a series of papers dealing with the inference of mantle viscosity using surface observables linked to postglacial rebound. He demonstrated that the lower mantle is not rigid, as had been proposed by others, but that it has a viscosity low enough to permit flow. This view of a dynamic lower mantle has had an enormous impact on all aspects of global geodynamics and it remains a standard pillar of modern geophysical research. The postglacial rebound literature has evolved considerably over the past few decades, but the dozens of papers dealing with mantle viscosity have provided little insight beyond Rick's early contributions.

During this phase of his career, Rick extended his thesis work to consider the influence of crustal and upper mantle phase boundaries on postglacial adjustments. He tackled problems related to the excitation of Earth rotation by earthquakes, the elastic and viscoelastic properties of cracked and porous materials, and the nature and distribution of partial melt within the upper mantle. In these cases, historical perspective is possible, and it reveals a body of pioneering work that has motivated a swarm of subsequent geophysical activity.

In the post–plate tectonics world, one of the central efforts in geophysics has been to elucidate the nature of the driving force responsible for plate motions. Rick's work on this problem elevates his contribution to geophysics from impressive to great. Collaborations with students, notably Brad Hager, Shimon Wdowinski, Carl Gable, and Winston Tao, and colleagues such as Philip England, led to a series of major advances. For example, he demonstrated that density contrasts in plates and slabs can drive surface plate motions in the case of "weak" plate-boundary faults; he was the first to recognize and model the equipartitioning of poloidal and toroidal energy in plate motions; he argued that the dip angles of subduction zones, as deduced by a variety of geophysical and geological methods, implied that upper mantle flow penetrated into the lower mantle; he extended the conventional view of one-sided plate subduction to include the possibility of "ablative" subduction in order to reconcile the geological and geophysical record within a spectrum of subduction environments; and, he pioneered calculations of three-dimensional mantle flow.

As if to balance his work on subduction dynamics, Rick has also made a series of significant contributions to the study of ascending mantle plumes. By modeling the interaction of plumes with mantle-wide flow, Rick and a graduate student, Bernhard Steinberger, provided plausible explanations for features ranging from the distribution of plumes and hotspot tracks relative to ridges and subduction zones to the enigmatic bend in the Hawaiian-Emperor seamount chain. The culmination of this work emerged recently, and it has provided no less than a new paradigm for mantle structure and dynamics. Observational constraints on mantle processes have been characterized by a series of apparent inconsistencies. Geochemical evidence suggests that the lower mantle is an isolated reservoir of primordial material, yet seismic tomography clearly indicates an active flux of material from upper to lower mantle. Furthermore, the stability of hotspots suggests a sluggish deep mantle, while a variety of geological and geophysical observations suggest a more dynamic evolution for the planet. Working with students Michael Manga, Thorsten Becker, and Jamie Kellogg, Rick has proposed a model of mantle dynamics that reconciles these inconsistencies. According to their work, long-lived and segregated blobs of chemically distinct (primordial) material reside within a high-viscosity lower mantle. This blob model is widely credited with opening the way toward a unified view of Earth.

An important Massachusetts politician once said "all politics is local." In this spirit of generalization, I might also say that all citations are personal. This one is no exception. I met Rick about a decade ago, and have benefited immeasurably from his advice, encouragement, and insight. He is a generous colleague, a patient mentor and a close personal friend.

Rick's achievements have placed him at the forefront of geophysical research for three decades, and his career has been distinguished by seminal contributions to our understanding of geological processes through application of geophysical methods. He is an impeccable choice for the Day Medal of the GSA and a truly worthy addition to the impressive list of past recipients.

Response by Richard J. O'Connell

I am honored to receive the Arthur L. Day Medal. Understanding how Earth works is an unusually rewarding application of physics and chemistry, and I am pleased that the award recognizes this. In fact, physics and chemistry are so essential to the solution of geologic problems that many, if not most, geologists are geochemists, geophysicists, geobiologists, or geoengineers. Nevertheless, I realize that in some circumstances, you still have to be careful what you call someone. In reading the description of the award, I also note that it was Day's intent to inspire further effort—I like to think this means that the committee hopes that I might yet amount to something.

My interest in Earth was inspired by my upbringing. I grew up in Montana, where I was surrounded by magnificent landscapes and abundant evidence of geologic processes. My grandfather was a copper miner from Ireland who found his way to hard-rock gold mines in Montana, and my father was a rancher who was still developing a patented gold claim in his spare time when he was in his 80s. However, my interests were initially in math and physics; at that time exposure to earth science in school came from looking out the window. With my parents' encouragement, I went to Caltech to study physics. There I was exposed to Bob Sharp's enthusiasm about geology and Jerry Wasserburg's combination of a mineralogy lab with lectures on the physics of minerals. For relief during summers in Montana, I herded cattle near a thick sequence of red shales from the Belt series and near Cretaceous volcanics. This whetted my interest in how it all worked. As a result I went to graduate school in geophysics, again at Caltech.

In graduate school, I worked on a couple of geodynamic problems, although they were not called that then. Jerry Wasserburg suggested that I work on a model of sedimentary basin formation. I saw the connection to the shales in Montana, and I was intrigued. Also, it seemed a good idea to do what my advisor suggested. It was a good problem, and we got results that showed that a basalt-eclogite transition could indeed account for cycles of subsidence followed by uplift. However, it was becoming clear that the Moho was not a basalt-eclogite transition, and that the model really wasn't applicable. Nevertheless, learning how to construct and analyze a model that allowed quantitative comparisons with the geologic record was important, as was learning to abandon it. I also learned that just because a model—even a good one—can reproduce some observations doesn't mean that it describes how Earth works.

Jerry went on sabbatical, and while I was unsupervised, I started work on a model of postglacial rebound. The importance of mantle flow and convection was becoming more clear at that time, and although Caltech was not exactly a hotbed of new global tectonics, Jerry and Don Anderson did not inspire modesty in approaching an important problem. I completed what I thought was a pretty good model indicating that mantle viscosity did not increase drastically with depth. That was counter to conventional wisdom at the time, and *Science* promptly rejected the paper.

By the time I went to Harvard, the advent of plate tectonics had illuminated many avenues for gaining new understanding of how Earth worked. I was inspired by Dan McKenzie's clear analyses of plate-tectonic processes as well as by frequent warnings from my geological colleagues about what was not explained by plate tectonics. I learned a lot from many inspiring colleagues in geology, materials science, and mechanics at Harvard and down the river at MIT. I have had excellent students, starting with Brad Hager. They share this award, for the flow of ideas and inspiration has been in both directions.

During much of this work, my wife, Susan, has made my life unusually enjoyable, and she gave me the chance to appreciate the geology of Maine from the waterside. Throughout my career, my son, Brian, has provided perspective and reminded me of what is really important in life. And my stepdaughter, Lily, has given me new perspectives and even shared my commute to work.

I was fortunate to start my career at a time full of opportunities for working on important problems that could be attacked with relatively simple models. Those opportunities continue and have been widened by new observations and new analytical and computational tools. GPS measurements allow us to see the earthquake cycle of deformation, and even continuous tectonic motions. Seismic tomography gives us images of convection in the mantle. Desktop workstations let us put it together. However, we still need simple models that allow us to understand the basic problems. Good models—not mere cartoons of a sequence of presumed events—will predict observations and relationships we didn't think of before and will lead to new insights. Bad models—simulations—will only reproduce what we put into them. But to do this sort of work, we need adequate funding for younger people with new ideas and funding for postdocs independent of large programs. This takes enlightened program directors who can recognize likely avenues for new advances and fund them. The growth of NSF-funded GPS is a good example of this.

Even as old problems are settled, such as whether slabs penetrate into the lower mantle, new ones, such as layers at the very base of the mantle, arise. And there are still a number of old problems that remain. However, the formation of sedimentary basins is not among them. Jerry Mitrovica and Mike Gurnis dealt with that. It seems that Jerry has also cleaned up the problem of postglacial rebound. So, I guess I'd better get started on the further effort that Arthur Day meant to inspire before they, and their colleagues and students, clean up the rest of the good problems.

A. Hope Jahren

Young Scientist Award (Donath Medal)

Presented to A. Hope Jahren

Citation by Ronald Amundson

In his *Autobiography*, the elderly Charles Darwin recalled his reaction, as a young naturalist engaged on the voyage of the *Beagle*, to the news that his letters were being read before the Philosophical Society of Cambridge and that he was to "take a place among leading scientific men." "After reading this letter I clambered over the mountains of Ascention with a bounding step, and made the volcanic rocks resound under my geological hammer!" The Donath Medal is the Geological Society's opportunity to formally welcome and acknowledge some of the brightest of our young scientists, and to swing a figurative rock hammer in celebration of their achievements.

It is my pleasure to provide the citation for Hope Jahren, the winner of this year's Donath Medal. It is an award that is richly deserved, resulting from years of exceedingly hard work, combined with an attention and aptitude for thoroughness, detail, and creativity. I am doubly pleased that Hope is this year's recipient of this award, for in addition to the deeply deserved recognition of her work, the award is being given to a young earth scientist in a decidedly interdisciplinary area of geology, one that is both timely and timeless.

Hope wandered into my lab in 1991, as I was putting the finishing touches on a vacuum extraction line, to inquire about what stable isotopes could do. To my surprise, my brief impromptu recitation on isotopes captured her attention, and thus began our long and fruitful collaboration. Hope has embarked on a career as a stable isotope geochemist who is largely concerned with developing, and applying, new biologically derived isotopic proxies of paleoenvironmental conditions. Her doctoral research on the isotopic composition of hackberry endocarps, the biomineralized "pits" of hackberry fruits, was a Herculean undertaking, involving time-series isotopic monitoring of widely spaced research sites in Colorado and South Dakota, detailed micromorphological studies, and long hours in the lab developing and testing methods of endocarp preparation and isotopic analyses. I doubt I will ever see again my lab and vacuum lines being run on a nearly 24-hour-a-day basis! Hope, with a bit of an assist by Yang Wang, now at Florida State University, developed hackberry endocarps into a "full service" climate indicator: one that provides both a powerful seasonal O isotope signal and a corresponding radiocarbon date. Hope's subsequent work on Cretaceous plant material has demonstrated the volatility of the atmosphere's CO_2 $\delta^{13}C$ signal and pointed to some important potential perturbations to the Cretaceous atmosphere. Her ongoing work at Johns Hopkins continues to push forward into an understanding of the past through the study of modern biochemically derived compounds.

Charles Lyell wrote that the study of present biological and inorganic processes constitutes "the alphabet and grammar of geology." Hope Jahren, more than most, has been an attentive student of this timeless principle, and has used her knowledge of these basics to develop, in the words of Martin Rudwick, her own "syntax of geology," one that will help formulate the prose of earth history for years to come. It has been my pleasure to watch and participate in this development and now to present her to you as this year's Donath Medal recipient.

Response by A. Hope Jahren

If the work I have done is good, it is by no means the result of my effort alone, but the culmination of the energies of several people who have cared about the science and about me. Jesús Gil de Lamadrid, my calculus professor at the University of Minnesota, was the first university academic to tell me that I might be capable of something special. He impressed upon me his standards of collegiality, which I try to live up to. He died in 1998, and like many others, I miss him. I learned to love geology at the University of Minnesota, and I am grateful for my happy years there. Chris Paola first introduced me to research journal articles and how to find neat stuff within; Mary Beck, Dawn Graber, and Jody Stroh were wonderful classmates—women who love life and love geology. Raymond Jeanloz at the University of California at Berkeley gave me my first opportunity to do real research, and although I wasn't cut out for the world of geophysics, his efforts to open that door to me is something that has made a great difference in my life, and something I never thanked him for adequately. Ron Amundson was my Ph.D. advisor at Berkeley, and he's someone that I can't say enough good things about. At the time, I didn't appreciate how annoying it must have been for him to deal with such an intense and stubborn graduate student, but it helped me grow into someone who knows the value of his patience and integrity. I am grateful to Nan Arens for teaching me so much about paleontology and plants in general, and I continue to admire her strength and skill. Oliver Chadwick, Andy Elby, Jim Kirchner, and Libby Stern were important sources of support and stimulation while I was at Berkeley. Sam Epstein and Leo Sternberg opened their labs to me and shared their love of instrumentation. I am grateful to Bill Schlesinger, Tim Bralower, Ben LePage, Keith Kvenvolden, Lisa Pratt, Greg Retallack, Sam Savin, Cathy Skinner, and Crayton Yapp for offering encouraging words about my research when I was getting started as a professor; their praise brightened moments in what were otherwise dark years. I thank the many talented students who have worked cheerfully in my lab, including Lori Cabena, Anne Jefferson, Emily Nielsten, Moses Rifkin, and Kristen Sanford. I am lucky to receive the warm and sincere regard of my colleagues at Johns Hopkins University, and hope I can become all the things they hope for me. I am most grateful to Bill Hagopian, my technician, who has been there since before the beginning. There is no one anywhere who is better at or more committed to his job, or whom I respect more as a scientist. Through sickness, ridiculousness, homelessness, and 43,000 miles of driving (enough for a "class A" trucker's license) we are doing better science than we were five years ago. Yet I know, with more effort, it can be better than it is now. The best is still to come.

GSA Public Service Award

Presented to G. Brent Dalrymple and Eugenie C. Scott

Citation by Mary Lou Zoback

GSA's Public Service Medal is awarded each year in honor of two dynamic scientists, Gene and Carolyn Shoemaker, whose scientific work and generosity in sharing it inspired and stimulated the public's curiosity about the universe around them. This year's award is shared by two similarly dynamic scientists, G. Brent Dalrymple and Eugenie C. Scott, both of whom have been highly effective in battling the inclusion of "creation science" and its various disguised forms within our public science-education curriculum. They also have been outstanding spokespersons for promoting the value of teaching evolution, the scientific evidence for the age of our Earth, and the concept of science as a way of knowing.

Brent and Genie are scientists trained in two rather different disciplines, geology and biological anthropology, respectively, but their special expertise and passion for public service drew them into the heavily charged national political debate about "creation science" and its role in our public school system. The nation was rocked in August 1999 when the Kansas Board of Education passed state science standards that were stripped of all mention of the Big Bang, the age of Earth, and any reference to organisms having descended with modification from common ancestors. However, this action was only one wellpublicized example of many similar struggles in educational boardrooms across the nation. Working largely independently but often speaking out from same stage, they have waged a war against pseudoscience and promoted a public understanding of the scientific method and the role of hypotheses and theories. They are leaders in the battle against those who, thwarted in the teaching of "creation science" by a Supreme Court decision, are now fighting for mandates which would require that evidence against evolution be taught along with evolution, or for textbook disclaimers (as in Oklahoma and Alabama) stating that "No one was present when life first appeared on Earth" (hence the theory of evolution cannot be taken seriously). No other science texts are subject to that level of proof!

I'm pleased to announce that, in support of the efforts of Genie and Brent and others like them, the GSA Council adopted last spring, on behalf of the entire society, a public statement underscoring the strong scientific foundation for evolution and the danger of treating religious dogma as pseudoscience. This statement, which is posted on GSA's Web site, can be utilized by our members, member societies, and sister societies as the official statement of 16,000 earth scientists on this topic.

Genie decided to leave an academic career in 1987 to become executive director of the National Center for Science Education (NCSE) in Oakland, California, a not-for-profit membership organization that works to improve the teaching of evolution and of science as a way of knowing. The NCSE has been outspoken in its opposition to the teaching of scientific creationism and other religiously based views in science classes. Genie herself has been in great demand as a spokesperson for this cause and has appeared on nearly every major national PBS program, on the Pat Buchanan radio show, and on the Christian Cable, as well as on popular TV news and discussion shows ranging from "Geraldo" to "Firing Line." She has received numerous awards for her efforts, including the Isaac Asimov Science Award from the American Humanist Association and the Hugh H. Hefner First Amendment Award from the Playboy Foundation. She is a member of the California Academy of Sciences and is president of the American Association of Physical Anthropologists.

Brent is a geochronologist who, throughout his career at the U.S. Geological Survey and then Oregon State University, has been involved in the development, improvement, and application of isotopic-dating techniques. It is no surprise that he is passionate about promoting an appreciation and understanding of the scientific evidence for the age of Earth: He has authored a book on that topic. In addition to his academic pursuits, Brent has been active in the creation vs. evolution debate for more than two decades. He served as an expert witness for the American Civil Liberties Union in an Arkansas creationism trial held in Federal District Court and in the Louisiana lawsuit which resulted in the U.S. Supreme Court banning, as unconstitutional, all "equal time for creationism" laws. Brent is a member of both the American Academy of Arts and Sciences and the National Academy of Sciences and is past-president of the American Geophysical Union.

G. Brent Dalrymple

Response by G. Brent Dalrymple

Thank you, Mary Lou, for your generous words. I'm delighted to have such a long-time friend and respected colleague as citationist. I am deeply appreciative and greatly honored to receive this award. It was a very pleasant surprise or, as Yoda might say, "Unexpected this was."

This award is even more special to me for two reasons. First, it is shared with Genie Scott. I have known Genie for two decades, and she is a good friend. Not only do we share the goal of protecting public science education from creationist mischief, but we have jointly appeared at more symposia than I care to think of and have even walked together in the footsteps of Charles Darwin on the Galapagos Islands. Second, this award is given in honor of Gene and Carolyn Shoemaker. Gene was a long-time USGS friend and colleague, and his and Carolyn's contributions to our science can only be described as monumental.

I became interested in the creationist threat to science education in 1979 when a California deputy attorney general asked if I would be willing to appear as an expert witness for the state. A lawsuit filed by a creationist family claimed that the California Science Curriculum Framework violated their constitutional rights by requiring that their son be taught evolution, geologic time, and other science subjects to which they objected on religious grounds. It seemed like it might be an interesting distraction, so I agreed. I have never regretted that decision.

During more than 20 years of involvement in this issue, including participation in one state and two federal court actions involving constitutional issues, I have had a lot of fun and the experiences have been uniformly positive.

A significant benefit is that my circle of friends, colleagues, and acquaintances has been broadened to include a large number of biologists and other scientists, but also philosophers, theologians, lawyers, sociologists, educators, and others. I have also gotten to know quite a few creationists, many of whom I genuinely like even though we will never see the universe in quite the same way. I've learned a lot from all of these people, and they have made my life immeasurably richer.

It was my involvement in the creation vs. evolution issue that motivated me to write a book explaining in detail the evidence for the age of Earth, a book that I otherwise would not have written and a task I found enjoyable and enlightening.

I am telling you about these benefits in the hope that those of you who are not presently lending your expertise to issues of societal importance will consider doing so. You have scientific knowledge that could inform a variety of important issues, and I urge you to pick one and devote some of your time to it. If your experience is anything like mine, it will not only be rewarding but will enhance your career in ways that will surprise and delight you.

Eugenie C. Scott

Response by Eugenie C. Scott

Every time I look out an airplane window, I wish I knew more about geology.

I look down on mountaintops and think of old men with deep creases down their cheeks, as erosion wrinkles attest to the accumulation and melting of snow and the inflexible rule that liquids will follow gravity. I pick out places farther down the slopes where disassembled former mountain tops have slowly, imperceptibly accumulated into smooth deposits, themselves sometimes further wrinkled by erosion, as water continues inexorably to seek the lowest place. The wrinkles on the steep upper slopes are businesslike, get-the-water-down-right-now, straight or nearly straight shots, sometimes quite deep. But among the sedimentary deposits towards the bottom, the lines become less compulsive, less deep, more like crow's-feet than deep wrinkles. Sometimes, the crow's-feet form beautiful, feathery tracings that branch and split in surprisingly regular patterns, almost like fractals. Maybe they *are* fractals. I don't yet know very much about geology.

But even the small amount of geology I do know extends the aesthetic pleasure of the view from the airplane window to an unmistakable recognition: The surface of our beautiful planet, while seemingly permanent, immutable, and immovable, is actually dynamic, active, and ceaselessly—if largely imperceptibly—ever changing. And the clearest impression from the view from the airplane is of indescribable, incomprehensible, age. Not for nothing does the image come to mind of *old* men with deep creases down their cheeks.

And then I think of creationist Ken Ham who cheerily challenges the scientifically accepted geological interpretation of Grand Canyon by saying, "Well, geologists say it was a small amount of water over a long period of time, I say it was a large amount of water over a small period of time," as he describes how Grand Canyon was cut in about two weeks time by the release of 3000 cubic miles of water from an impound in the Colorado Plateau left over from Noah's Flood. And the people in the audience nod sagely, as if this made good sense to them.

The planet is dynamic; evolution has taken place. The belief that Earth reached its present state in 10,000 years—absurd as it may seem—is accepted by close to half of the American public, if polls are to be believed. Equally disturbing is the fact that high percentages of Americans reject the concept that the diversity of living things on Earth is the result of descent with modification from common ancestors. Evolution is so basic to geology and biology—and so fascinating! What a shame that so many students are being denied the ability to study it!

My job is dealing with this unfortunate scientific confusion. At the National Center for Science Education, we try to help the public understand astronomical, geological, and biological evolution, and we try to help teachers, scientists, and concerned citizens keep this important subject in the science curriculum. Sometimes the problem is *getting* it into the curriculum, not keeping it there, as intimidated teachers shy away from mentioning the "e" word. It is especially distressing when the administrators, whose jobs it is to ensure sound science education, lean on teachers to drop or water down the teaching of evolution—to qualify it or disclaim it as "just a theory" that has "much evidence against it." Far too much of the time, teachers are left hanging on a limb, unsupported. Fortunately, scientists can and do support them, which is what NCSE is all about.

I am very grateful to GSA and geologists for their support for good science education. More than many scientific associations, GSA has taken seriously the issue of public school science education, and, through articles in its publications, and symposia and workshops at its annual meetings, has helped to educate its members that there are serious problems in the public understanding of one of the organizing principles of geology. Your members have gone to school board meetings to explain what science is all about, and written op-ed pieces and letters to editors and gone on talk radio programs to help our fellow citizens understand the immense amount of evidence for evolution.

I, and my staff at NCSE, have a lot of work to do. I am both reassured and proud that geologists and GSA are standing with us. Antievolutionism is a grassroots problem that must be dealt with by individuals willing to leave their classrooms and laboratories and reach out to the general public. As you thank and honor me with the 2001 Public Service Award, I in turn thank and honor you for *your* support.

Thank you, GSA. Those airplane trips are going to mean even more to me now.

Craig H. Jones

GSA Distinguished Service Award

Presented to Craig H. Jones

Citation by Bob Karlin, Sharon Mosher, Jane Selverstone, and Rob van der Voo

A member of the Annual Program Committee (APC) from 1998 to 2000, Craig Jones assumed the mantle of technical program chair for the 1999 Denver Annual Meeting at a critical time, when GSA's Annual Meeting was being changed from a symposia and thematic format to the Pardee and topical session format. Topical sessions were proposed with unusual formats and with large numbers of invited speakers. Many proposed Pardee Symposia had to be retooled to become topical sessions.

Craig was an exceptional technical program chair. He was extremely organized and enthusiastic, he was creative in finding solutions to apparent conflicts, and he cut right to the point when handling thorny issues. Craig was a wizard at managing the evolving electronic program, keeping a keen eye on overall program balance, and scheduling sessions to avoid the most conflict and to make moving between sessions easy. He responded to fellow committee members' queries quickly, and at least one convener mentioned giving him a hero cape.

An effective and active leader on the APC as well, Craig contributed many ideas on ways to have a better program, and he was a tremendous help in working out the technological aspects of the proposal review system.

Craig's dedication and hard work would set a standard for service in any organization. His contributions at a critical juncture in GSA history have been fundamental in helping to make GSA into an active, vital organization that is responsive to its members and capable of changing to meet the needs of the future.

Response by Craig H. Jones

I am honored to be receiving this award, but must really accept it on behalf of a larger group of people. My task as technical program chair was only a part of a large effort by many volunteers and staff to make the meeting possible. It is an odd job, being part traffic cop, part cheerleader, and part mediator. It was my good fortune to happen into the job, with no previous experience in making a technical program, just as GSA restructured the program to replace symposia and theme sessions with the Pardee Keynote Symposia and topical sessions. My ignorance made change easy, at least for me! I am grateful to the many people who helped me learn what I needed to make the technical program.

The new program structure proved successful in Denver because of the tremendous effort that members of the APC made prior to my involvement. APC members had met with nearly every group associated with the technical program, and they pondered the changes necessary to make the program more vital. Their hard work provided a clear road map for me to implement for the Denver meeting.

The groundwork of previous technical program chairs—especially that of John Bartley, who pioneered the electronic system we used in 1999—also made things easy, made a clear set of guidelines for assembling a program, and provided timely advice that kept us on track.

Many others who worked on the nuts and bolts of the 1999 program share this honor as well: the Joint Technical Program Committee representatives who scheduled everything in a few days, my co-chair Lang Farmer, who shared in the work and loss of summer time, and past Distinguished Service Award–winner Sue Beggs, who came out of semiretirement to push things along at crunch time. Sharon Mosher repeatedly stepped beyond her 1999 role as APC Chair to do some needed tasks and provide near-instant feedback on various decisions and problems.

It is gratifying to know that we helped make major change to one of the crown jewels of GSA succeed. I hope that the improvements first made in Denver continue to keep the annual GSA meeting a dynamic and open program. The structure now in place provides, I think, the best possible potential for a scientific meeting of its size.


Bruce G. Gladfelter

Rip Rapp Archaeological Geology Award

Presented to Bruce G. Gladfelter

Citation by Curtis E. Larsen

Bruce Gladfelter is one of the pioneers in geoarchaeology, or archaeological geology. Those of us who became interested in geoarchaeology, in the 1960s and 1970s (when Quaternary, let alone Holocene, were bad words in geology departments) were drawn to Karl Butzer's first edition of *Environment and Archaeology* when it appeared in 1964. Bruce was a student in the geography department at the University of Wisconsin while Karl was writing this book.

Bruce became Karl's first graduate student at Chicago in geomorphology and geoarchaeology. His doctoral dissertation, "Meseta and Campiña Landforms in Central Spain: A Geomorphology of the Alto Henares Basin," was published as a monograph in the Research Papers series of the university's Department of Geography in 1971. This was followed a few years later by his first work in geoarchaeology, which addressed the glacial stratigraphy of British Lower Paleolithic sites. His work focused on the deposits at Hoxne and their associated lithic artifacts.

Bruce went on to help define the role of the geomorphologist as archaeologist in his 1977 *American Antiquity* paper, "Geoarchaeology: The Geomorphologist and Archaeology," and again in 1981 with "Developments and Directions in Geoarchaeology," which appeared in Michael Schiffer's edited volume, *Advances in Archaeological Method and Theory*. I consider his 1985 paper, "On the Interpretation of Archaeological Sites in Alluvial Settings" in Julie Stein and Bill Farrand's co-edited book, *Archaeological Sediments in Context*, to be a significant contribution. Bruce forcefully introduced the concepts of sediment storage and geomorphic process as a check on simplistic views of paleoclimate as the driving force behind the sediment sequences in alluvial archaeological sites.

In the 1970s, Bruce began a close collaboration with Jim Phillips at the University of Illinois at Chicago. Bruce worked with Jim in the major efforts at the American Bottom projects in and around Cahokia and again in the Sinai Peninsula in the 1980s. He helped integrate a program in geoarchaeology into the master's degree curriculum in anthropology at the university. In addition, through his cooperative efforts with Jim Phillips and Bob Hall, he has helped to incorporate geomorphology and geoarchaeology into cultural resources management work at the University of Illinois. More recently, Bruce's work on the Sinai is appearing after his academic tenure as an administrator during a turbulent time of departmental reorganization at his university. His 1990 and 1992 papers on the geomorphic settings for upper paleolithic sites in the Wadi el-Sheikh and Wadi Feiran are good examples.

In preparation for this nomination, I consulted several of Bruce's contemporaries about his work. In one of the responses, I received the following: "I have worked in the field with a number of well-known and accomplished North American and foreign geomorphologists, including Vance Haynes, Karl Butzer, Bill Farrand, and Fekri Hassan. Bruce Gladfelter is, without question, not only in their league, but in some ways he has surpassed them in his wonderful eye for landscape and inclusive knowledge of geomorphological process." It is within this same spirit that I proudly nominate Bruce for this award.

Response by Bruce G. Gladfelter

I had no idea in 1977, the year the Archaeological Geology Division was established, that a paper I published in *American Antiquity* about geomorphology and geoarchaeology would lead me here today. I suspect that I had no idea where I was going at all. I did know, however, that the aspects of geography and geomorphology with which I was fascinated should be of obvious interest to archaeologists, or at least *I* thought they should. Over subsequent years, I learned that the perspective I had and the things that interested me had not occurred to many archaeologists, or if they did, had not been pursued or applied by them. Much has changed since then.

Curt referred to my work in England, Illinois, and Sinai. In each of these cases, I was fortunate to be part of a larger, multidisciplinary archaeological project. The excavations of the Lower Paleolithic, Clactonian flake industry at the golf course at Clacton-on-Sea (1969–1970) were my introduction to geoarchaeology. That project was a springboard for a protracted excavation of the Acheulian at Hoxne, Suffolk, which is the type-site for the Hoxnian interglacial. Details of deposits burying the interglacial, lacustrine clay-mud were clarified and elaborated, and it was established that the Paleolithic material is in the Upper Sequence and not within the Hoxnian interglacial sensu stricto. Controversy endures, however, about the age of these deposits and their correlation with marine oxygen isotope stages, primarily because of the biases of palynologists and faunal specialists who are not in agreement with some of the chronostratigraphic data that have been developed at Hoxne.

My introduction to the Mississippi Valley was at Cahokia in the flood plain of the American Bottom (1976–1981), an appropriate name, because this is without doubt *the* most miserable place in which to work, at least in the summer. At that time, archaeologists were content to scrape the surface for Woodland and Mississippian sites; more deeply buried and possibly older occupations seemed not to be of interest, or worse, not thought to be preserved. The ages of the surface of the flood plain, the relict geomorphic features on it, and certain buried channels were established by extensive boring and trenching that allowed for sites to be placed in their respective, prehistoric hydrogeomorphic environment and for an appropriate assessment of the completeness of the diachronic pattern of settlement that has survived.

The excavations in southern Sinai (1982–1993) centered on the Ahmarian tradition of the Levantine Upper Paleolithic. The thick deposits in which the sites are found contain a succession of late Quaternary, marl sediments that is unmatched in Egypt or the Middle East. Publication of all of this information is not yet complete, but the sedimentary sequence ultimately may be shown to reveal abrupt, short-term episodes of climate change and to perhaps provide a terrestrial link between late Pleistocene events in the North Atlantic and the Indian Ocean.

Archaeologists are an inquisitive and stimulating bunch—an eclectic breed hungry for insights or answers that others might provide. At the same time, they are keen to protect their intellectual turf. But the interdisciplinary nature of geoarchaeology and of archaeological geology is still largely a one-way street: While archaeology benefits from the participation of the geoscientist, the geosciences have yet to fully embrace or appreciate the potential that can be realized from archaeological research.

I am keenly aware of the patience extended to me over the decades by archaeologists, field workers, and students who tolerated my interruptions, endured annoying queries and engaged my arguments. But we all share interests in the temporal and spatial variations of human activity and in the space it occupies, and without these interactions, I would have been unable to fulfill my objectives, and the archaeological research would not have been complete.

The Archaeological Geology Division does me great honor by this recognition, and I thank my colleagues for bestowing upon me this valued award.

E.B. Burwell, Jr., Award

Presented to Candace Jochim, David C. Noe, and William P. (Pat) Rogers

Citation by Vicki Cowart

"Geology that makes a difference" and "getting our message across where it counts" are familiar battle cries in our community today, particularly within state geological surveys. The mission of outreach and education is essential in engineering geology, as the success or failure of people living with geology depends on how well we communicate our information.

There is little question that the 2001 Burwell Award recipients—David Noe, Candace Jochim, and Pat Rogers—accomplished the mission. Over 125,000 copies of their *Guide to Swelling Soils for Colorado Homebuyers and Homeowners* have sold. This informative book is in the hands of homeowners, builders, and planners as well as geological and engineering consultants. Finally, all of the key players in the residential development and building industry can be reading from the same page.

Since the 1950s, waves of population growth have swept the Front Range piedmont of Colorado. Residential development expanded from alluvial sites to areas of horizontal bentonitic claystones. Gradually, engineering technologies were developed to minimize swelling soil damage *if* troublesome sites were recognized. Unfortunately, many developers and consultants did not use even minimal mitigation, resulting in tens of millions of dollars of annual damage. Losses became so large that warranty insurance obligations were often not met. Thousands of families lost virtually the entire value of their homes.

The situation worsened during the growth spurt of the 1980s. Residential development expanded onto foothill areas of steeply dipping Pierre Shale claystones, a geological environment with a new set of problems not amenable to the prevailing mitigation for swelling soils. The combination of insufficient mitigation for conventional problems and the intractable problems of steeply dipping claystone resulted in a problem so bad that the general public and local officials anticipated disastrous implications to the state's future growth and economy. People wanted answers.

Noe presented a model to explain the heaving process from his research on heaving bedrock in steeply dipping terrain. The Colorado Geological Survey (CGS) sponsored conferences and field trips to educate stakeholders and explore solutions. Other investigators contributed key information that led to radically different mitigation methods. The affected counties explored new development and building standards for designated geologic hazard areas.

During this time of creative flux, Noe and Rogers conceived and completed the book, building on Jochim's previous CGS publication. The professional community embraced the concept and contributed with case histories and reviews. CGS publication staff applied expert skills to create a visually appealing and effective presentation. The book immediately became a bestseller.

The book has profoundly and positively affected the standard of practice for geologists and engineers in the home building industry of Colorado. It also has a lasting effect for the general public. Colorado legislation requires that new homebuyers receive this book before they close the deal on the largest investment that many will ever make. The informed potential buyer may choose to back out as a result of what they learn. Most don't. Thus, this year's Burwell Award winner becomes, in effect, the owner's manual about how to successfully live with geology.

Candace Jochim

Response by Candace Jochim

I would like to thank GSA and the Engineering Geology Division for conferring the E.B. Burwell, Jr., Award upon Dave Noe, Pat Rogers, and me.

Over the years, I have had the good fortune to associate professionally with several recipients of this award. I have also used and admired the works of many other recipients. It is an unexpected honor to be included, if only for this one time, in their distinguished company.

The publication for which we are being honored, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners*, is just one of the many excellent publications that the CGS has produced over the last three decades. I am privileged to have had the opportunity to contribute to a few of those publications. The public's enthusiastic acceptance of our swelling soils publications over the past 20 years has been a source of great personal satisfaction. It is, however, especially gratifying to now be acknowledged by other geology professionals.

Again, thank you for this most unexpected and deeply appreciated honor.

David C. Noe

Response by David C. Noe

On behalf of my co-authors, Candace Jochim and William Pat Rogers, I thank the GSA and the Engineering Geology Division for recognizing our book, *A Guide to Swelling Soils for Colorado Homebuyers and Homeowners.*

In Colorado, swelling soils constitute the primary cause of geology-related damage to private property and public facilities. Many of the state's rapidly growing population areas occupy nearly flat ground underlain by expansive clay soils and claystone bedrock. Yet few Coloradans are aware of this natural hazard. For many newcomers, swelling soils are something completely new that didn't exist back home. There is also an image problem: Compared to earthquakes, volcanic eruptions, landslides, floods, tornadoes, and hurricanes, swelling soils are among the least temporally violent of natural hazards. They are the geologic-hazard equivalent of watching the grass grow! Whereas sudden disasters bring extensive media coverage and federal aid, swelling soils are a private hazard, a financial detriment endured by individual homeowners, homebuilders, and warranty insurers.

The CGS has been a leader in creating tools to deal with this destructive geologic hazard. In 1984, the CGS assisted the Colorado Legislature in drafting an innovative statute for disclosing swelling-soil hazards to buyers of new homes. This law calls for potential homebuyers to be furnished with a document that describes swelling soils and their attendant problems, construction methods used to address these problems, and suggestions for care and maintenance of homesites that are underlain by swelling soils. The CGS was instrumental in providing the earliest disclosure books used by homebuyers.

We began writing an updated disclosure book on swelling soils in 1995. Our goal was to create a document that would convey valuable information to homebuyers who are about to close on a new house. Assuming that most buyers actually purchase the house, the book also needed to serve as a longer-term reference for landscaping, water control, and damage awareness and prevention. The text benefited greatly from comments by 16 reviewers representing groups whose activities and livelihoods are affected by swelling soils (i.e., homebuilders, real estate brokers, warranty insurers, landscapers, engineers, geologists, and local-government planners and officials). It took nearly a year to incorporate all of their comments.

In the end, we had a book that reflects a consensus among different professional groups, contains easily read language and numerous illustrations, and satisfies the disclosure statutes. The book has flown off our shelves since its 1997 debut, being bought by the boxload by builders. It has become a geologic bestseller! More important, citizens throughout Colorado are using it to make informed decisions about swelling soils.

I would like to acknowledge my co-authors for giving the book its solid foundation and Larry Scott and Cheryl Brchan for its illustrations and design. Finally, I'd like to thank Vicki Cowart for her words today, and for her support of our efforts to provide geologic information to the general public.

William Pat Rogers

Response by William Pat Rogers

It is an honor for me to accept the E.B. Burwell, Jr., Award in the field of engineering geology from the Engineering Geology Division of GSA. This is the most treasured recognition of my 43 years as a practicing geologist. I am most grateful to GSA for selecting us to receive the award in this the first year of the third millennium. I am grateful to the CGS and our director, Vicki Cowart, for unflagging support for the research and preparation time that made the report possible. I also wish to express my sincere gratitude and admiration for the major contributions of co-authors David Noe and Candace Jochim and to Larry Scott of the CGS publication section for his responsive and insightful work with the authors in designing a visually appealing and readily understandable booklet for Colorado homeowners and home builders.

The greatest challenge for the geologist in public life today is to effectively communicate our best information and advice to the nonscientist citizens and to decision makers at all levels of government. To do this, our work must be both credible and understandable. Credibility is earned by consistently presenting objective, balanced, and well-reasoned information to our peers and the public in a variety of forums. Effective and credible communication also requires perspectives that are neither self-serving nor excessively micro-focused on peripheral details that tend to confuse rather than inform.

In preparing our award-winning booklet, *A Guide to Swelling Soils for Colorado Homeowners and Homebuyers*, we were determined to create a reference that would be scientifically sound but with language and graphics that would make it readily understandable to our Colorado homeowner and homebuilder clientele. We were pleased and somewhat surprised at the immediate and resounding success of the swelling soil guide. Sales of the booklet now exceed 125,000 and it is widely used by all sectors of the homeowner and home building community. We are convinced that the widespread availability and use of this up-to-date and easy-to-use information will save Colorado homeowners and taxpayers millions of dollars annually through better designed and built homes and public facilities.

Bradford H. Hager

George P. Woollard Award

Presented to Bradford H. Hager

Citation by Thomas H. Jordan

It is a distinct honor and personal pleasure for me to present the George P. Woollard Award to Bradford Hager of the Massachusetts Institute of Technology. My acquaintance with Brad began in the mid-1970s while he was still a graduate student working with his thesis advisor, Rick O'Connell, at Harvard University on various aspects of geodynamics. In the intervening quarter of a century, he has cut a very wide swath through many geophysical subjects, ranging from the gravity fields and internal dynamics of the terrestrial planets to GPS geodesy investigations of the surface deformations on our very active home planet, Earth.

Brad's very first scientific publication with Rick and Adam Dziewonski in 1977 presented one of the first tomographic images of the lower mantle, derived from *P*-wave traveltimes, and used this image to demonstrate a correlation between Earth's gravity field and lower-mantle heterogeneity. This led him and his student, Mark Richards, to formulate the first dynamical theory of the low-degree gravity field, a line of research that culminated in his classic 1985 paper in *Nature* (with R. Clayton, M. Richards, R. Comer, and A. Dziewonski) entitled, "Lower Mantle Heterogeneity, Dynamic Topography and the Geoid." His thesis work on how oceanic plate motions are driven by the forces of lithospheric thickening and subducting slabs put the hypotheses about plate driving forces formulated by D. Forsyth and S. Uyeda in 1975 on a firm dynamical footing and began a series of evermore sophisticated investigations of mantle dynamics. Among his latest and most interesting contributions was a *Science* paper in 1999 (with L. Kellogg and R. van der Hilst) on novel ideas about compositional stratification in the deep mantle that may reconcile a long-standing controversy between geochemists and geophysicists.

The Woollard Award is specifically given "in recognition of distinctive contributions to geology through the application of the principles and techniques of geophysics." In this regard, Brad's research has been exceptional. Very early on, he recognized the potential of space-geodetic methods to elucidate fundamental tectonic processes. In fact, my first collaboration with Brad was in 1985–1986, when he was a newly tenured professor at Caltech, on one of the first deployments of GPS receivers to survey tectonic motions in southern and central California. His work in this area has broadened to include other parts of the southwestern United States, as well as a good chunk of Asia comprising the Tien Shan Mountains and related geologic structures. In these studies, he has shown how precise measurements of rates of deformation can be combined with dynamical models to improve our understanding of the mechanics of deformation and faulting. Brad epitomizes the type of scientist the Woollard Award is meant to honor: a person who has pushed the field forward using sensibilities about Earth that are physics-based and geologically informed.

Response by Bradford H. Hager

Receiving the Woollard Award means a great deal to me. Many of its previous recipients have shaped my approach to science: Sei Uyeda and Don Forsyth, who demonstrated the power of the empirical approach; Frank Richter, who embodies reductionism, good taste, and the beauty of simple models; and Tom Jordan, who opened my reductionist eyes to the richness of complex geo-systems.

I am fortunate to work in a field where such a diversity of approaches is so rewarding. Mostly I am lucky to have been repeatedly in the right place at the right time, entrained in the revolution in our understanding of continental dynamics made possible by GPS. Early on, Roger Bilham, Stick Ware, and others recognized the potential of GPS and the need, given the $300,000 cost per receiver, to form a consortium of universities to obtain equipment. They asked me to join them in setting up the UNAVCO GPS Consortium because they wanted my Caltech Institutional affiliation, not my expertise in mantle dynamics.

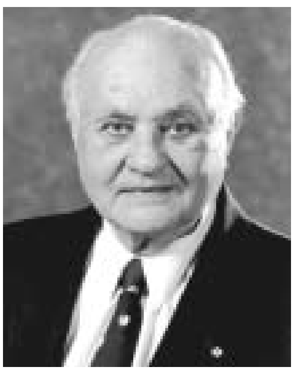
At a time when several gangs were trying to carve out GPS turf in California, Mike Mayhew at NSF strong-armed us into working together. The resulting paper's scientific return was far greater than any of us could have accomplished on our own and established the community approach that led to the ongoing geodetic accomplishments of the Southern California Earthquake Center. Most of the coauthors were students—it has been highly rewarding to learn from them, and from all my students, and to see them move on to leadership positions.

When I was about to drown in not-yet-analyzed GPS data, I was again fortunate to join the GPS powerhouse that Tom Jordan put together at MIT. Data analysis gurus Tom Herring and Bob King rescued me. Peter Molnar expanded my horizons to the Tien Shan in Central Asia, a mountain range so young and so active that even I can see the structure in the geomorphology. Gorbachev's glastnost opened the region for study just as precise tracking by the International GPS Service gave GPS its mm/yr accuracy. It has been a demanding project, but with vast returns, none of which would have been possible without the skill and endurance of colleagues at the Russian Institute of High Temperature Physics under the strong leadership of Yuri Andreevich Trapeznikov.

I realize now that I have been lusting after this award for over 25 years. As an undergraduate physics major, I took one geology course. I was hooked, and not just because we got to drink beer while pondering magnificent vistas on field trips. Entering graduate school, I wasn't sure whether to pursue geophysics or structural geology. My joy at mastering a geology lab turned to dismay when I was docked one full letter grade because my colored pencil had strayed across a line! This experience shaped my view of geologists, but now that I am being rewarded for straying across the line between geophysics and geology, I'll reconsider my opinion.

Disillusioned with geology, I turned to geophysics, where Rick O'Connell generously handed me a rich problem in mantle dynamics. But I was also fortunate to get paid as a TA in geology for John Haller, a "pre-plate fuddy-duddy," who taught me the significance of continental deformation as a tectonic process worth quantifying.

I thank my wife, Patty, and our parents for nurturing my sense of adventure. I hope that our daughters, Emily and Anna, who now read maps better than I do, are as fortunate in their quests as I've been in mine. Thanks again to all the students, mentors, colleagues, and program directors who have made my work so rewarding.



Walter Oscar Kupsch

History of Geology Award

Presented to Walter Oscar Kupsch

Citation by W.G.E. Caldwell

Walter Oscar Kupsch, Professor Emeritus of Geology in the University of Saskatchewan, has enjoyed a 60-year love affair with the science of geology, throughout which he has taken every reasonable opportunity to expose and interpret its history. He has done this in part through sustained service to a variety of professional organizations, but mainly through his own research, the pursuit of which straddles key events in his career and the rich comprisal of geological and related fields in which he has engaged. Three disparate examples make the point.

Postdoctoral appointment to the faculty of Saskatchewan's provincial university in 1950 formed the backdrop to Kupsch's studies of certain critical geological blocks of the prairie heartland. Review of prior investigations in these led him to evaluate the written records left by three illustrious figures in medicine and science who had been members of exploratory expeditions to British North America in the early-to-middle nineteenth century. Exposition of this fascinating chapter in the history of the Canadian Great Plains can be found in *Pioneer Geologists in Saskatchewan* (1955), written by Kupsch for the province's golden jubilee.

Appointment as executive director of the Carrothers Commission on Government of the Northwest Territories in 1965 was the first of a series of prestigious positions held by Kupsch that fueled latent interest in the Canadian North and brought him face to face with the history of exploration of what he himself has called, "a vast, empty, cold country." *Living Explorers of the Canadian Arctic* (1986), with Shirley Milligan, is merely one of the historical works that developed from his Arctic interests.

Finally, the discovery of rich uranium mineralization in the Athabasca Basin of northern Saskatchewan in 1972 generated in Kupsch an interest in the history of mineral exploration, one that burgeoned in subsequent years and led to the inclusion of other kinds of industrial and precious-metal deposits. The uranium story was summarized historically in his lengthy 1978 paper, "From Erzgebirge to Cluff Lake—A Scientific Journal Through Time."

Kupsch's predilection for the history of geology has its roots in the elementary and high school education he received prior to WW II in his native Netherlands—an education forcefully shaped by the historical tradition. In like fashion, his geological breadth and versatility can be traced to experiences in the University of Amsterdam and the University of Michigan. As an undergraduate student in the former, he had to satisfy a broad-based geological curriculum that did not permit elective specialization. As a graduate student (M.Sc.,1948; Ph.D.,1950) in the University of Michigan, he was directed by one of North America's renowned geological generalists, A.J. Eardley, who, by engaging him in field-based regional interpretations, required that he draw upon the full range of his diverse undergraduate training.

What distinguishes Kupsch's historical work is the thoroughness with which he has treated the observations of his predecessors and the skill with which he has drawn from them interpretations that are readily reconciled to modern concept and principle. As a youth in Europe, he may have studied the writings of Johann Wolfgang von Goethe (1749–1832). Certainly, Kupsch's historical research allows us to understand exactly what Goethe meant when, with mineralogy and geology the focus of his thoughts, he made his now-familiar remark, "The history of science is science itself."

Response by Walter Oscar Kupsch

Why does one become interested in the history of one's profession? For some, the answer to that question may be complex. For geologists trained the classical way based on field work, however, it is simple. When going from one outcrop to another, a geologist cannot help reflecting on the work of preceding pioneers who walked the same path years before.

For me, it all started in Beaverhead County in southwestern Montana and adjacent Clark County in east-central Idaho where A.J. Eardley, then at the University of Michigan, had sent three of his Ph.D. candidates to do their field work. To get background knowledge, I dug into the U.S. Geological Survey report on progress in Montana and portions of adjacent territories by F.V. Hayden, published in 1872.

An attractive job offer as assistant professor at the University of Saskatchewan, combined with a government appointment as field geologist and supervisor of a core lab, brought me to Saskatoon in 1950. It was a place I hadn't heard of—an ignorance I did not reveal when interviewed at the University of Toronto.

My field work in Saskatchewan required that I become familiar with the work of Sir John Richardson, James Hector, and Henry Youle Hind. It resulted in my writing *Pioneer Geologists in Saskatchewan* (1955), the Golden Jubilee Year commemorating the 50th anniversary of the Province of Saskatchewan. One sentence in the preface of this booklet by the minister of mineral resources, John H. Brockelbank, is worth quoting: "The history of geological exploration of the mineral industries consists of hard work, keen observation, faith in the future, and above all, love of one's work."

In the mid-1970s, the discovery of exceptionally rich uranium deposits in the Athabasca Region of northern Saskatchewan led to the Cluff Lake Board of Inquiry. A historical review of uranium mining and the investigations into the physical-chemical properties of the metal was needed. I had to learn a lot before "From Erzgebirge to Cluff Lake—A Scientific Journey Through Time" was ready for publication in 1978.

In 1965, I had become familiar with the Canadian Arctic as the executive director of the Advisory Commission on the Development of Government in the Northwest Territories. Although my work had nothing to do with geology, I took an interest in what others had done in the field. It resulted in writing papers with strange titles such as "Pots, Kettles, Barrels, and Kegs," and "Canned Food in the

Arctic." Everything was summarized in "Surveying the Geology of a Vast, Empty, Cold Country," published in the GSA Centennial Special Volume in 1985. I am still shivering.

I can assure you that this year's History of Geology Division Award has gone to one who loves his work, an octogenarian who in only nannoseconds of geological time will himself be history.

Fred M. Phillips

O.E. Meinzer Award

Presented to Fred M. Phillips

Citation by Mark Person

Fred M. Phillips represents a growing number of Meinzer awardees recognized for their pioneering work in the application of isotopic methods in hydrogeology. He is recognized here for five seminal papers focusing on isotope hydrology in general and the development and application of ^{36}Cl isotopic techniques to arid region hydrology, in particular.

In 1995 and 1998, Fred published two outstanding single-authored review articles on the use of isotopic tracers in hydrogeology (Phillips, F.M., 1995, Review of Geophysics, vol. 30, p. 1029–1033; Phillips, F.M., 1998, in National Research Council, Hydrologic Sciences: Taking Stock and Looking Ahead, p. 87–100). These articles have gone a long way toward transforming isotope hydrology from, in his words, "a status akin to alchemy (a field for which the fundamentals are difficult to understand, the terminology peculiar, and the results dubious) to the rank of a method that many might consider applying themselves."

In 1997, one of Fred's doctoral students, Mitch Plummer, along with Fred, June Fabryka-Martin and Jake Turin at Los Alamos National Laboratory, and others published a manuscript in *Science* (Plummer, M.A., Phillips, F.M., et al., 1997, Science, vol. 277, p. 538–541) that presented a chronological record of $^{36}Cl/Cl$ within rat middens. Assuming that rat bathrooms habits are relatively invariant through time, this record was used to document secular variations in the production rate of ^{36}Cl in the upper atmosphere. This showed, for the first time, that the production rate of ^{36}Cl was at times almost double current levels during the past 70,000 years.

In his book *Roughing It*, Mark Twain described the hydrology of Mono Lake as follows: "Half a dozen little mountain brooks flow into Mono Lake but not a single stream of any kind flows out. What it does with its surplus is a dark and bloody mystery." Fred resolved this mystery using $^{36}Cl/Cl$ ratios to establish the hydrologic budgets of watersheds in the Great Basin, California. In 1995, Fred, Shirley Dreiss, and others published a manuscript (Phillips et al., 1995, Water Resources Research, vol. 31, p. 3195–3204) that compared salinity and $^{36}Cl/Cl$ ratios in Mono Lake to those of groundwaters from the contributing watershed. Fred and his coauthors were able to establish that the basin became hydrologically closed about 400 ka when the region's climate is believed to have shifted from humid to arid conditions.

In 1999, two of Fred's graduate students, Michelle Walvoord and Page Pegram, along with Fred and a host of co-investigators used ^{14}C dating methods and thermal data to constrain the transport and fate of deep-dwelling bacteria within the San Juan Basin near a 3.39 million year old basalt dike intrusion (Walvoord, et al., 1999, Water Resources Research, vol. 35, p. 1409–1424). This study helped establish that bacterial transport rates for deep dwelling bacteria are relatively fast, perhaps as high as 0.1 m/yr.

What is truly remarkable is that this represents only a fraction of the work Fred has undertaken in the past two decades in the application of ^{36}Cl and other isotopic methods to the study of earth surface processes. Fred, you richly deserve this honor and we here today heartily congratulate you as the 2001 Meinzer award recipient.

Response by Fred M. Phillips

I am deeply honored and grateful to receive the Meinzer Award. No one enters our profession with wealth or power as the objective. Our only extraordinary reward is public appreciation of our contributions to science by our peers, and that knowledge makes this award very meaningful to me.

What I have been able to accomplish in hydrogeology has only been with the aid and encouragement of many people: my wife, Lois, whose unfailing love and support has been the mainstay of my life; my graduate advisor, Stanley N. Davis, who enabled me to start out on the path I have taken; and numerous colleagues, including John Wilson, Alan Gutjahr, David Elmore at PRIME Lab, Eric Small, Harold Bentley, and June Fabryka-Martin; my students, in particular Nancy Jannik, Matt Davis, Beiling Liu, Mitch Plummer, and Michelle Walvoord; and my hydrogeological heroes, including Stanley Davis, Ike Winograd, Graham Allison, John Cherry, John-Charles Fontes, Charles Slichter, and, last but certainly not least, Oscar Meinzer.

Meinzer was a remarkable man who shaped, guided, and inspired the development of hydrogeology in our nation. I would like to take the occasion of this award to examine a rather somber question: Are we approaching the end of the road that Meinzer started us out upon?

In asking this question, I pick up the gauntlet that Frank Schwartz and Motomu Ibaraki threw down with their paper "Hydrogeological Research: Beginning of the End or End of the Beginning?" published in the July-August, 2001, issue of *Ground Water.* Schwartz and Ibaraki conducted an extensive analysis of citation patterns in the hydrogeology literature, with the goal of assessing the vitality of the field. They conclude: "Research is inefficient with much produced for little gain. On a typical industrial life-cycle curve, groundwater research is likely ranked as mature and close to aging. At this stage, much work will have been completed and the number of truly impactful problems will have dwindled to just a few."

What has brought us from the exciting days of Meinzer and Theis to the present sad picture in the mirror that Schwartz and Ibaraki hold to our faces? These authors describe most hydrogeological research as "commodity-driven," meaning that it is characterized by incremental improvements to issues motivated by practicality, rather than by trying to achieve major advances in understanding. It is a matter of satisfaction to me to be able to contribute to solving problems of societal importance, and also to be able to educate students in a field in which they will be able to find good jobs, but I think that we have become so accustomed to viewing our science as one oriented toward practical problems that we forget that the pioneers embarked on their research simply because exploring how water behaved in the subsurface was so exciting.

I suggest a threefold approach for addressing the exciting issues of the next 20 or 50 years. The first component I call "look back." Most hydrogeologists could easily recite the geological history of the rocks composing an aquifer they are studying, but what if you asked them the history of the water cycle in that basin over the fairly recent geological past? Just as the rocks have a history, so does the water cycle, but although we often know a lot about the geological history, we generally know almost nothing about the history of the water cycle. When I researched Meinzer's work, I found, rather to my surprise, that he published papers on paleohydrology and clearly considered the issue of the history of the water cycle to be very important. We, as hydrogeologists, have lately tended to define our field in such a way as to exclude questions on the history of the water cycle and we need to reconsider that exclusion.

My second strategy is "stretch out." Eighty years ago, pioneers such as Meinzer defined the region below the land surface as the new frontier of hydrogeology, but in the intervening decades that definition has tended to turn into an intellectual prison. Peter Eagleson has encouraged us to think of hydrology as a global science, rather than one related to local problems. The land surface is the interface that supports plants, and, in fact, most life, but we have tended to ignore that messy zone filled with roots and worms and focus on "cleaner" problems of physics and chemistry at depth. This has ultimately had the effect of distancing us from the more urgent scientific and practical problems of the present day. Ignacio Rodriguez-Iturbe has recently urged us to deal directly with the role of subsurface hydrological processes in plant communities, a new endeavor he calls "ecohydrology." This is only one aspect of integrating subsurface hydrology into the global water cycle, but he is pointing in exactly the right direction.

My third initiative is "push forward." In the past few years, the scientific community has produced very convincing evidence that, due to the effects of human civilization, the globe is beginning to experience environmental changes of an unprecedented magnitude. Shifts in the water cycle will be perhaps the single most significant aspect of these changes and will have enormous impacts on human populations. In order to claim that we can predict the nature and effects of such shifts, we must understand similar changes in the recent geological past, and we must understand how the subsurface hydrology interfaces with ecosystems and with geomorphic systems. Look back, stretch out, and then push forward. We hydrogeologists are in a unique position to meet what will be the most urgent societal needs of the next century and to advance scientific understanding of the earth system, but we will only be able to accomplish this if we stretch our vision beyond the limits we ourselves have defined for our field.

John C. Crelling

Gilbert H. Cady Award

Presented to John C. Crelling

Citation by Russell R. Dutcher

The Gilbert H. Cady Award is presented this year to John C. Crelling in recognition of his many outstanding achievements in the field of coal geology. He has contributed in significant fashion to our practical knowledge of the composition of coal, the nature of coal macerals, the formation of metallurgical coke, and the properties of other forms of carbon such as chars, graphites, and carbon composites.

The five years that Crelling spent working at the Homer Research Laboratories of the Bethlehem Steel Corporation gave him insights and discipline that served him in good stead when working in his own laboratory in a university setting. His ability to plan his research programs and to stick to a carefully developed scheme has been key to his success in getting his work published, in obtaining funding to support his work, and attracting students and co-investigators. To date, he has authored or coauthored over 100 published articles and three books as well as co-edited two books. He has been awarded over $4.5 million in funding for 65 projects, and he has worked with colleagues in geology, chemistry, engineering, physics, and materials science from home and from the United Kingdom, France, Spain, Canada, Pakistan, Japan, the Czech Republic, and the Netherlands.

Crelling has been amazingly astute in his efforts to understand the nature of coal by focusing on the macerals that are the basic constituents of coal. Within a few years of arriving at Southern Illinois University, he set up a laboratory using the biological technique of density gradient centrifugation in an ongoing 20-year program of isolating and characterizing pure maceral concentrates. He was the first to separate and characterize the macerals vitrinite and pseudovitrinite, and he has advanced such work on the liptinite and inertinite macerals. To help characterize the maceral concentrates, he developed petrographic techniques in spectral fluorescence, rotational polarization, and bireflectance imaging. The results of this research have led to an increasingly clear understanding of the petrology, chemistry, thermal reactivity, and physical properties of a wide variety of macerals. He has also extended the use of coal petrographic techniques into the field of materials science by using them to characterize such things as automobile and aircraft brakes, carbon-carbon composites, petroleum cokes, synthetic graphites, and carbon blacks.

His success in these efforts and his ability as a teacher have led to requests to present numerous short courses and workshops, such as "Foundations and Principles of Coal Petrology," "Applied Fluorescence Microscopy," "Petrology of Cokes, Chars, Carbons, and Graphites" and "Teaching Principles for Graduate Students." At Southern Illinois University, he has directed 22 master's theses and two Ph.D. dissertations dealing with coal geology, applied coal petrology, and maceral characterization. In addition, he has developed a widely used petrographic atlas of coals, cokes, chars, carbons, and graphites that is available through a Southern Illinois University Web site.

By virtue of his many accomplishments in the fields of coal science, Crelling is an outstanding recipient of the Gilbert H. Cady Award.

Response by John C. Crelling

As a graduate student, I was fortunate to meet Gilbert H. Cady. I remember him as a lively scientist who had earned the sincere respect of his colleagues. I am honored to receive the award named after him and to join the company of the previous award winners.

The citation stresses my work on coal macerals. At Penn State under Russ Dutcher and Bill Spackman, I learned well that macerals are distinct substances with unique chemical and physical properties. During my five years at Bethlehem Steel with Dick Thompson and Lou Benedict, I realized the importance of macerals in industrial practice. Pasteur said that "chance favors the prepared mind." So when I learned of the work of Gary Dyrkacz and his colleagues at Argonne National

Laboratory in separating macerals with the density gradient centrifugation (DGC) technique, I realized its importance. I established a DGC laboratory at Southern Illinois University (SIU) in 1984, and I have been separating pure macerals ever since. The results of all my maceral separation and characterization show that Spackman's work holds true—macerals do indeed control the behavior of coal.

With my first DGC research grant in 1984, I had been trying to separate cutinite from a paper coal for almost a year without success. In desperation I called Gary Dyrkacz, who quickly set me right. I will never forget the thrill of my first view through the microscope of a density fraction that was totally cutinite. Since then I have separated the components of coals (macerals), quinoline insolubles, automobile brakes, and carbon-carbon composites. One of the most difficult tasks that I have encountered is maintaining a comprehensive research program on coal macerals. With the uncertainties of funding and administrative enthusiasm, there is a constant danger of having a research program disintegrate into a random collection of projects funded on a hit-or-miss basis.

As a professor, I learned that since no analytical equipment is actually designed for coal and carbon work, to advance you must get into the specifications and limits of your equipment and eventually design your own. When I came to SIU, I was able to help set up a new fluorescence system which I have been tweaking and rebuilding ever since. Fluorescence spectrophotometry has proven to be a valuable tool in characterizing both in situ and separated macerals. I later worked with Ken Johnson of the SIU Physics Department putting together a photoacoustic microscope that was able to determine the thermal properties of coal macerals in situ. Currently, I am working with Jon Gibbins of Imperial College, London, on a Bireflectance Imaging Microscope, which incorporates rotational polarization to generate bireflectance maps not previously available. This system holds great promise.

I thank Russ Dutcher for introducing me to the field of coal geology and patiently teaching me the craft of research at Penn State. I also thank Harry Marsh and Ralph Gray for introducing me to the world of carbon materials. All three men are my friends and mentors.

While I am most grateful to receive this award, I want to assure my friends and colleagues that I still have much research to complete and new projects to start.

Richard M. Iverson

Kirk Bryan Award

Presented to Richard M. Iverson

Citation by Gary A. Smith and John E. Costa

Iowa is not a location well known for the study of debris flows or other forms of rapid mass movements. But Iowa was the home and Iowa State University was the site of the undergraduate education of the scientist who has probably made the greatest contribution to understanding the dynamics of debris flows, which are among the deadliest and costliest of processes studied by geomorphologists. Dick Iverson went on to complete two M.S. degrees and a Ph.D. in applied earth sciences at Stanford University in 1984. His training was outstanding, and his intellect even more so. Nurtured in the wake of the unprecedented size and variety of mass flow processes associated with the May 1980 eruption of Mount St. Helens, Washington, Dick initiated a U.S. Geological Survey (USGS) research program to understand the linkage between the sedimentological and geomorphological field expressions of huge debris avalanches and debris flows, and the physical processes that could produce these features. For this, Dick needed careful field observations, theoretical models that linked soil mechanics and fluid mechanics, small-scale laboratory and field experiments, and eventually, controlled, field-scale laboratory experiments in which a variety of parameters could be systematically altered. He accomplished all of these, and the outcome is the paper we honor today.

Regrettably, many geologists approach their field research qualitatively and without rigorous physical understanding of the processes they study. Dick has worked hard to change traditional textbook views. "Physics of Debris Flows" is a landmark contribution to the field and a testimony to his grasp of fluid and solid dynamics and cleverness as a field-scale experimentalist. Dick has combined observations of active flows, study of resulting deposits, thorough consideration of relevant theoretical arguments, and experiments in diverse fields (including those far removed from earth science) to modernize and quantify what debris flows are, how they move, and how they deposit their load. Key to his studies was the establishment of the USGS field-scale debris-flow flume in the H.J. Andrews Experimental Forest, near Blue River, Oregon. Experiments there by Dick and colleagues have substantially expanded understanding of debris-flow initiation, dynamics, transport, and deposition, and identification of the critical variables affecting these phenomena.

"Physics of Debris Flows" is drawn substantially from Dick's own work as well as being a remarkable and succinct integration of relevant theoretical and experimental results reported by other researchers. He has separated wheat from chaff while explaining the merits of the former and weaknesses of the latter, and he has integrated diverse results into coherent pictures without simplifying debris-flow processes. Most important, Dick developed a new, simple model for debris-flow motion that will serve as a foundation for future developments. His approach recognizes the need to account for both solid and fluid forces, whereas past models have emphasized one or the other.

Dick Iverson's "Physics of Debris Flows" is worthy of the Kirk Bryan Award for several reasons: It is remarkably well written, despite being quantitatively rigorous and astonishingly wide in breadth, and presents a new model for debris-flow motion; it emphasizes the need for surficial geologists to understand the link between field observation and the quantifiable underlying physical basis for the observed processes; and it substantially advances our understanding and focuses future research objectives regarding debris flows—a dynamic surficial process that is both threatening as a hazard and important to interpreting many aspects of past environments.

Response by Richard M. Iverson

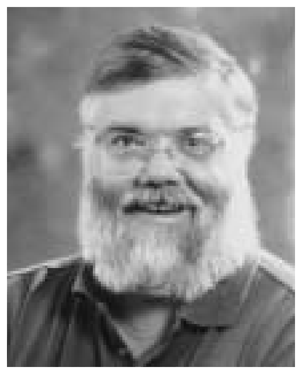
Thank you, John and Gary, for your kind citation. I feel very fortunate to have my work honored in this way. Four factors served as catalysts for studying debris flows and building the USGS debris-flow flume. One was a widely perceived need for improved mathematical models of debris flows and for data to motivate and test such models. Another was a legacy of frustration wrought by numerous attempts to collect high-resolution, real-time data in the field. (These attempts revealed that natural debris flows have an alarming appetite for electronic instrumentation, consumed either plain or garnished with cables and data loggers.) The third catalyst was my participation in controlled, large-scale landslide experiments in Japan—an experience that prompted dreams of similarly controlled experiments with debris flows. The fourth was the presence of two key people. John Costa, my boss in 1988 when I formally proposed the debris-flow flume, provided unwavering support that was crucial because enthusiasm for the project was not universal. Rick LaHusen participated in the flume project from its earliest stages, and his electromechanical wizardry turned my sometimes harebrained ideas into functional measurement systems.

The good fortune that propelled the flume project reminds me of a quote written on a card I've kept on my desk for 15 years: "Concerning all acts of initiative and creation, there is one elementary truth, the ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits, then providence moves, too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents, meetings and material assistance which no man could have dreamed would have come his way. Whatever you do or dream you can, begin it. Boldness has genius, power, and magic in it. Begin it now."

This quote is commonly attributed to Johann Goethe (1749–1832), although scholars of German literature caution that Goethe's authorship is not an unequivocal fact. In any event, Goethe was not only a fine writer but also a geologist and physicist, and I favor the hypothesis that he both wrote this passage and had scientists in mind at the time.

That brings me to a second topic, which is the linkage between geomorphology and science in general. Geomorphology is nearly unique among geological sciences because it deals mostly with phenomena that are accessible to direct measurements and manipulative experiments. Furthermore, the conservation laws of classical physics provide a solid framework for building and testing geomorphological models.

Why apply classical physics to geomorphology? It's admittedly difficult to abstract geomorphic phenomena in experiments and formalize them with mathematics, and such efforts might be viewed as unnecessary if inferences about the origin of landforms are the ultimate goal. In my view, a further goal of geomorphology is to structure our knowledge of Earth's surface within the framework of physical laws that govern all natural phenomena. Such structuring is possible because, in the words of Richard Feynman (1918–1988), "Nature uses only the longest threads to weave her patterns, so each small piece of her fabric reveals the organization of the entire tapestry." Geomorphology examines one small piece of the fabric of nature, and within geomorphology experiments and models of debris flows have a modest aim: to gain a clear view of a thread or two that connects with a greater whole. Thank you for honoring this type of work with the Kirk Bryan Award.



H.J. Melosh

G.K. Gilbert Award

Presented to H.J. Melosh

Citation by Thomas J. Ahrens

It is my distinct pleasure to present the 2001 recipient of the G.K. Gilbert Award of the Division of Planetary Geology, H. Jay Melosh. Jay received his bachelor's degree in 1969 from Princeton. In graduate school at Caltech in theoretical physics, he worked under Murray Gell-Mann, who received his Nobel Prize during the same period. Jay was also introduced to the flow of solid media as a field assistant to Caltech's professor of geology and geophysics, Barclay Kamb, who was researching the flow of Blue Glacier in the Cascade Mountains. As a graduate student, Jay received his first accolade as Best Scientific Secretary at the Erice (Sicily, Italy) International Summer School of Theoretical Physics in 1972. Jay went on to be a visitor at European Center for Nuclear Research (CERN) in Geneva in 1971, and in 1972, he became a research associate at the University of Chicago's Enrico Fermi Institute (1972–1973). During this period, further communication with Barclay began to convince Jay that planetary physics and geology were possibly more exciting than theoretical high-energy physics. In 1973, he accepted an appointment as an instructor in planetary science in the Division of Geological and Planetary Sciences at Caltech.

When Jay moved into his office down the hall from me, he told me, "Tom, I know you work on impact cratering, too, but I need to finish up a few problems on that subject before I move on." His first important contribution was on the effect of giant impacts on perturbing the spin axes of planets. Jay contributed an important paper on the shock weakening of impacted rocks to the book, *Impact and Explosion Cratering* that D.J. Roddy et al. edited in 1977. One of Jay's most controversial papers was published in the *Journal of Geophysical Research* in 1979 on the process he called "acoustic fluidization."

Much to my regret and that of other Caltech colleagues, Jay left Pasadena for Stony Brook in 1979. In 1982, he joined the Lunar and Planetary Laboratory of the University of Arizona, where he has contributed enormously to the field in the past 21 years. Jay is probably best known for his highly acclaimed 1989 book, *Impact Cratering, A Geologic Process.* Jay has contributed many important and often novel ideas to his science.

The theory of impact spall, which he developed to explain how only moderately shocked SNC meteorites are accelerated as a result of impact from the surface of Mars at speeds greater than the Mars escape velocity. Jay's collaborative papers with Charles Sonnett and later Marlin Kip provided critical support to A. Cameron's and W. Benz's smooth particle hydrodynamics calculations suggesting that the Moon could have formed from the impact ejecta from a giant collision onto Earth.

By the same mechanism of impact spall, Jay Melosh argued very convincingly that primitive life forms could well have been launched from Earth to the other planets providing, crucial support to the theory of panspermia.

Melosh and Vickery's 1989 initial model of atmospheric erosion via planetary impact and its application to Mars provided the first quantitative model of this process to planetary scientists.

Jay's 1990 theory (with Schneider, Zahnle, and Latham) of the ignition of global wildfires from the thermal radiation of reentering ejecta from the Cretaceous-Tertiary extinction bolide has become increasingly accepted. In 1993, he and J. Scotti derived from the observation of the break-up of Comet Shoemaker-Levy 9 (SL9) an elegant theory that quantitatively demonstrated the very low global cohesive strength of comets and provided an estimate of the mass of SL9.

In an accompanying analysis with Paul Shenk, Jay also demonstrated how previously, earlier tidally disrupted comets such as SL9 had crashed into Jupiter's satellite, Ganymede, producing series of "chained" impact craters discovered two decades earlier by the Voyager spacecrafts.

While conducting all these marvelous research projects, Jay has supervised some 12 Ph.D. students. More recently Jay has been a co-investigator on NASA's Deep Impact Mission that will probe Comet Tempel 1 in July 2005.

Jay, we look forward to great things.

Response by H.J. Melosh

I am particularly honored to receive this award because G.K. Gilbert has long been one of my scientific heroes. Gilbert combined an active imagination, intense curiosity about the world, and a fine analytic turn of mind. His research ranged from the effects of rain splash on drainage divides to the geology of lunar craters. He was a master at finding novel methods to solve difficult scientific problems. When analytic methods of his day could not interpret his magnetic search for the iron projectile at Meteor Crater, he constructed a scale model using a miniature magnetic pendulum and cannonball. On another occasion, he cut slits in gelatin blocks then deformed them to understand the geodetic changes caused by the 1906 San Francisco earthquake.

Princeton's Ken Deffeyes first awakened my interest in geology in 1967. This interest led me to spend two wonderful summers on geologic field excursions, accompanying Barclay Kamb and his team to Blue Glacier on Mount Olympus, Washington. Blue Glacier is a treasure house of natural science. I was entranced by the glacial scratches and gouges (on which Gilbert wrote several papers), and I marveled at the colored fogs and red snow and thought deeply about the flow of glacier ice as an analog for the deformation of Earth's mantle. Back at Caltech, Jerry Wasserburg instructed me in the art of critical but creative thinking, and Bob Sharp taught me the importance of field trips. After a brief postdoctoral year at Chicago's Enrico Fermi lab, Barclay and Jerry convinced me to return to Caltech as a junior faculty member in the Division of Geological and Planetary Sciences. At Caltech, Brann Johnson acquainted me with the mechanical challenges of landslides. I spent a summer with Bob Sharp in the Henry Mountains mapping a small laccolith. Gilbert's shadow stretches long over the Henrys and I read and reread his report on the geology of the Henry Mountains as the summer proceeded. My years at Caltech were wonderful ones for planetary science. Data was pouring in from the Mariner 10, Viking, and Voyager missions. New, weird landscapes appeared on the computer monitors, and all begged for interpretation. Impact craters were everywhere, but also global fracture systems, giant volcanoes and huge landslides. Gilbert would have loved it. I know Bob Sharp did.

In subsequent years at the University of Arizona, my research directions were strongly influenced by new data appearing on the scientific horizon. The suspicion that a rare group of meteorites may have come from Mars opened the way to a careful study of how impacts could launch intact rocks from the surface of a planet and to speculations on whether living organisms could have hopped from Earth to Mars. The Alvarezes' discovery of an iridium anomaly at the K-T boundary led to thoughts about how impacts could cause extinctions. The idea that a giant impact created the moon led to further studies of the physics of giant impacts and of how magma oceans may have formed on early Earth. Careful study of how impact craters collapse lead to theories about how large masses of rock debris may slide in a low-friction mode, theories that may have further applications to the mechanics of large landslides and perhaps seismic faulting.

I have been supported in this research by a large collection of colleagues and scientific acquaintances, too numerous to name. I am especially grateful to my many excellent students who have, perhaps unwittingly, inspired me and challenged me. I thank GSA President Sharon Mosher and the other members of GSA who have honored me by bestowing this award.

Donald U. Wise

Structural Geology and Tectonics Career Contribution Award

Presented to Donald U. Wise

Citation by Arthur W. Snoke and Arthur Goldstein

As former students of Don Wise, we agree that two words characterize his work as a scientist and educator: creativity and enthusiasm. Don is truly a unique individual; he has made enormous contributions in structural geology and tectonics through his distinctively original research publications, and he has inspired a legion of students to pursue geoscience careers in academia, industry, and government.

Don's interests span a remarkable range of topics, from global to microscopic in scale. He has written papers on the origin of the Moon by rotational fission, statistics of crater age dating, tectonics of Mars, structural geology and tectonics of Laramide basement-involved uplifts and arches, Appalachian polyphase deformation, freeboard of continents over time, Mesozoic tectonics of the Appalachians, patterns and significance of topographic lineament swarms, origin of joints and microjoints, paleostress determinations using minor faults and calcite twin lamellae, and the truth behind creationism propaganda. Don's early contributions to structural geology and tectonics focused on the western North American Cordillera and were stimulated by a long-standing association with the Yellowstone-Bighorn Research Association. His record of publications on the development of the classic Laramide basement–involved uplifts of the eastern Rocky Mountains began in the early 1960s and continues to this day. His 1963 "Outrageous Hypothesis" paper is a classic, and his 2000 *AAPG Bulletin* paper on the structural evolution of the Beartooth uplift is a major contribution representing over 40 years of continuing research. It was in his early Laramide papers that

Don's skill as a geologic illustrator first appeared. As Don says, if he can't draw it, he really doesn't understand it.

Two papers on Don's work in the Appalachians are particularly significant: Freedman, Wise, and Bentley (1964) and Wise (1970). These papers were instrumental in understanding the complex, multiphase structural history of southeastern Pennsylvania and adjoining Maryland. Furthermore, these papers provided useful and innovative techniques for study of polyphase-deformed, metamorphic terranes in general.

Don's early papers on the origin of the Moon may well have laid the foundation for his appointment to NASA's lunar program. He also published on the origin of mascons on the Moon, the fracture pattern around the Martian volcano Alba, crater age time scales for Mars, and the global tectonics of Mars. His planetary work has laid the foundation for an entire generation of planetary geologists, and his hypotheses have stood the test of time.

Don has been a pioneer in many fields of structural geology and tectonics. He was contemplating the big picture when others were focusing on a single quadrangle. He was applying new techniques to old problems when traditional arguments had lost their meaning, and the problem required new insight for further scientific progress. His work has always been data-rich, and his ideas have always been creative and provocative.

One of Don's major and long-lasting contributions is his work as an educator. Don has, literally, launched the careers of a generation of structural geologists and is now the "grandfather" of the succeeding generation. Innovative, inspiring, challenging, timely, and meaningful are just a few words that describe Don's techniques in teaching.

Don discovered that raised plastic relief maps are, in fact, quite accurate and that one could simulate an SLAR image by illuminating the underside of the maps from the side. The advantage was that one could vary the illumination direction and study the effect of preferential enhancement of topographic lineaments. At one point, Don constructed a turntable on a lab bench in a classroom at the University of Massachusetts by placing a sheet of plywood on a handful of marbles. A camera mounted on a tripod rotated with the maps, and pictures were taken every five degrees. Unfortunately, the marbles tended to migrate toward the edge of the plywood and would periodically fall on the hard tile floor and bounce across the room. This attracted a small crowd of Don's colleagues and some graduate students who always had suspected, but on that day knew for certain, that Don had indeed lost his marbles.

With great pride and fondness, we present Donald U. Wise, the 2001 recipient of the GSA Structural Geology and Tectonic Division Career Contribution Award.

Response by Donald U. Wise

There is a park in Lancaster, Pennsylvania, where an outcrop of the Conestoga Limestone has a synclinal fold hinge now polished to a glassy surface by the backsides of generations of local kids using it as a sliding board. Some of my earliest memories involve that outcrop and a "seat of the pants" approach to field work. Later, as a kid roving the local hills, I saw and puzzled over folded beds and veins that seemed to be everywhere and kept wondering, "How, when, why did all this happen?" From then on I was hooked on the discipline.

Basic field methods and approaches were drummed into me at Franklin and Marshall by the likes of Pete Foose and John Moss. Later, Caltech overlaid a much more quantitative methodology through the likes of Dick Jahns, Ian Campbell, and Bob Sharp. Finally at Princeton, Harry Hess, John Maxwell, and Arthur Buddington overprinted a more contemplative and philosophical approach. Then there was the luck of timing and good fortune to be at just the right places for revolutionary changes in structure and tectonics of the second half of the twentieth century. It was a time when almost every idea in our subdiscipline was subject to reconsideration.

Many of the best questions in geology arise from field observations that highlight little inconsistencies and puzzles. These must be teased, tested, and worried by additional lab and field work to yield a number of possible hypotheses. The best of these must answer not only the original field and lab relationships but also make sense on all scales from the microscopic to the regional or even global. Such a recipe does not always lead to standard explanations and the results are sometimes outrageous but nevertheless possible hypotheses. As a result, I have innumerable fights with reviewers and editors. In fact, at one time I seriously considered getting out of geology because I couldn't get my work and ideas published. Ultimately, these papers were fought through to publication and in retrospect, a few of them may even have been largely correct.

One of the great joys of teaching is to have had some small part in the present success of so many former students. Part of that influence may have been the approaches and educational philosophies already mentioned but there is another aspect. Courtesy of people such as Pete Foose, John Moss, and especially Dick Jahns, I saw innumerable pranks being played by them and upon them. Slowly, I realized that students worked twice as hard and learned far, far more if they were also letting off steam and having fun in this way. I firmly believe that while we must always take our science very seriously, we should never take ourselves too seriously. Within my realm of influence, there were never any repercussions so long as good science was being done and dignity was the only casualty. This, I believe, can be part of the basis of a happy and productive atmosphere for research and teaching.

My sincere thanks go to the Structural Geology and Tectonics Division for this recognition, to my many students, friends, and colleagues who secretly made it possible, and finally to the Arts—Snoke and Goldstein—for all the kind words as well as for what they did not say in the interest of good taste. And last, beware! There are still a few more outrageous ideas remaining in the career pipeline! Thank you, one and all.

Robert H. Dott Jr.

Laurence L. Sloss Award

Presented to Robert H. Dott Jr.

Citation by Charles W. Byers

Back when I was a grad student, plate tectonics was new (the theory I mean). In those early days, it was all about magnetism of the ocean floor. I recall quite clearly the first time I saw an attempt to connect the history of seafloor spreading with the geology of the continents. I came across an article in *Science* entitled "Circum-Pacific Late Cenozoic Structural Rejuvenation: Implications for Sea Floor

Spreading." In it, the author, Robert H. Dott Jr., made the explicit point that the events in the ocean should show up in the continental record as well, and that geologists should start looking for correspondences, even in the stratigraphic and paleontologic record. The plate tectonics light dawned for me at that moment. I was impressed by the author's breadth of knowledge and the creativity of his insight. Three decades later I'm still impressed, and it pleases me greatly to see the division confer this honor on Bob Dott. It is thoroughly deserved.

The Sloss award is given in recognition of outstanding contributions to the interdisciplinary field of sedimentary geology. It's hard to imagine a geologist more interdisciplinary in outlook and practice than Bob. Trained in classical stratigraphy and biostratigraphy by Marshall Kay at Columbia, Bob first worked in the petroleum industry and then served as a first lieutenant in the U.S. Air Force, stationed in the geophysics division of the Cambridge Research Center. He arrived in Wisconsin as an assistant professor in 1958 and began a two-decade research program in sedimentary tectonics, with special emphasis on the Pacific Rim of North and South America. Along the way, Bob published landmark papers on the dynamics of gravity flow deposits, the geosyncline concept, paleocurrent analysis, and the proper approach to the classification of immature sandstones. He also authored studies in paleogeography and paleoclimate, as well as interpretations of depositional environments from desert to sea cliff to marine shelf to deep-sea fan. In the 1980s, his focus shifted to cratonic strata, as he and his students broke new ground in the description and interpretation of hummocky stratification and of genetic sequences in eolian strata.

Beyond his fame as a sedimentary geologist, Bob has long maintained a second career as a historian of science, including teaching an advanced course in the history of geologic thought and publishing scholarly articles and books.

In academia, Bob rose rapidly through the ranks, served as department chair, then became an endowed professor, president of SEPM, Twenhofel Medalist, and now Sloss awardee. He retired from teaching in 1994 and is currently Stanley A. Tyler Emeritus Professor. In addition to directing 59 graduate students, he taught extensively at all levels and co-authored a premier undergraduate textbook, *Evolution of the Earth*. As SEPM president, he spoke out loud and bold against the resurgent creationist threat to education.

John Lennon said that life is just what happens to you while you're busy making other plans. I think that sentiment holds especially true for academics, where you are continually looking forward to the next course, the next grad student, the next proposal. Sometimes it is hard to realize just how good things are at the moment. In the 1980s at Wisconsin, sedimentary geology was a close-knit group. At the time, we were all too busy to see that it was one of those fleeting golden ages that sometimes come to lucky departments. A good part of our "luck" was having such a creative, industrious, and collegial geologist in our midst. It is an honor for me to present him as the 2001 recipient of the Laurence L. Sloss Award for Sedimentary Geology.

Response by Robert H. Dott Jr.

I first met Larry Sloss around 1950 when he spoke at the University of Michigan about newfangled lithofacies maps and stratigraphic sequences bearing strange Native American names. How timely, for I had just authored a profound term paper about facies. His visit also brought to my attention that remarkable Northwestern University troika of Sloss, Dapples, and Krumbein.

Most of my early geological research was in the mountainous west, the southern Andes, and Antarctica. In the 1950s, I became fascinated by turbidites and mass flow deposits within evolving orogenic belts. Coincidentally, while stationed in the Air Force at Boston, I applied my new interest to the Squantum rocks and suggested the heresy of a mass flow rather than glacial origin. How nice to find today that till is out and mass flow is in at last. My early work was undertaken within the geosynclinal paradigm, but in 1967, everything changed. Plate tectonics provided a new context, but also we were able to strengthen that new paradigm using sediments. Not only did deepwater gravity flow deposits fit the paradigm well, but we recognized many shallowing-up successions replete with hummocky stratification and capped by deltaic deposits full of volcanic detritus; local carbonate banks even fit in. In the 1970s, I was also drawn to those spectacular late Paleozoic-Mesozoic sandstones of the Colorado Plateau and found myself swept up in the renaissance in eolian studies.

When I came to Wisconsin, I suddenly found myself in the middle of the craton, but I assumed that Twenhofel and his contemporaries had solved all of the important problems. In 1965, we built a house upon the Sauk sequence, and Sloss bragged that "he could have walked through the Early Ordovician sea that once covered our home site." That, plus stromatolites, oolites and intriguing storm features right in our backyard cliff finally got my attention. So, when Wisconsin was to host the 1970 GSA meeting, I co-authored a guide for the classic Baraboo district, which led to my studies of Cambrian tropical storm deposits. Soon, with Charlie Byers now on board, our group recognized Cambrian tidal fingerprints, hummocky strata, and eolian deposits, Ordovician karsting, and, recently, a spectacular case of mass stranding of Cambrian jellyfish.

When my early research was centered far away, I felt a bit of a loner, but as I studied Wisconsin geology, I experienced the collegiality of others with shared interests. I had become so impressed with the fruits of the Sloss-Dapples-Krumbein collaboration that I wished to copy it. When Byers joined our faculty, we realized that wish in pursuing joint research with students on Cambro-Ordovician sediments and in organizing the first SEPM Research Conference in 1980. On the teaching front, our Wisconsin team included Lloyd Pray, David Clark, and later Toni Simo. With these fine colleagues and a terrific bunch of students, we enjoyed a near-utopian collegiality.

I deeply admired Laurence L. Sloss for his fertile mind, which gave us the stratigraphic sequence concept, as well as his incomparably good humor and cheerful friendliness, which livened many a meeting. I also cherished his professional dedication and commend it as a model for all. The most important message that he or I could offer a younger generation in these days of ever more frenetic schedules, inhumane tenure hurdles, and feeding frenzies at the grant trough is to urge revival of old fashioned collegiality and service. The rewards are maximum stimulation, sympathetic support, and a genuine delight in colleagues' successes. I doubt that I would be before you receiving this wonderful recognition were it not for the collegiality of those whom I have mentioned as well as others. Try it, you'll like it, because geology is a lot more fun that way.

Honorary Fellows

The following people were named GSA Honorary Fellows in 2001.

Erik Flügel
Institut für Paläontologie
Friedrich-Alexander Universität
Erlangen-Nürnberg, Gemany

Alberto Carlos Riccardi
Facultad de Ciencias
Naturales y Museo, Argentina

K.S. Valdiya
Jawaharial Nehru Centre for
Advanced Scientific Research, India

The GSA Council established this program in 1909, and since then, except during a few war years, one or more Honorary Fellows have been elected annually. Most Honorary Fellows are non–North Americans who live and work outside of North America. They have distinguished themselves through outstanding and internationally recognized contributions to the science or in notable service to the Society.

UPCOMING DEADLINES

Nominations for the **John C. Frye Environmental Geology Award*** are due March 31, 2002. Nominations for the following national awards are due April 30, 2002: **William T. Pecora Award, National Medal of Science, Vannevar Bush Award**, and **Alan T. Waterman Award**. Details and nomination procedures for these awards are posted at www.geosociety.org. Go to "About Us," then to "Awards and Medals." You may also contact Leah Carter, (303) 357-1037, lcarter@geosociety.org, Grants, Awards, and Medals, P.O. Box 9140, Boulder, CO 80301-9140, or see the October and November issues of *GSA Today*.

Applications for the GSA Coal Geology Division's **Antoinette Lierman Medlin Scholarship in Coal Geology*** are due February 15, 2002, to Leslie F. Ruppert, Coordinator, A. Lierman Medlin Scholarship Committee, U.S. Geological Survey, 956 National Center, Reston, VA 20192, (703) 648-6431, lruppert@usgs.gov. For details, see the December issue of *GSA Today* or visit www.geosociety.org. Go to "Professional Development," then to "Grants."

For details on the following awards, see the January issue of *GSA Today* or visit www.geosociety.org. Go to "About Us," then "Divisions."

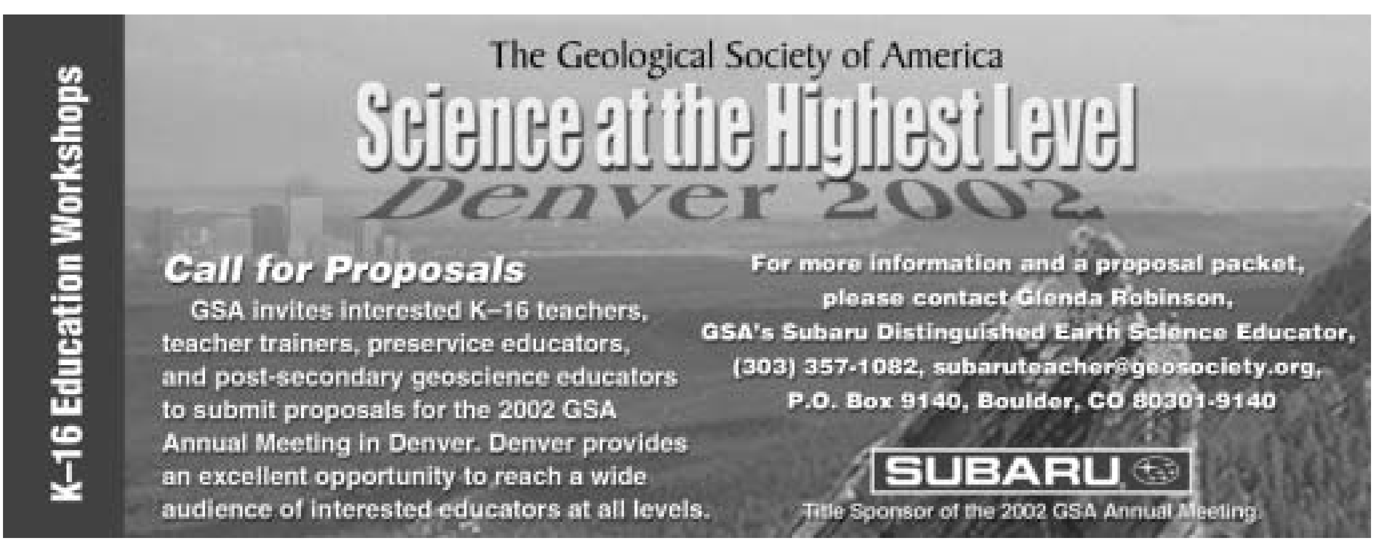
- **Don J. Easterbrook Distinguished Scientist Award,* Quaternary Geology and Geomorphology Division:** Nominations due by April 1, 2002, to Debbie Harden, harden@geosunl.sjsu.edu, San Jose State University, One Washington Square, San Jose, CA 95192-0102.

- **Farouk El-Baz Award for Desert Research,* Quaternary Geology and Geomorphology Division:** Nominations due by April 1, 2002, to J. Steven Kite, jkite@wvu.edu, Dept. of Geography, West Virginia University, 223 White Hall, P.O. Box 6300, Morgantown, WV 26506.

- **Laurence L. Sloss Award for Sedimentary Geology,* Sedimentary Geology Division:** Nominations due by March 1, 2002, to Paul Karl Link, Secretary, Sedimentary Geology Division, Dept. of Geology, Box 8072, Idaho State University, 1400 E. Terry, Pocatello, ID 83209-8072.

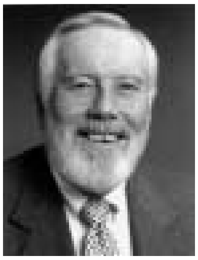
- **Gilbert H. Cady Award,* Coal Geology Division:** Nominations due by February 28, 2002, to Charles E. Barker, U.S. Geological Survey, Denver Federal Center, Sixth Avenue and Kipling Street, Building 20, MS 977, Denver, CO 80225, (303) 236-5797, fax 303-236-3202, barker@usgs.gov.

* Funds supporting these awards are administered by the GSA Foundation.



Donna L. Russell, *Director of Operations*

Dunn Trades GSA Hat for Foundation Hat!



David E. Dunn

I am extremely pleased to announce that David E. Dunn has joined the Foundation's Board of Trustees for a five-year term.

At the Boston annual meeting, Dunn retired as GSA's treasurer. He had held that position with GSA since 1993. He brings to the Foundation's Board both his experience in the financial world and his 26 years of service and leadership with GSA.

A Fellow of the Society since 1962, he has an extensive record of service to GSA. He served as vice-chair and chair of the Structural Geology and Tectonics Division, general chair of the 1990 GSA Annual Meeting, editorial board member for *Geology*, member of the Committee on Short Courses, and member of the Joint Technical Program Committee, to name just a few of the positions he has held. His service on the GSA Council and the GSA Executive Committee has spanned 16 years, and his stewardship of GSA's financial resources—as treasurer of GSA, as chair of the Budget Committee, and through his participation on GSA's Audit Committee and the Committee on Investments—has been widely recognized and acclaimed.

Born in Dallas, Texas, Dunn earned his B.S. in 1957 and his M.S. in 1959 from Southern Methodist University, and he earned his Ph.D. in 1964 from the University of Texas at Austin. He has taught at the University of Texas, the Texas Technological College, the University of North Carolina, the University of New Orleans, and the University of Texas at Dallas. At the University of North Carolina, Dunn has served as director of the Geology Field Camp, acting chair of the Geology Department, and associate director of the Space Sciences Program. He also served on the Executive Committee of both the Materials Research Center and the Faculty Council and was director of the North Carolina Fellows Program.

Dunn has served as chairman of the board of directors of the Louisiana Universities Marine Consortium and Drilling, Observation, and Sampling of Earth's Continental Crust, and as a consultant to two law firms, the U.S. National Research Council, the American Civil Liberties Union, Pennzoil, Amoco, and Oryx.

When asked why he has been a part of GSA and served in so many capacities throughout the years, Dunn commented, "Serving GSA has always been a labor of love. How could anyone have as much fun as I have had and not try to give something back to the profession?"

Having made significant contributions to all of the geosciences by guiding the financial course of GSA, Dunn will be an outstanding addition to the current Foundation Board of Trustees.

Most memorable early geologic experience

In 1938, ten days by canoe from my base, I extracted—with a scalpel—a steel chip from the eyeball of one of my men. Operation on a kitchen table: a success!!

Paul Emille Auger

Perry Rahn Named GSA–AEG Richard H. Jahns Distinguished Lecturer

Perry Rahn will be available throughout 2002 as the Richard H. Jahns Distinguished Lecturer. Rahn's two talks have a common theme of showing the importance of geology to engineering works.

Rahn's first talk, entitled "Flood Hazards," covers current techniques of flood evaluation and the Federal Emergency Management Administration programs now in effect. He gives examples of flooding in the United States and describes the usefulness of geomorphology and detailed field mapping to flood hazard evaluation. Dams have been the traditional method of reducing floods, and many engineering geologists are employed in the construction of dams. Flood plain management is a more environmentally acceptable method of reducing flood hazards.

The second talk, "Transmissivity Anisotropy," emphasizes that geologic mapping and an understanding of geology are required to effectively study groundwater. Sound geologic input is the limiting factor in most groundwater models. Directional permeability is shown to have effects on groundwater pumping and contaminant transport. Rahn uses surficial and bedrock aquifers in South Dakota and Connecticut as examples.

Rahn is a professor emeritus of geological engineering at the South Dakota School of Mines and Technology. He is the author of *Engineering Geology, an Environmental Approach*, for which he received the Claire P. Holdredge award by the Association of Engineering Geologists in 1987 and the E.B. Burwell award by GSA's Engineering Geology Division in 1990.

The Richard H. Jahns Distinguished Lectureship was established in 1988 by the Association of Engineering Geologists and the GSA Engineering Geology Division. Monies for the lectureship, administered through the GSA Foundation, provide funding for a distinguished engineering geologist to present a lecture at academic institutions to increase awareness of students about careers in engineering geology. The Distinguished Lectureship honors Richard H. Jahns (1915–1983), an engineering geologist who had a diverse and distinguished career in academia, consulting, and government.

To arrange for a talk at your university or professional group, contact Perry Rahn through the Department of Geology & Geological Engineering, South Dakota School of Mines & Technology, Rapid City, SD 57701, (605) 394-2461, fax 605-394-6703, perry.rahn@sdsmt.edu.

Final Announcement

ROCKY MOUNTAIN SECTION, GSA

54th Annual Meeting · Cedar City, Utah · May 7–9, 2002

The Rocky Mountain Section of GSA will meet on the campus of Southern Utah University (SUU). The meeting is sponsored by Southern Utah University, Department of Physical Science, and by the Utah Department of Natural Resources, Utah Geological Survey.

ENVIRONMENT

At an elevation of 5,800 feet, Cedar City lies within the transition zone between the Basin-and-Range and Colorado Plateau physiographic provinces. The structural styles and stratigraphy of both regions combine to produce some of the most exceptional and well-exposed geology in the western United States. A several-thousand-foot-thick sequence of upper Paleozoic through Mesozoic sedimentary rocks crop out a few miles to the south in and around Zion National Park. Near Cedar City and extending northeastward toward Cedar Breaks National Monument and Bryce Canyon National Park, these same units are overlain by Late Cretaceous and Paleocene sedimentary rocks, and by middle Tertiary volcanic rocks derived from calderas to the north and west. Westward in the Great Basin, these units are overlain by Pliocene-Quaternary valley-fill deposits and a series of younger bimodal volcanic rocks formed during an episode of extensional tectonism that resulted in north-trending basin-range faults.

The Mojave Desert environment extends into the Santa Clara and Virgin River Valleys near St. George (elevation 2,800 feet), a one-hour drive southward. A half-hour drive to the east from Cedar City leads to Utah's high plateaus with their lush forests, beautiful lakes, and elevations in excess of 10,000 feet. Cedar City owes much of its presence and size to the huge iron deposits of the nearby Iron Springs district. Historically, mineral wealth in adjacent areas has also been great. Petroleum resources are attracting renewed exploration attention. The water resources of southwestern Utah and adjacent regions of Nevada and Arizona increasingly come from groundwater, the development of which requires continued inquiry.

On-Site Registration Fees

	Full Meeting	One Day
Professional Member*	$60	$30
Professional Member (70 and older)	$30	$25
Professional Nonmember	$70	$40
Student or Associate Member	$30	$20
Student Nonmember	$40	$25
K–12 Professional	$10	N/A
Guest or Spouse	$25	$10

* Associated Societies qualifying for member rate: AWG, NAGT, PS

REGISTRATION

Preregistration deadline: April 2, 2002
Cancellation deadline: April 9, 2002

Register online at the GSA Web site, www.geosociety.org/sectdiv/rockymtn/02rmmtg.htm. You can also download a PDF version of the registration form from the site, or use the form printed on page 40. Registration is required for all who attend technical sessions, guest activities, or the Exhibit Hall. Either a registered professional or a student must accompany guest registrants (nongeologist spouses or friends). Students must show a current ID for reduced rates. If you preregister, your badge will be mailed to you two weeks prior to the meeting.

All requests for registration additions, changes, and cancellations must be made in writing and received by April 9, 2002. There will be no refunds for cancellations made after this date.

On-Site Registration

On-site registration will begin at 4 p.m., Mon., May 6 in the Rotunda, Sharwan Smith Center on campus.

Accessibility for Registrants with Special Needs

GSA is committed to making all events at the 2002 meeting accessible to all people interested in attending. Indicate special requirements (wheelchair accessibility, etc.) on the registration form.

TECHNICAL PROGRAM

Oral sessions will typically include 12 minutes for presentation and three minutes for questions and discussion. Two standard 35 mm slide projectors, one overhead projector, and two screens will be provided for each technical session. Please bring your own loaded carousel trays if at all possible. A speaker ready room, equipped with projectors, will be available for review and practice.

Poster sessions will be centrally located in the Sharwan Smith Ballroom on campus and will allow for four hours of display time; the authors must be present for two hours. Each poster presenter will be provided with at least one eye-height board, about 4 × 8 feet. Access to electrical outlets and furniture for poster sessions must be requested well in advance.

For technical assistance, contact Fred Lohrengel, Department of Physical Science, Southern Utah University, Cedar City, Utah 84720, lohrengel@suu.edu, (435) 586-7491. Other questions may be addressed to the technical program chair, Robert Blackett, blackett@suu.edu, (435) 865-8139.

FIELD TRIPS

Unless otherwise noted, field trips will begin and end at the western-most SUU parking lot, 211 South 1150 West, in Cedar City. For details about particular field trips, contact the field trip leaders listed below or the field trip coordinator, Peter D. Rowley, at (435) 865-5928, pdrowley@accesswest.com. We hope there will be a strong linkage between symposia and related field trips.

Preregistration for all field trips is strongly encouraged because of participant limitations. Participants are accepted on a first-come, first-served basis through GSA headquarters. Trip costs include transportation for the trip, field notes, and other services as noted by the following symbols: B—breakfast; L—lunch; D—dinner; ON—overnight lodging.

Field trip registrants must register for at least one day of the meeting. Registration after the preregistration deadline is possible if field trip logistics and space permit; please contact field trip coordinator, Pete Rowley. On-site registration for postmeeting trips may be possible during the meeting in the registration area.

If GSA must cancel a field trip due to logistics or registration requirements, a full refund for the field trip will be issued after the meeting. Be aware of cancellation deadlines and possible penalties imposed by the airlines.

Premeeting

1. **Structural Development and Paleoseismicity of the Hurricane Fault, Southwestern Utah and Northwestern Arizona.** Two-day trip, May 5–6. William R. Lund, Utah Geological Survey, (435) 865-8126, lund@suu.edu; Wanda J. Taylor, University of Nevada, Las Vegas. Max.: 34; min.: 20. Cost: $175 (2L, 1ON—double occupancy).
2. **Influences of Proterozoic and Laramide Structures on the Miocene Strain Field of the North Virgin Mountains, Arizona.** Two-day trip, departing Cedar City on May 4, return to Cedar City on the evening of May 6. Mark Quigley, (505) 277-6546, mcquigs@unm.edu, and Karl E. Karlstrom, University of New Mexico, Albuquerque. Max.: 40; min.: 12. Cost $180.
3. **The Navajo Aquifer System in Southwestern Utah.** One-day trip, May 6. Kimball E. Goddard, (801) 908-5033, kgoddard@usgs.gov; Victor Heilweil and others, Utah District, Water Resources Division, U.S. Geological Survey, West Valley City. Max: 36; min.: 14. Cost: $55 (1L).
4. **Volcanology and Mineral Resources of the Marysvale Volcanic Field, Southwestern Utah.** One-day trip, May 6. P.D. Rowley, Geologic Mapping, Inc., New Harmony, Utah, (435) 865-5928, pdrowley@accesswest.com; C.G. Cunningham, U.S. Geological Survey, Reston; J.J. Anderson, New Harmony, Utah; T.A. Steven, Lakewood, Colo.; J.B. Workman, U.S. Geological Survey, Denver. Max.: 42; min.: 14. Cost: $70 (1L).
5. **Late Cretaceous Marine and Brackish Water Strata in Grand Staircase–Escalante National Monument, Utah.** One-day trip, May 6. T.S. Dyman, U.S. Geological Survey, Denver, (303) 236-5730, dyman@usgs.gov; W.A. Cobban, U.S. Geological Survey, Denver; L.E. Davis, St. Johns University; R.L. Eves, Southern Utah University; G.L. Pollock, Bryce Canyon Natural History Association; J.D. Obradovich, U.S. Geological Survey, Denver; A. Titus, Grand Staircase–Escalante National Monument; K.I. Takahashi and T.C. Hester, U.S. Geological Survey, Denver; D. Cantu, Bryce Canyon Natural History Association. Max.: 28; min.: 7. Cost: $65 (1L).

Postmeeting

6. **NAGT: The Geology of the Grand Staircase in Southern Utah: Road Log and Guide for Public School Teachers.** Two-day trip, Fri. and Sat., May 10–11. Larry E. Davis, College of St. Benedict–St. John's University, (320) 363-3328, ldavis@csbsju.edu; Robert L. Eves, Southern Utah University. Max.: 29; min.: 9. Cost: $90 (2L, 1ON).
7. **Associated Miocene Laccoliths, Gravity Slides, and Volcanic Rocks, Pine Valley Mountains and Iron Axis, Southwestern Utah.** One-day trip, May 10. David B. Hacker, (330) 675-8831, dhacker@kent.edu; Daniel K. Holm, Kent State University. Max.: 36; min.: 7. Cost: $45 (1L).
8. **Hydrogeology and Groundwater Conditions of the Tertiary Muddy Creek Formation in the Lower Virgin River Basins of Southeastern Nevada, Arizona, and Utah.** One-day trip, May 10. Gary L. Dixon, Southwest Geology, Inc., Blackfoot, Idaho, (208) 782-2056, gldixon@ida.net; Michael Johnson and Michael Winters, Virgin Valley Water District, Nev. Max.: 42; min.: 14. Cost: $65 (1L).

SYMPOSIA

1. **Recent Investigations of Basin and**

Range Paleoseismology. Michael N. Machette, U.S. Geological Survey, (303) 863-8612, machette@gldvxa.cr.usgs.gov.

2. **Paleontological Research in Grand Staircase–Escalante National Monument and Surrounding Area.** Alan L. Titus, Grand Staircase–Escalante National Monument, (435) 644-4332, atitus@ut.blm.gov; Jeffrey G. Eaton, Weber State University, (801) 626-6225, jeaton@weber.edu.
3. **Rock Stars of the Colorado Plateau: The Geo Giants Upon Whose Shoulders We Stand.** Steven H. Heath, Southern Utah University, (435) 586-9334, heath@suu.edu.
4. **P³: Proterozoic Paleogeography and Paleoclimate.** Paul K. Link, Idaho State University, (208) 282-3365, linkpaul@isu.edu; Carol Dehler, Utah State University, (435) 797-0764, chuaria@cc.usu.edu.
5. **Hillslope and Mountain Slope Hazards in the Rocky Mountains.** Paul M. Santi, Colorado School of Mines, (303) 273-3108, psanti@mines.edu; Francis X. Ashland, Utah Geological Survey, (801) 537-3380, fashland.nrugs@state.ut.us.
6. **Geology for Public Policy.** *(Sponsored by Institute for Earth Science and the Environment.)* Lee Gerhard, Kansas Geological Survey, (785) 864-2195, lgerhard@kgs.ukans.edu; Victor Yannacone Jr., (516) 758-9468, v_yannacone@icnt.net.

THEME SESSIONS

1. **Undergraduate Research Poster Session.** *(Sponsored by the Geoscience Division of the Council on Undergraduate Research.)* Kim Hannula, (970) 247-7463, hannula_k@fortlewis.edu, Fort Lewis College, Durango, CO 81301. This session will showcase senior theses and other undergraduate research projects. A student must be listed as the lead author and be the major preparer of the poster. For information, contact Hannula.
2. **National Cooperative Geologic Mapping Program—New Maps, New Research, New Discoveries.** Grant C. Willis, Robert F. Biek, and Douglas A. Sprinkel, Utah Geological Survey, (801) 537-3355, nrugs.gwillis@state.ut.us.
3. **Gemstone and Semiprecious Minerals and Host Rocks in the Western United States.** W. Dan Hausel, Wyoming Geological Survey, (307) 766-2286, dhause@wsgs.uwyo.edu.
4. **Groundwater Recharge Processes in the Arid Southwest.** Kimball E. Goddard, U.S. Geological Survey, Water Resources Division, (801) 908-5033, kgoddard@usgs.gov.
5. **Groundwater Flow Systems in the Desert Southwest.** Peter D. Rowley, Geologic Mapping, Inc., (435) 865-5928, pdrowley@accesswest.com.
6. **Volcanology and Mineral Resources of the Great Basin and the Colorado Plateau Transition Zone.** John J. Anderson, Kent State University (retired), (435) 867-8553, jjau@accesswest.com; Charles Cunningham, U.S. Geological Survey, (703) 648-6121, cunningham@usgs.gov.
7. **Cenozoic Landscape Evolution of the Colorado Plateau and the Basin-and-Range Transition Zone.** Joel L. Pederson, Utah State University, (435) 797-7097, bolo@cc.usu.edu.
8. **Connections: Correlation of Devonian Rocks in the Western Cordillera.** David K. Elliott, Northern Arizona University, (928) 523-4561, david.elliott@nau.edu; Carol Dehler, Utah State University, (435) 797-0764, chuaria@cc.usu.edu.
9. **Latest Developments in the Paleozoic of the Great Basin.** Russell S. Shapiro, Department of Geoscience, University of Nevada, Las Vegas, (702) 895-1239, rshapiro@nevada.edu.
10. **NAGT Session I: Field Trips—Their Importance in Undergraduate Education.** Larry E. Davis, College of St. Benedict–St. John's University, (320) 363-3328, ldavis@csbsju.edu.
11. **NAGT Session II: Higher Education/K–12 Partnerships and Mentorships.** Larry E. Davis, College of St. Benedict–St. John's University, (320) 363-3328, ldavis@csbsju.edu.

STUDENT WORKSHOP

Roy J. Shlemon Mentor Program in Applied Geoscience. Tues., May 7, 11:30 a.m.–1:30 p.m. Karlon Blythe, GSA Program Officer, kblythe@geosociety.org. Workshop for graduate and advanced undergraduate students about professional opportunities and challenges in the real world. Free lunch provided. Preregistration is encouraged to secure a seat, but meeting registration is not required to attend only this workshop.

SHORT COURSES

Premeeting

1. **GSA and AEG Partnership Short Course: Phase I Environmental Site Assessments.** Mon., May 6. Raymond C. Kimbrough, rckimbro@aol.com, (205) 343-2432. Min.: 10; max.: 40; cost: $200 (includes an extensive course manual and other materials). Optional exam fee: $90 (paid in advance to NREP; includes exam fee and one year's registration as an REPA).

Postmeeting

2. **Processing and Interpretation of Satellite Imagery for Geologic Mapping.** Fri., May 10, 8 a.m.–5 p.m., Room 024, Science Building, SUU. John C. Dohrenwend, Southwest Satellite Imaging, Teasdale, Utah, dohrenwend@rkymtnhi.com, (435) 425-3118. Max.: 20; cost: $200 (includes course manual, data, CD-ROM, and lunch).
3. **Geological Engineering Field Camp Exercises.** Fri., May 10, 8 a.m.–5 p.m., Room 016, Science Building, SUU. Paul M. Santi, Colorado School of Mines, Golden, (303) 273-3108, psanti@mines.edu; Robert C. Laudon, University of Missouri—Rolla. Max.: 40; cost: $40 (includes lunch and field transportation).
4. **Introduction to Field Digital Mapping for Geology and Geomorphology using EDM (Total Station) and GMT (Generic Mapping Tool).** Fri., May 10, 8 a.m.–5 p.m., Room 016, Science Building, SUU. Koji Okumura, University of Hiroshima, Japan, kojiok@hiroshima-u.ac.jp. Max.: 20; cost: $50 (includes lunch and field transportation).

STUDENT TRAVEL SUPPORT

The Rocky Mountain Section and the GSA Foundation have travel grants available for GSA Student Associates who are presenting oral or poster papers as authors or co-authors. Students must be currently enrolled to be eligible. Rocky Mountain Section students should contact Kenneth E. Kolm, Colorado School of Mines, kkolm@mines.edu, (303) 273-3932.

STUDENT AWARDS

Awards will be given for the best oral and poster student papers at the meeting in both graduate and undergraduate categories. Awards will be based on the quality of both the research and presentation. To be eligible, a student must be the lead author and presenter of the work. The abstract must be clearly identified as a student paper.

BUSINESS MEETINGS

Paleontological Society Business Meeting. Held in conjunction with its luncheon (see "Special Events").

The Rocky Mountain Section Business Meeting. Held in conjunction with the meeting banquet (see "Special Events").

EXHIBITS

Exhibits will be centrally located in the Sharwan Smith Ballroom, SUU Campus, adjacent to the poster sessions The cost of a standard booth is $250 for commercial exhibitors and $50 for educational or non-profit institutions. For further information, contact the exhibits coordinator, Sue Finstick, Bullock Brothers Engineering, Inc., 36 North 300 West, P.O. Box 3174, Cedar City, Utah 84720, finstick@suu.edu, (435) 586-9592.

ACCOMMODATIONS

A block of rooms has been booked at the Holiday Inn, located near the Southern Utah University campus (see map) at $55 (plus tax) per night for single or double room. (Please note that a room tax will be added to this rate.) For reservations, call the Holiday Inn directly, 1575 West 200 North, (435) 586-8888, and identify yourself as a participant in the GSA Rocky Mountain Meeting. The reservation deadline is May 1, 2002. For a list of other nearby hotels, see the meeting Web sites.

TRAVEL

Cedar City lies along Interstate 15 in southwestern Utah, roughly two hours by car north of Las Vegas, Nevada, and three hours south of Salt Lake City. Regional airports serve the Cedar City–St. George area with daily flights to and from Salt Lake City (www.skywest.com). Rental cars are available at these airports (Avis Rent-a-Car, National Car Rental). Shuttle van service (www.stgshuttle.com) is also available to and from McCarren International Airport in Las Vegas. The SUU campus is within walking distance (less than one-half mile) of many hotels (see map).

SPOUSE AND GUEST ACTIVITIES

Calf Creek Falls and Anasazi State Park. Tues., May 7, 12 hours. Includes 5 1/2 mile, round-trip hike to 126-foot-high Lower Calf Creek Falls; picnic lunch; visit to Anasazi State Park. Cost: $65.

Zion National Park. Tues., May 7. Great White Throne, Angel's Landing, Court of the Patriarchs, and the Narrows. Cost: $69.

Lake Powell. Wed, May 8. Five-hour boat ride past beautiful formations; lunch provided at Wahweap Lodge. Cost: $139.

Bryce Canyon National Park. Wed, May 8. Hiking; lunch provided in park lodge; shopping at Ruby's Inn. Cost: $69.

Pioneer St. George. Thurs., May 9. St. George LDS temple and historic tabernacle. Cost: $39.

Historic Cove Fort and Fremont Indian Museum. Thurs., May 9. Tours; lunch provided; stops at the Beaver Cheese Factory and birthplace of Butch Cassidy. Cost: $29.

SPECIAL EVENTS

Ice Breaker. 6 p.m., Mon., May 6, Holiday Inn, 1575 West 200 North, Cedar City.

Paleontological Society Luncheon and Business Meeting. Noon, Tues., May 7, Zion A-B Rooms, Sharwan Smith Convention Center, SUU. Cost: $15 professionals; $12 students.

Annual Banquet and Business Meeting. 7 p.m., Wed., May 8, Great Hall, Hunter Conference Center, Southern Utah University Campus, 392 West Center. Cost: $18–$20 professionals; $15–$17 students.

ADDITIONAL INFORMATION

For complete descriptions of technical sessions, field trips, and short courses, and for more information on registration, accommodation, and activities, please contact the general chair, Robert L. Eves, Department of Physical Science, Southern Utah University, Cedar City, Utah 84720, eves@suu.edu, (435) 586-1934, or the technical program chair, Robert Blackett, Utah Geological Survey, SUU Box 9053, Cedar City, Utah 84720, (435) 865-8139, blackett@suu.edu.

Preregistration Form

GSA ROCKY MOUNTAIN SECTION MEETING
CEDAR CITY, UTAH • MAY 7–9, 2002
Preregistration deadline: April 2, 2002 • Cancellation deadline: April 9, 2002
Register online at www.geosociety.org.

GSA Mbr #_______________

First Name ______ Last Name ______

Mailing address   Is this a permanent address? ☐ Yes ☐ No   Is this home ☐ or work ☐

City ______ State or Province ______ ZIP or Postal Code ______ Country ______

E-mail ______ Daytime Phone ______ Fax ______

Badge Information

First Name/Nickname ______

School/Company ______ City/State/Prov. ______

Spouse/Guest First Name/Nickname ______ Last Name ______ City/State/Prov. ______

Do you or your guest require any special considerations? ☐Yes ☐No

Check member affiliation(s) (to qualify for registration member discount): ☐ (a) GSA
☐ (b) AWG ☐ (c) NAGT ☐ (d) PS

Preregistration Fees (US$)	Full Meeting	US$ Amt.	One Day	US$ Amt.
Professional Member*	(10) $ 50	$______	(11) $ 20	$______
Professional Member (70 & over)*	(12) $ 20	$______	(13) $ 15	$______
Professional Nonmember	(14) $ 60	$______	(15) $ 30	$______
Student Member or Student Associate*	(30) $ 20	$______	(31) $ 20	$______
Student Nonmember	(32) $ 30	$______	(33) $ 25	$______
Guest or Spouse**	(90) $ 20	$______	(91) $ 10	$______
K–12 Professional	(60) $ 10	$______	N/A	
			Total	$______

*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed above. Discount does not apply to guest registrants. **Guest or Spouse registration fee does not allow access to technical sessions.

FAX TO: **303-357-1071 or 303-357-1072**

MAIL TO: **2002 GSA ROCKY MOUNTAIN SECTION MEETING**
P.O. BOX 9140, BOULDER, CO 80301-9140

Remit in U.S. funds payable to 2002 GSA Rocky Mountain Section Meeting

*(All preregistrations must be prepaid. **Purchase orders not accepted.**)*

Payment by (check one): ☐ Check #______ ☐ American Express ☐ VISA ☐ MasterCard ☐ Discover

Card Number ______ Expires ______

Signature ______

GSAT

TICKETED EVENTS

				Qty	Amount
1. PS Luncheon and Business Meeting—May 7					
Professional			(301) $ 15	______	$ ______
Student			(301) $ 12	______	$ ______
2. Annual Banquet/Business Meeting—May 8	Beef	Chicken	Vegetarian		
Professional	(302) $20	(303) $19	(304) $ 18	______	$ ______
Student	(302) $17	(303) $16	(304) $ 15	______	$ ______

FIELD TRIPS

		Qty	Amount
1. Struct. Dev. and Paleoseismicity, Hurricane Fault—May 5–6	(401) $175	______	$ ______
2. Miocene Strain Field, N. Virgin Mtns., Ariz.—May 5–6	(402) $180	______	$ ______
3. Navajo Aquifer System, SW Utah—May 6	(403) $ 55	______	$ ______
4. Marysvale Volcanic Field, SW Utah—May 6	(404) $ 70	______	$ ______
5. Grand Staircase–Escalante Natl. Mon.—May 6	(405) $ 65	______	$ ______
6. NAGT: Grand Staircase, S. Utah—May 10–11	(406) $ 90	______	$ ______
7. Pine Valley Mtns. & Iron Axis, SW Utah—May 10	(407) $ 45	______	$ ______
8. Tertiary Muddy Creek, SE Nev., Ariz., and Utah—May 10	(408) $ 65	______	$ ______

SHORT COURSES

		Qty	Amount
1. Phase I Environmental Site Assessments—May 6	(501) $200	______	$ ______
2. Satellite Imagery for Geologic Mapping—May 10	(502) $200	______	$ ______
3. Geol. Engineering Field Camp Exercises—May 10	(503) $ 40	______	$ ______
4. Intro. Field Digital Mapping, EDM and GMT—May 10	(504) $ 50	______	$ ______

GUEST ACTIVITIES

		Qty	Amount
1. Calf Creek Falls and Anasazi State Park—May 7	(101) $ 65	______	$ ______
2. Zion National Park—May 7	(102) $ 69	______	$ ______
3. Lake Powell—May 8	(103) $139	______	$ ______
4. Bryce Canyon National Park—May 8	(104) $ 69	______	$ ______
5. Pioneer St. George—May 9	(105) $ 39	______	$ ______
6. Cove Fort, Fremont Indian Museum—May 9	(106) $ 29	______	$ ______

STUDENT WORKSHOP

		Qty	Amount
1. Shlemon Mentor Program—May 7	(650) **FREE**	______	**FREE**

(Meeting registration is not required to attend this workshop.)

Subtotal $ ______

Registration Fees $ ______

TOTAL FEES REMITTED **$ ______**

Final Announcement

CORDILLERAN SECTION, GSA

GEOLOGICAL SOCIETY OF AMERICA Where Plates Collide 2002

98th Annual Meeting · Corvallis, Oregon · May 13–15, 2002
www.geosociety.org/sectdiv/cord/02cdmtg.htm · terra.geo.orst.edu/users/gsa2002

You are invited to attend the 98th annual meeting of the Cordilleran Section of GSA, close to the North America–Juan de Fuca Plate boundary in Corvallis, Oregon. The active volcanic arc is visible to the east, and we are on the edge of the outer-arc high (Coast Range) to the west. The theme of the meeting is **"Where Plates Collide."**

The convention host is the Department of Geosciences, Oregon State University (OSU). Participating organizations include the Northwest Energy Association (NWEA) of the American Association of Petroleum Geologists (AAPG), the Oregon and Washington Chapters of the Association of Engineering Geologists (AEG), the Cordilleran Section of the Paleontological Society (PS), and the National Association of Geoscience Teachers (NAGT). The meeting will be held at the LaSells Stewart Center and CH2M Hill Alumni Center, Oregon State University. Free parking is available at nearby Reser Stadium, and a free shuttle will operate between the convention site and motels in downtown Corvallis. The convention chair is Bob Yeats, (541) 737-1226, yeatsr@geo.orst.edu.

REGISTRATION

Preregistration deadline: April 5, 2002
Cancellation deadline: April 12, 2002

Register online at the GSA Web site, www.geosociety.org/sectdiv/cord/02cdmtg.htm, download a PDF version of the registration form, or use the form printed on page 45. Discounts are available for those organizations listed on the form. Guest registration is required for all those attending guest activities or exhibits. Registration questions should be directed to the registration coordinator, Jeff Templeton, (503) 838-8858, templej@wou.edu or GSA Member Services, 1-888-443-4478, member@geosociety.org.

On-site registration will be available at the LaSells Stewart Center starting at 4 p.m. Sunday, May 12. The meeting program will be distributed free to all registrants. The *Abstracts with Programs* volume will be available for purchase at the registration desk for $15 for those who have not previously purchased them as part of their GSA dues. Students and K–12 teachers must show current ID to obtain reduced rates.

GSA is committed to making all events at the 2002 meeting accessible to all people interested in attending. Indicate special requirements (wheelchair accessibility, etc.) on the registration form.

KEYNOTE ADDRESS

John R. Delaney, Professor of Oceanography, University of Washington: **"Exploring the Oceans off the Pacific Northwest."** Mon., May 13, 8 p.m., Austin Auditorium, LaSells Stewart Center. Open to the public.

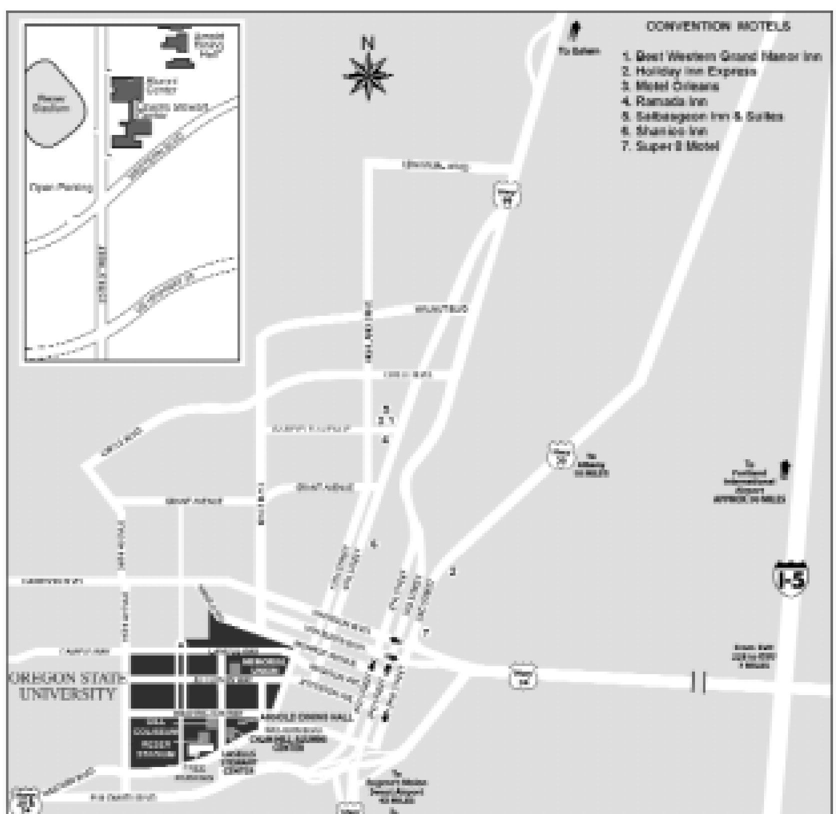
TECHNICAL PROGRAM

Besides the usual discipline-related technical sessions, 36 theme sessions and symposia have been organized for this meeting. Only titles and chairs are listed below; see www.geosociety.org/sectdiv/cord/02cdmtg.htm or http://terra.geo.orst.edu/users/gsa2002 for descriptions. Theme sessions will include both invited and volunteered papers.

Unless otherwise arranged by theme session chairs, oral sessions will allow 12 minutes for presentation and three minutes for discussion and change of speakers. Technical session rooms will have two 35 mm carousel slide projectors, one overhead projector, and one LCD digital projector. *Presenters must bring their own computer (PC or Macintosh) and cable for the digital projector; bring slides or overheads as backup.* Extra carousel slide trays will be available in the Speaker Ready Room in the CH2M Hill Alumni Center; however, speakers are strongly encouraged to bring their slides already loaded into a carousel tray.

Posters will be on display for 4 hours, and poster presenters must be present for two hours. Each poster booth will contain 8×4 feet of exhibit space.

Address general questions to the technical program chair, Andrew Meigs, (541) 737-1214, meigsa@geo.orst.edu. The poster chair is Roy Haggerty, (541) 737-1210, haggertr@geo.orst.edu. For questions



about presentations using the digital projector, contact Julia Jones, jonesj@geo.orst.edu.

Theme Sessions and Symposia

1. **Presenting Geology to the Public in Parks, Museums, and Outdoor Classrooms.** (Sponsored by NAGT.) Bob Lillie, (541) 737-1242, lillier@geo.orst.edu; Carolyn Driedger.
2. **The Evolving Pacific Northwest Landscape: Geomorphic and Ecologic Controls, Constraints, and Conundrums in the Quaternary.** Gordon Grant, (541) 750-7328, Gordon.Grant@orst.edu; Stephen Lancaster; Shannon Hayes.
3. **Constraints on Cretaceous Paleogeography of the Western Cordilleran Margin.** Bernie Housen, (360) 650-6573, bernieh@cc.wwu.edu; Brian Mahoney.
4. **Geology and Hydrology of the Willamette Basin, Oregon.** *(Sponsored by AEG.)* Jim O'Connor, (503) 251-3222, oconnor@usgs.gov; Marshall Gannett.
5. **Architecture of Cascadia: A Synthesis of New Geologic and Geophysical Mapping Along the Convergent Margin.** *(Sponsored by NWEA of AAPG.)* Ray Wells, (650) 329-4933, rwells@usgs.gov; Tim Walsh; Ian Madin. POSTERS
6. **Hazards and Risks from Cascade Volcanoes.** *(Sponsored by AEG.)* Britt Hill, (210) 522-6087, bhill@swri.edu; Ed Taylor. ORAL AND POSTERS
7. **Pattern and Rates of Long-term Deformation across the Washington Segment of the Cascadia Forearc High.** Mark Brandon, (203) 432-3135, mark.brandon@yale.edu; Dave Montgomery; Frank Pazzaglia.
8. **Debris Flows: Theory and Practice.** *(Sponsored by AEG.)* Dick Iverson, (360) 993-8920, riverson@usgs.gov; Keith Mills; Jon Hofmeister.
9. **Unraveling the Tertiary Stratigraphy and Structure of the Pacific Northwest and its Implications for Hydrocarbon Occurrence and Underground Gas Storage: In Honor of Alan and Wendy Niem.** *(Sponsored by NWEA of AAPG.)* Jack Meyer, h2m@nwnatural.com; George Sharp; Robert Deacon.
10. **Engineering Geology Case Histories of Landslides.** *(Sponsored by AEG.)* Scott Burns, (503) 725-3389, burnss@pdx.edu; Charlie Hammond.
11. **Coastal Paleodune Landscapes.** *(Sponsored by AEG.)* Curt Peterson, (503) 725-3375, petersonc@pdx.edu; Chuck Rosenfeld.
12. **Active Tectonics of Cascadia: Geodesy.** Herb Dragert, (250) 363-6447, dragert@pgc.nrcan.gc.ca; Meghan Miller.
13. **Active Tectonics of Cascadia: Continental Shelf and Slope and Accretionary Prism.** Chris Goldfinger, (541) 737-5214, gold@oce.orst.edu.
14. **Active Tectonics of Cascadia: Deformation in the North America Plate.** Ray Weldon, ray@newberry.uoregon.edu; Pat McCrory; Gene Humphreys; Mark Hemphill-Haley.
15. **Submarine Volcanism and Hydrothermal Vents in the Northeast Pacific.** Bill Chadwick, (541) 867-0179, chadwick@pmel.noaa.gov.
16. **Terrestrial Paleontology of the Pacific Northwest.** *(Sponsored by PS.)* Jeff Myers, (503) 838-8365, myersj@wou.edu.
17. **Third Decadal Symposium on the Geology of Washington: In Honor of Rowland W. Tabor.** Eric Cheney, (206) 543-1163, vaalbara@u.washington.edu; Josh Logan.
18. **Pacific Northwest Geology East of the Cascades: In honor of George W. Walker.** Martin Streck, (503) 725-3379, streckm@pdx.edu; Anita Grunder.
19. **Applications of Geographic Information Systems in Geology and Geophysics.** Dawn Wright, (541) 737-1229, dawn@dusk.geo.orst.edu
20. **Jurassic Tectonics and Magmatism in Outboard Terranes from Northern California to Washington.** Greg Harper, (518) 442-4476, gdh@csc.albany.edu; Cal Barnes.
21. **Groundwater and Surface-Water Interactions.** Roy Haggerty, (541) 737-1210, haggertr@geo.orst.edu.
22. **Environmental Cleanup: Use of Hydrogeological and Biological Principles and GIS.** *(Sponsored by AEG.)* John Kuiper, (503) 639-3400, john.kuiper@agraus.com.
23. **Natural Hazard Monitoring and Warning Systems.** Mark Darienzo, (503) 378-2911, ext. 237, mdarien@oem.state.or.us.
24. **Invertebrate Paleontology: In honor of Ellen J. Moore.** *(Sponsored by PS.)* Elizabeth Nesbitt, (206) 543-5949, lnesbitt@uwashington.edu.
25. **Quaternary Paleoclimates Inferred from Eolian Deposits in the Western United States.** Mark Sweeney, (509) 335-5987, sweeney@wsunix.wsu.edu; David Gaylord.
26. **Surface Effects of the Nisqually, Washington, Earthquake of February 28, 2001.** *(Sponsored by AEG.)* Tim Walsh, (360) 902-1432, tim.walsh@wadnr.gov; Kathy Troost.
27. **Catastrophic Glacial Outburst Floods in the Pacific Northwest: A Progress Report.** Pat Spencer, (509) 527-5222, spencerp@whitman.edu.
28. **Innovations in Earth Science Education: Dorothy LaLonde Stout Memorial Session.** *(Sponsored by NAGT.)* Peter Wampler, (541) 758-8418, wamplerp@geo.orst.edu; Jeff Templeton.
29. **Undergraduate Research Poster Session.** *(Sponsored by Council on Undergraduate Research.)* Karen Grove, (415) 338-2617, kgrove@sfsu.edu.
30. **Volcanic Arcs and Ores: Links of Magmatic Gases with Porphyry Copper and Epithermal Gold Deposits and Geothermal Systems.** John Dilles, (541) 737-1245, dillesj@geo.orst.edu; Cy Field; Mark Reed.
31. **Phanerozoic Subduction-Related Magmatism in Mexico: Comparison with the Rest of the Cordillera.** Elena Centeno-Garcia, +52-5622-4309, centeno2@prodigy.net.mx; Luca Ferrari.
32. **Communicating Science: Lessons from the Klamath Basin.** Maria Panfill, (541) 737-4032, panfil@engr.orst.edu.
33. **Geophysics and Biogeochemistry of Gas Hydrates and Methane Seeps on the Northeastern Pacific Margin.** Marta E. Torres, (541) 737-2902, mtorres@oce.orst.edu; Joel E. Johnson. ORAL AND POSTER

Symposia

1. **Paleogeodesy: Unraveling Displacement Fields in Magmatic Arcs: In Honor of Othmar Tobisch.** Brendan McNulty, (310) 243-3412, bmcnulty@csudh.edu; Scott Paterson.
2. **Geology for Public Policy.** *(Sponsored by Institute for Earth Science and the Environment.)* Lee Gerhard, (785) 864-2195, lgerhard@kgs.ukans.edu; Victor Yannacone Jr., (516) 758-9468, v_yannacone@icnt.net.
3. **Contributions to Tectonics and Fission-track Dating in the Pacific Northwest: In Honor of Joseph A. Vance.** Mark Brandon, (203) 432-3135, mark.brandon@yale.edu; Darrel Cowan; John Garver.

FIELD TRIPS—REGISTER EARLY!

Field-trip preregistration deadline: April 5, 2002

Cancellation deadline: April 12, 2002

Except as noted, all trips leave from the north entrance to the CH2M Hill Alumni Center (open parking available at Reser Stadium). Specifics will be sent to registrants. Trip fees include transportation during the trip and a copy of the comprehensive field-trip guidebook, a special publication of the Oregon Department of Geology and Mineral Industries. The guidebook will also be on sale at the meeting. Other included services are indicated by the following letter code: B—breakfast; L—lunch; R—refreshments; D—dinner; N—overnight lodging. Meeting registration recommended but not required for field trips. We suggest that participants not make plane reservations until field-trip participation is confirmed. Trip descriptions are posted at www.geosociety.org/sectdiv/cord/02cdmtg.htm and http://terra.geo.orst.edu/users/gsa2002. For additional information, contact the field-trip leader or the field trip chair, George Moore, (541) 737-1244, mooreg@geo.orst.edu.

A limited number of **field-trip scholarships** (providing a 50% reduction in field-trip fees) are available for students. Students should register for field trips with GSA and submit a separate letter of request giving student status, e-mail address, and explanation of interest in the field trip to George Moore, Dept. of Geosciences, Oregon State University, Corvallis, OR 97331-5506, by April 5. Awards will be based on (1) merit and (2) availability of funds. Awards will be made on April 12.

Student drivers for vans will have their field-trip fees waived. Students interested in driving a van should contact the field-trip leader. Anyone planning to drive OSU vans must request an OSU vehicle driver authorization form from George Moore.

Premeeting Trips

1. **Fluvial Record of Plate-Boundary Deformation in the Olympic Mountains.** Noon (Corvallis), 2 p.m. (Portland airport). Thurs.–Sun, May 9–12. Frank Pazzaglia, Lehigh University, (610) 758-3667, fjp3@lehigh.edu; Mark Brandon, Yale University; Karl Wegmann, Washington Dept. of Natural Resources. Max.: 30; cost: $315 (3B, 4L, 4R, 3D, 3N, vans, lodge).
2. **Geology and Geomorphology of the Lower Deschutes River Canyon, Oregon.** 6 a.m. (Corvallis), 8 a.m. (Portland airport). Fri.–Sun., May 10–12. Robin Beebee, University of Oregon, (541) 346-4354, rbeebee@darkwing.uoregon.edu; Jim O'Connor, USGS; Gordon Grant, U.S. Forest Service. Max.: 10; cost: $410 (2B, 3L, 3R, 2D, van, professionally-guided raft, camping on the river; bring sleeping bag and tent, drybag provided).
3. **Hydrogeology of the Upper Deschutes Basin, Central Oregon: A Young Basin Adjacent to the Cascade Volcanic Arc.** 4 p.m., Fri.–Sun., May 10–12. David Sherrod, USGS, (808) 967-8831, dsherrod@usgs.gov; Marshall Gannett, USGS; Kenneth Lite, Oregon Water Resources Dept. Max.: 24; cost: $115 (2B, 2L, 2R, D, 2N, vans, rustic ski-lodge, bring sleeping bag and towel).
4. **North-Central Oregon Cascade Margin: Exploring Petrologic and Tectonic Intimacy in a Propagating Intra-Arc Rift.** 8 a.m., Sat. and Sun., May 11–12, overnight in Redmond. Richard Conrey, Washington State University (509) 332-6610, conrey@mail.wsu.edu; Ed Taylor, OSU. Max.: 22; cost: $95 (L, 2R, N).
5. **Pleistocene and Holocene Dunal Landscapes of the Central Oregon Coast, Newport to Florence.** 9 a.m., Sat. and Sun., May 11–12, overnight in Florence. Curt Peterson, Portland State University, (503) 725-3375, petersonc@pdx.edu; Courtney Cloyd, USFS; Georg Grathoff, PSU. Max.: 20, Cost: $95 (2L, 2R, N, vans, dunebuggy ride).
6. **Landslides at Kelso, Washington, and Portland, Oregon.** *(Sponsored by AEG.)* 7:30 a.m. (Corvallis), 9 a.m. (Cromer Hall, PSU, 1721 SW Broadway). Sun., May 12. Scott Burns, Portland State University, (503) 725-3389, burnss@pdx.edu; Tom Kuper, Kuper Consulting; John Lawes, PSU. Max.: 26; cost: $35 (L, R, vans).
7. **Miocene Molluscan Fossils and Stratigraphy, Newport, Oregon.** *(Sponsored by PS.)* 9 a.m., Sun., May 12. Ellen Moore, OSU, (541) 758-0314, ellen.moore@cmug.com; George Moore, OSU. Max.: 13; cost: $35 (L, R, van).
8. **Geomorphology and Hydrology of the H.J. Andrews Experimental Forest, Blue River, Oregon.** 9 a.m., Sun., May 12. Julia Jones, OSU, (541) 737-1224, jonesj@geo.orst.edu; Fred Swanson, U.S. Forest Service. Max.: 22; cost: $35 (L, R, vans).

Trips During Meeting

9. **Paleobotanical Record of Eocene-Oligocene Climate and Vegetational Change Near Eugene, Oregon.** *(Sponsored by PS.)* 12:30 p.m., Mon., May 13. Jeff Myers, Western Oregon University, (503) 838-8365, myersj@wou.edu; Paul Kester, University of Washington; Greg Retallack, University of Oregon. Max.: 20; cost: $35 (L, R, vans).
10. **Geology of Vineyards in the Willamette Valley, Oregon.** 5 p.m., Mon., May 13. George Moore, OSU, (541) 737-1244, mooreg@geo.orst.edu. Max.: 44; cost: $30 (vans, wine, artisan breads, and cheese).

Postmeeting Trips

11. **Bimodal Volcanism and Tectonism of the High Lava Plains, Oregon.** 5 p.m., Wed.–Fri., May 15–17, overnight in Bend first night, Burns second night. Brennan Jordan, OSU, (541) 737-1249, jordanb@geo.orst.edu; Martin Streck, Portland State University; Anita Grunder, OSU. Max.: 21; cost: $190 (2L, 2R, 2N, vans).
12. **Josephine and Coast Range Ophiolites, Oregon and California.** 5 p.m., Wed.–Sat., May 15–18. Greg Harper, SUNY Albany, New York, (518) 442-4476, gdh@csc.albany.edu; Mario Giaramita, California State University Stanislaus. Max.: 33; cost: $385 (B, 3L, 3R, D, 3N, vans, jet boat, wilderness lodge).
13. **Columbia River Gorge Landslides.** *(Sponsored by AEG.)* 9 a.m., Thurs., May 16. Begins and ends at Portland State Office Building, 800 NE Oregon St. (corner of 7th), Portland. Yumei Wang, Oregon Dept. of Geology and Mineral Industries, (503) 731-4100, ext. 226, yumei.wang@dogami.state.or.us; Scott Burns, Jon Hofmeister, and Vicki McConnell (DOGAMI). Max.: 20; cost: $35 (L, R, vans).

WORKSHOPS

Workshops will be held at several locations on the OSU campus. The workshop chair is Bob Lillie, (541) 737-1242, lillier@geo.orst.edu.

Premeeting

1. **Parks and Plates: How Earth's Dynamic Forces Shape Our National Parks.** Sun., May 12, 8 a.m.–5 p.m., Wilkinson Hall, Rm. 108. Bob Lillie, Oregon State University, (541) 737-1242, lillier@geo.orst.edu. Max.: 40; cost: $30 (includes course notes).

Postmeeting

2. **Geographic Information Systems Applications in the Earth Sciences.** Thurs., May 16, 8 a.m.–noon. Peavy

Hall, Rm. 236. Michael Wing, OSU, (541) 737-4009, michael.wing@orst.edu. Max.: 18; cost: $30 (includes course notes and snacks).

3. **Integrating Geology and Geophysics on PC Workstations: 3-D Seismic.** Thurs., May 16, 8 a.m.–4:30 p.m. Valley Library, Rm. 5420. Alex Garcia, Seismic Microtechnology, (713) 464-6188, agarcia@seismicmicro.com. Max.: 15; cost: $100 (includes individual workstation use and course notes).

K–12 EDUCATIONAL ACTIVITIES Sponsored by NAGT

Premeeting Field Trips

See "Field Trips," for registration and departure information.

1. **Oligocene Flora at Sweet Home, Oregon: A Field Study for K–12 Teachers.** 9 a.m.–5.p.m., Sat., May 11. Larry Enochs, OSU, (541) 737-1305, enochsl@ucs.orst.edu; Lockwood DeWitt, Erwin Schutfort, and Peter Wampler, OSU. Max.: 33; cost: $30 (vans, lunch, and new book, *Field Guide to Geologic Processes in Cascadia*).
2. **Luckiamute River Watershed, Upper Willamette Basin, Oregon: An Integrated Environmental Study for K–12 Teachers.** 7:30 a.m.–5 p.m., Sun., May 12. Steve Taylor, Western Oregon University, (503) 838-8398, taylors@wou.edu; Bryan Dutton and Pete Poston, WOU. Max.: 33; cost: $30 (vans, lunch, and the new book, *Field Guide to Geologic Processes in Cascadia*).

STUDENT WORKSHOP

Roy J. Shlemon Mentor Program in Applied Geoscience Workshop and Field Trip. Two sessions. Workshop: Tues., May 14, 11:30 a.m.–1 p.m., CH2M Hill Alumni Center, Rm. 111A. Max.: 25. Field trip: Wed., May 15, 11:30 a.m.–2 p.m. Meet at CH2M Alumni Center, Rm. 111A, to pick up lunch and proceed to van. Max.: 12; priority given to those attending the Tuesday session. Free lunch to registered attendees at each session. Karlon Blythe, GSA Program Officer, kblythe@geosociety.org. Program led by Tom and Dorian Kuper of Kuper Consulting LLC, an independent engineering-geology consulting firm in Tualatin, Oregon. Preregistration is encouraged to secure a seat, but meeting registration is not required to attend.

EXHIBITS

Exhibits will be located in the lobby of LaSells Stewart Center adjacent to the poster sessions. Exhibits chair is Cy Field, (541) 737-1219, fieldc@geo.orst.edu. Exhibits will be up from Sunday evening to Wednesday at noon.

GUEST PROGRAM

Oregon Coast. 9 a.m., Mon., May 13. Visit to coastline of Oregon, Oregon Coast Aquarium, Nye Beach. Angela Yeats, (541) 754-0622, oryeats@home.com. Max.: 13; cost: $20.
Wine Tasting. 5 p.m., Mon., May 13. See field trip 10.
Walking Tour of OSU Campus. Self-guided; height of rhododendron and azalea season. Guide in registration packet.

SOCIAL EVENTS

Welcoming Icebreaker. Sun., May 12, 6–9 p.m. Lobby of LaSells Stewart Center.
Alumni Get-togethers. Tues., May 14, 6–8 p.m. CH2M Hill Alumni Center. If interested in a special site for your school, contact Roy Haggerty, (541) 737-1210, haggertr@geo.orst.edu. Beer and wine cash bar; hors d'oeuvres provided; costs shared among participating schools.

BUSINESS MEETINGS

Cordilleran Section GSA Management Board Meeting. Mon., May. 13, noon–1:30 p.m., CH2M Hill Alumni Center Johnson Lounge.
National Association of Geoscience Teachers Luncheon. Mon., May 13, noon–1:30 p.m., CH2M Hill Alumni Center, Rm. 114. Cost: $12.
Association for Women Geoscientists Breakfast. Tues., May 14, 7:30 a.m., CH2M Hill Alumni Center Johnson Lounge. Cost $12.
Paleontological Society. Tues., May 14, noon–1:30 p.m., CH2M Alumni Center Johnson Lounge. Cost: $12.
Cordilleran Section GSA Annual Business Meeting. Wed., May 15, noon–1:30 p.m., CH2M Hill Alumni Center Johnson Lounge. Cost: $12.

STUDENT AWARDS AND SUPPORT

Scholarships are available to assist students who are attending field trips; see "Field Trips."

The GSA Cordilleran Section and GSA Foundation have funds available for partial support of Student Members or Associates who are presenting papers or posters. Apply to Cordilleran Section Secretary-Treasurer Joan E. Fryxell, Dept. of Geological Sciences, California State University, San Bernardino, CA 92407, (909) 880-5311, jfryxell@csusb.edu. The student must be a GSA Student Associate or Member of the Cordilleran Section as of February 28, 2002. *Applications must be received by the section secretary by March 1, 2002.* A student can only receive travel support from one section.

The GSA Cordilleran Section will present cash awards for best and honorable mention undergraduate and graduate presentations (both oral and poster). The student must be both first author and presenter, must be a GSA Student Associate or Member, and must be registered for the meeting.

Preregistered students may earn $75 for serving as projectionists for two half-day sessions during the meeting. To sign up, click on the Student Workers link when registering, and indicate the time you are available. Other student opportunities: assist at preregistration and in the Speaker Ready Room. Contact Randy Milstein, milsteir@geo.orst.edu, with questions. For field-trip drivers, see "Field Trips."

ACCOMMODATIONS AND TRAVEL

Several blocks of rooms have been reserved in downtown Corvallis motels (located on map). Reservations should be made by the attendees. Details on housing can be found at the OSU Web site, terra.geo.orst.edu/users/gsa2002/housing. Cutoff date for guaranteed GSA rates is April 15. Shuttle service to and from the meeting will be provided from convention motels.

Details on airlines serving the area, discounts, and shuttle services are posted at www.geosociety.org/sectdiv/cord/02cdmtg.htm or http://terra.geo.orst.edu/users/gsa2002.

CANCELLATIONS, CHANGES, AND REFUNDS

All requests for registration additions, changes, or cancellations must be made in writing and be received by GSA by **April 12, 2002.** No refunds will be made on cancellation notices received after this date. Refunds will be mailed from GSA after the meeting. Refunds for fees paid by credit card will be credited to the card number on the preregistration form. There will be NO refunds for on-site registration or ticket sales.

FURTHER INFORMATION

For further information, contact the convention chair, Bob Yeats, (541) 737-1226, yeatsr@geo.orst.edu, or see www.geosociety.org/sectdiv/cord/02cdmtg.htm or http://terra.geo.orst.edu/users/gsa2002. A printout of the detailed announcement is available from GSA Meetings, P.O. Box 9140, Boulder, CO 80301-9140 or (303) 447-2020.

Preregistration Form

GSA CORDILLERAN SECTION MEETING
CORVALLIS, OREGON • MAY 13–15, 2002
Preregistration deadline: April 5, 2002 • Cancellation deadline: April 12, 2002
Register online at www.geosociety.org.

GSA Mbr #______________

First Name ______ Last Name ______

Mailing address Is this a permanent address? ☐ Yes ☐ No Is this home ☐ or work ☐

City ______ State or Province ______ ZIP or Postal Code ______ Country ______

E-mail ______ Daytime Phone ______ Fax ______

Badge Information

First Name/Nickname ______

School/Company ______ City/State/Prov. ______

Spouse/Guest First Name/Nickname ______ Last Name ______ City/State/Prov. ______

Do you or your guest require any special considerations? ☐Yes ☐No

Check member affiliation(s) (to qualify for registration member discount): ☐ (a) GSA ☐ (b) AAPG ☐ (c) AEG ☐ (d) PS ☐ (e) NAGT ☐ (f) SEPM

Preregistration Fees (US$)	Full Meeting	US$ Amt.	One Day	US$ Amt.
Professional Member*	(10) $100	$______	(11) $50	$______
Professional Nonmember	(14) $125	$______	(15) $60	$______
Student Member or Student Associate*	(30) $ 50	$______	(31) $25	$______
Student Nonmember	(32) $ 60	$______	(33) $30	$______
Guest or Spouse**	(90) $ 10	$______	N/A	
K–12 Professional	(60) $ 30	$______	(61) $15	$______
Field Trip or Workshop Only	no charge			
			Total	$______

*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed above. Discount does not apply to guest registrants. **Guest or Spouse registration fee does not allow access to technical sessions.

FAX TO: **303-357-1071 or 303-357-1072**

MAIL TO: **2002 GSA CORDILLERAN SECTION MEETING**
P.O. BOX 9140, BOULDER, CO 80301-9140

Remit in U.S. funds payable to 2002 GSA Cordilleran Section Meeting

(All preregistrations must be prepaid. ***Purchase orders not accepted.****)*

Payment by (check one): ☐ Check #______ ☐ American Express ☐ VISA ☐ MasterCard ☐ Discover

Card Number ______ Expires ______

Signature ______

GSAT

TICKETED EVENTS

			Qty	Amount
1. NAGT Luncheon—May 13	(301)	$ 12	______	$ ______
2. Association of Women Geoscientists Breakfast—May 14	(303)	$ 12	______	$ ______
3. PS Luncheon—May 14	(302)	$ 12	______	$ ______
4. Cord Section Business Meeting and Luncheon—May 15	(304)	$ 12	______	$ ______

FIELD TRIPS

1. Olympic Mountains—May 9–12	(401)	$315	______	$ ______
2. Lower Deschutes Canyon Raft Trip—May 10–12	(402)	$410	______	$ ______
3. Upper Deschutes Basin Hydrogeology—May 10–12	(403)	$115	______	$ ______
4. North-Central Oregon Cascade Margin—May 11–12	(404)	$ 95	______	$ ______
5. Dunes of Central Oregon Coast—May 11–12	(405)	$ 95	______	$ ______
6. Landslides at Kelso and Portland—May 12	(406)	$ 35	______	$ ______
7. Molluscan Fossils and Strat., Newport, Ore.—May 12	(407)	$ 35	______	$ ______
8. Experimental Forest, Blue River, Ore.—May 12	(408)	$ 35	______	$ ______
9. Paleobotany Near Eugene, Ore.—May 13	(409)	$ 35	______	$ ______
10. Vineyards in the Willamette Valley—May 13	(410)	$ 30	______	$ ______
11. High Lava Plains, Oregon—May 15–17	(411)	$190	______	$ ______
12. Ophiolites, Oregon and California—May 15–18	(412)	$385	______	$ ______
13. Columbia River Gorge Landslides—May 16	(413)	$ 35	______	$ ______

K–12 EDUCATIONAL ACTIVITIES

1. Oligocene Flora, Sweet Home, Ore., Field Trip—May 11	(501)	$ 30	______	$ ______
2. Luckiamute River Watershed, Field Trip—May 12	(502)	$ 30	______	$ ______

WORKSHOPS

1. Parks and Plates—May 12	(601)	$ 30	______	$ ______
2. GIS Applications in Earth Science—May 16	(602)	$ 30	______	$ ______
3. 3-D Seismic on PC Workstations—May 16	(603)	$100	______	$ ______

GUEST ACTIVITIES

1. Oregon Coast Trip—May 13	(101)	$ 20	______	$ ______
2. Field Trip 10: Vineyards in Willamette Valley—May 13	(410)	$ 30	______	$ ______

STUDENT WORKSHOP

1. Shlemon Mentor Program—May 14	(650)	**FREE**	______	**FREE**
May 15	(651)	**FREE**	______	**FREE**

(Meeting registration is not required to attend this workshop.)

STUDENT WORKERS WANTED. Preregistered students can sign up at http://terra.geo.orst.edu/users/gsa2002. Click on Student Workers.

Subtotal $ ______

Registration Fees $ ______

TOTAL FEES REMITTED **$ ______**

CoFORCE: COASTAL FORECASTING IN RAPIDLY CHANGING ENVIRONMENTS

Report of a National Science Foundation–Sponsored Workshop
November 2–4, 2000 • Rice University, Houston, Texas, USA

Challenges in Coastal Forecasting

The world's population continues to migrate toward the coasts, despite the fact that the capacity for coastal environments to sustain this growth is highly uncertain. Almost half of the coastal wetlands have been destroyed during the past century, due in large part to human encroachment. Frequent hurricane and severe storm landings along the eastern seaboard of the United States have resulted in dramatic changes in the coastline. Likewise, rates of coastal erosion along the Gulf Coast have increased over the past few decades. Further complicating the problem is the fact that climate modelers warn that global warming could result in an increase in the rate of sea-level rise and increased storm frequency and magnitude. How will these predicted changes impact coasts?

Coastal change occurs in response to natural processes that operate across a wide range of spatial and temporal scales. The shoreline exists in a non–steady state of dynamic equilibrium with incident energies that are only predictable within large ranges. If we are to succeed at forecasting coastal change during the twenty-first century and beyond, quantitative models that relate coastal response to various forcing mechanisms operating at different time scales must be developed.

The U.S. coastal science community is making progress toward improving our understanding of the dynamics of sedimentation within the littoral zone and at defining future research needs. Likewise, the international Quaternary geology community has made good progress toward coordinating research projects aimed at examining the stratigraphic record of coastal change, through the International Geological Correlation Program (IGCP Projects 367 and 437). However, the number of U.S. scientists participating in these workshops and their published results has been small by comparison to other countries. The U.S. coastal geology community in particular has been slow in organizing itself and adopting a specific research plan for the future. To help remedy this problem, a National Science Foundation (NSF)–sponsored workshop was held at Rice University, Houston, Texas. The theme of the workshop was forecasting coastal change during the current millennium.

Workshop participants recognized three broad areas where research is needed:

1. **Quantifying coastal change.** Determine how coastal systems respond (change in height to width ratios, landward retreat rates, submergence rates, sediment budget variations) to quantifiable forcing mechanisms (changes in relative sea-level rise and climate, and associated biogeochemical, hydrogeophysical, and anthropogenic processes).
2. **Developing hindcasting ability.** Investigate how coastal systems evolved to their present state so that coastal forecasting models can be tested by hindcasting.
3. **Creating more accurate coastal change models.** Develop numerical models with the ability to unify and integrate observational databases as well as improve prediction of unobserved phenomena and future patterns.

Is the Coastal Science Community Ready to Meet the Challenge?

Our ability to forecast coastal changes remains imprecise. This is due mainly to a lack of understanding of the geologic framework of coastal systems, and the impacts and interactions of changes in relative sea level and climate, as well as biogeochemical, hydrogeophysical, and anthropogenic processes on coastal evolution. To truly understand how different coastal systems respond to forcing mechanisms, a variety of end-member type coastal environments need to be examined and compared. An important strategic tool should be the integration of multidisciplinary teams of investigators working in specific coastal cells with the use of models and field experiments utilizing specific observational, mapping, and drilling technologies.

Although a number of federal and state agencies currently fund coastal research, a significant amount of this work focuses on environmental quality, coastal habitat conservation, use of living and non-living resources, national defense, and coastal erosion. These programs represent a first line of defense against changes that are already occurring within the coastal zone. However, relatively little money or effort is going toward preparing for those changes that will impact coasts by the year 2100.

Because funding for coastal research has shifted more toward immediate needs, young scientists in the field have found it more lucrative to follow this avenue of research than compete for the limited NSF funds available for coastal research. Further complicating the problem is the fact that there has been a decline in the number of new Ph.D.'s in coastal geology. Indeed, the number of universities with coastal research programs focusing on basic science problems has declined. So, as the appeal for more coastal research is being made, a declining number of young scientists are available to answer the challenge.

This initiative to strengthen the vital mission of understanding long-term changes of the U.S. shorelines is currently known as Coastal Forecasting in Rapidly Changing Environments, or CoFORCE. The current report, a brief summary of a white paper that was prepared for NSF, can be found at www.geo.nsf.gov/ear/programs/gepage.html.

Acknowledgment

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Emergency Management: Education and TRAINING Opportunities

Jeffrey N. Rubin, *Tualatin Valley Fire & Rescue, Oregon City, Oregon*

Ed. note: This is the second of three articles about emergency management and its relevance to earth scientists. Part 1 appeared in the November issue, also available at www.geosociety.org/pubs/.

If the goal of emergency management (EM) is to prevent or lessen the impacts of disasters, the goal of the education and training resources—ranging from one-day classes to degree programs—described here is to provide basic tools to those attempting to do so. For the purpose of this discussion, *training* programs are skill-based and generally last one week or less, serving as stand-alone classes or a series of classes; they tend not to be eligible for higher-education credit or otherwise be part of degree programs. *Education* programs provide more in-depth knowledge and tend to be longer and more formal than training courses. They generally last more than a week and are offered by an accredited institution and are eligible for higher-education credit, regardless of whether the course is part of a degree program.

J. Wilson and A. Oyola-Yemaiel (2001, How higher education can contribute to EM professionalism: Florida trial: IAEM Bulletin, v. 18, no. 5, p.1–6) provide a useful summary of EM education and training and describe a series of goals and desired skillsets for emergency managers: critical thinking; management and problem-solving skills; communication skills; knowledge of core concepts (e.g., history of EM, four phases of EM, legislation, key agencies); and hands-on experience.

Training

The principal source of emergency management training is the Emergency Management Institute (EMI), part of the Federal Emergency Management Agency (FEMA). States offer EMI classes through the state emergency management agency, and a broader selection is available at FEMA's training facility in Emmitsburg, Maryland. Several introductory classes are also available online. A typical selection of classes yields training in all four phases of EM (mitigation, preparedness, response, recovery), in specialty subsets (e.g., debris removal, flood mitigation), and in general topics (e.g., effective communication). All EMI classes are offered free of charge, commonly in multiple locations within each state, although attendees may have to pay all or part of their travel costs.

Two credentialing programs have been established by EMI: the Professional Development Series (PDS) and Applied Practice Series (APS). The PDS provides baseline training to new or potential emergency managers. Because much of emergency management focuses on coalition building and dealing with core needs first (e.g., planning and exercise development), the PDS focuses on these areas in a total of seven classes encompassing just under 200 hours. The APS, initiated in the late 1990s, provides a secondary credential for those who want to expand their training. Building on the PDS, APS training allows participants to choose from a variety of core courses and electives. Although neither PDS nor APS are required to function as an emergency manager, successful PDS completion is commonly listed as a preferred attribute for job applicants. A third EMI training program, the Integrated Emergency Management Course, places local representatives in a series of small exercises and discussions, culminating in a simulated disaster in which each participant plays his or her real-life role. EMI's Independent Study Program lets participants download materials for free, although there is a fee for obtaining college credit upon successful completion.

The recent increase in awareness of terrorism dictates a mention of training and information sources on this broad and unfortunate topic. The 1996 Domestic Preparedness Act (a.k.a., Nunn-Lugar-Domenici Act) funded training and preparedness programs for the 120 largest cities in the United States. Initially administered by the Department of Defense and later the Department of Justice, the program helped spawn a variety of training, planning, response, and mitigation programs, both public and private. The current scope of terrorism-related training is enormous and extremely variable in scope, focus, and quality. Interested readers will find a Web-based training course through FEMA's Independent Study Program and the National Fire Academy.

FEMA's Higher Education Project fosters college classes and degree programs in EM as well as general dissemination of disaster preparedness information across the country. A comprehensive list of domestic and international programs may be found on the EMI Web site listed below.

Credentials

The profession has two credentialing programs, one international and a similar one by state. The Certified Emergency Manager (CEM) program, administered by the International Association of Emergency Management, requires a combination of training, education, experience, professional service, and a written exam. In addition, most states have their own credentials that tend to be complementary with the CEM requirements. The private sector has several credentials in business continuity, the most common being Certified Business Continuity Professional (CBCP), administered by DRI International. Although many positions require either a specific credential or educational background, no registration or license for EM set by national or state statute currently exists.

EM training programs not affiliated with degree-granting institutions:
FEMA Emergency Management Institute, www.fema.gov/emi/

California Specialized Training Institute (State Office of Emergency Services), www.oes.ca.gov/oeshomep.nsf/csti/csti+home+page

State EM agencies and training centers, www.fema.gov/fema/statedr.htm

- Professional Development Series, www.fema.gov/emi/prodev.htm
- Applied Practice Series, www.fema.gov/emi/applprc.htm
- Integrated Emergency Management Course, www.fema.gov/emi/iemc_01.htm
- Independent Study Program, www.fema.gov/emi/ishome.htm

EM education program affiliated with degree-granting institutions: EMI Higher Education Project, www.fema.gov/emi/edu/

EM and related credentialing programs:
Certified Emergency Manager program, www.iaem.com/certification.html

Certified Business Continuity Professional program, www.drii.org/certification.html

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Juanzuo Zhou
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Michele Zucali
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The following members have transferred from Student Associate status.

Amanda L. Albright
Neal D. Alexandrowicz
Omar Ali
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Jared N. Allen
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Edgar Angeles-Moreno
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James Arthur
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Michelle R. Cooper
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Molly Coughlin
Seth G. Cowdery
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Paul L. D'Annibale
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Stephen B. DeOreg
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NEW GSA MEMBERS

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The following student associates joined GSA between February and September 2001.

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Scott Douglas Samson, Syracuse University

Bruno C. Vendeville, Bureau of Economic Geology, University of Texas

J. Douglas Walker, University of Kansas

Donald U. Wise, Franklin and Marshall College

ANNOUNCEMENTS

MEETINGS CALENDAR

2002

June 3–7	Canadian Society of Petroleum Geologists Diamond Jubilee Convention, Calgary, Alberta, Canada. Information: Lori Humphrey-Clements, Conventions Manager, (403) 264-5610, lori@cspg.org, www.cspgconvention.org.
June 8–13	The Clay Minerals Society 39th Annual Meeting, Boulder, Colorado, USA. Information: Kathryn Nagy, Dept. of Geological Sciences, University of Colorado, Boulder, CO 80309, USA, (303) 492-6187, fax 303-492-2602, Kathryn.nagy@Colorado.edu, http://cms.lanl.gov, www.Colorado.edu/geo/sci/cms/.
August 8–11	American Quaternary Association (AMQUA) 17th Biennial Meeting, Anchorage, Alaska, USA. Information: David R. Yesner, Local Arrangements Chair, c/o the Department of Anthroplogy, University of Alaska, 3211 Providence Drive, Anchorage, AK 99508, afdry@uaa.alaska.edu, (907) 786-6845, fax 907-786-6850. *(Deadline for poster submissions and registration: May 1, 2002.)*
October 9–11	Deep Foundations Institute Annual Conference of Deep Foundations, San Diego, California, USA. Information: Deep Foundations Institute, 120 Charlotte Place, Third Floor, Englewood Cliffs, NJ 07632, USA, (201) 567-4232, fax 201-567-4436, dfihq@dfi.org, www.dfi.org.

Send notices to jhammann@geosociety.org. Only new or changed information is published in *GSA Today*. A complete listing is posted in the Calendar section at www.geosociety.org.

2002 Bernard L. Majewski Research Fellowship Announced

The American Heritage Center at the University of Wyoming announces the availability of the Bernard L. Majewski Research Fellowship, funded by an endowment provided through the generosity of Thelma Majewski and intended to provide research support for a recognized scholar in the history of economic geology and to facilitate the fellow's use of archival collections in the center. For information on research fields, qualifications, selection, obligations, and application procedures, contact: Director, American Heritage Center, University of Wyoming, P.O. Box 3924, Laramie, WY 82071-3924, (307) 766-4114, fax 307-766-5511, ahc@uwyo.edu, www.uwyo.edu/ahc.

The deadline for applications is February 28, 2002.

Kinematics and Vorticity in High-Strain Zones

April 16–21, 2002
Virginia Blue Ridge and Piedmont

This field forum will examine a number of well-exposed high-strain zones in the Blue Ridge and Piedmont provinces of the Virginia Appalachians and discuss what information can be gained into the kinematic history of these rocks. It will provide geologists the opportunity to discuss contemporary research in the context of what *can* and *cannot* be learned about deformation history from naturally deformed rocks.

Location: Blue Ridge and Piedmont provinces, north-central Virginia, approximately 120 km southwest of Washington, D.C. Lodging at the Graves Mountain Lodge, Madison County.

Cost: $625 ($300 for students), including guidebooks, handouts, meals, lodging (double occupancy), refreshments, and transportation to and from the Charlottesville airport.

Registration, Applications, and Information: Christopher (Chuck) M. Bailey, Department of Geology, College of William & Mary, Box 8795, Williamsburg, VA 23187, (757) 221-2445, fax 757-221-2093, cmbail@wm.edu. For complete information, see the September 2001 issue of *GSA Today*, also available at www.geosociety.org/pubs/, or visit www.wm.edu/CAS/GEOLOGY/faculty/bailey/GSA/fieldforum/.

"'When I use a word,' Humpty Dumpty said, in rather a scornful tone, 'it means just what I choose it to mean—neither more nor less'" (Lewis Carroll; 1899, ff.).

James R. Underwood Jr.'s "Anthropic Rocks: Made, Modified, and Moved by Humans" (*GSA Today*, November 2001, p. 19) leaves me dizzy. Why coin exotic new terms when common English will serve? Despite Underwood's closing plea that "The concept is much more important than the terms," I believe that definition creep is the enemy of understanding.

Perhaps Underwood never learned what Gerald P. "Gerry" Brophy taught his Amherst College students: Rocks are naturally occurring structural parts of Earth. If a student holding an object in his hand should ask, "What kind of rock is this?" Brophy would reply, "That's no rock. It's a rock SAMPLE, because it's no longer a structural part of Earth." With that part of the definition of *rock* in mind, how can "humans produce immense quantities of rock," as Underwood claims?

So, in resonance with the delightful "What, if anything, is a rabbit?" (Wood, 1957), I ask, "What, if anything, is a rock?"

Manmade, rock-like things appropriately may be identified by such words as *artifact, ceramic, brick,* and *concrete,* or by existing phrases such as *manmade glass.* I don't even mind the phrases *artificial stone* or *artificial rock*. But *anthropic rock* is self-contradictory.

Was it Aristotle who said "Nature grades and man divides"? (For example, when describing rainbows, we define color names and bounds.) Taxonomies are used to categorize, but some types can cross taxonomic boundaries.

Word definitions are like taxonomic categories. Neither should be tinkered with lightly; some concepts may fall on the boundaries between terms. Coining a term for every concept that lies on such a boundary would be as endless as coining a science name for every astronomical body would be.

We can change definitions to the point that words become meaningless. We can also get so wrapped up in debating terms that we forget entirely about the subjects of our original interest: minerals, rocks, geology, and such—remember?

Rocks, to me, will remain naturally occurring structural parts of Earth, or (in common usage) other planetary bodies. I can even speak now of the geology of Mars or the Moon (e.g., Mutch, 1970), without gagging. If a human moves a rock, it is no longer a rock (something that humans can so easily destroy but can never create).

When it is possible to do so, let's stick to concepts, words, and phrases that we already understand. Otherwise, we'll spend all our time defining and arguing about new terms. Just coining a term does not qualify it for common usage—especially when existing terms are adequate for the same concepts.

Even if most geologists are convinced by Underwood on this, I remain convinced that: (1) the majority is not always correct; (2) good science should not be a matter of majority rule; and, (3) science needs stronger adherence to naming standards.

I reject anthropic rock and hope that you will, too.

References Cited

Carroll, L. (1899, ff.), Through the looking glass and what Alice found there: Macmillan, 224 p.

Mutch, T.A., 1970, Geology of the Moon: A stratigraphic view: Princeton, Princeton University Press, 324 p.

Wood, A.E., 1957, What, if anything, is a rabbit?: Evolution, v. 11, no. 4, p. 417–425.

Stephen A. Langford
Oro Valley, Greater Tucson, Arizona

As a paleontologist, I particularly appreciate the importance of evolution in our understanding of geology and biology and applaud the efforts of GSA to develop a statement on evolution ("Council Approves Two Position Statements," GSA Today, October 2001, p. 32). The statement covers several aspects well. The history of views on both the age of the earth and on evolution is an important but often overlooked aspect of understanding current views.

However, I believe that parts of the statement regarding religious aspects may be counterproductive. The purpose of GSA is scientific, not political or religious. As scientists, we object to the popular young-earth or antievolutionary scientific claims not because they are religious but because they are false. Most of us probably have opinions about the proper role of religious teaching in public schools, but geological research provides no insight into the question. Furthermore, antievolutionary views appeal primarily to those who would like to see a greater role for religious teaching in the schools. Saying "Creationist ideas have no place in these courses because they are based on religion rather than science" will not persuade them. Instead, they might quote that sentence as evidence that evolution is merely an atheistic plot.

Some wording in the GSA statement accepts a particular philosophical view on the relationship between science and religion, namely that they are separate "domains." In contrast, the traditional Christian view is that every aspect of life is sacred. In this view, science is not a separate domain but rather integrated with religion. This does not mean that a Christian geologist should suppress geological evidence that troubles his religious views. Rather, his task is to be a good geologist, working carefully, diligently, and honestly. Of course, any good geologist of other theological views will also work carefully, diligently, and honestly.

Whether science is seen as integrated with religion or as a separate domain, it is confined to dealing with physically testable propositions. Thus, some claims of "intelligent design" or "creation science" can, at least in theory, be examined scientifically. Claims that have been scientifically disproven do not belong in science classes. Other claims are not scientifically testable, but it should be emphasized that this makes them scientifically inaccessible rather than inherently invalid. It is also important to recognize similar errors on the part of those who accept evolution. The claims of Richard Dawkins in support of philosophical materialism are metaphysical, not scientific, just like the religious claims of young-earthers.

A few adjustments to terminology may help the GSA statement counter some popular young-earth claims. Using the term creationist to refer to all who believe in a creation event, especially those who accept an old earth, may help counter the popular claim that one must either be a young-earther or an atheist. Similarly, emphasizing the fact that young-earthers and antievolutionists come from a wide range of religious backgrounds will counter young-earthers' claims to be defending the Bible.

I hope that these comments can help build on the good start of the existing GSA statement.

David Campbell
Lexington Park, Maryland

More letters are posted at www.geosociety.org/pubs/.

Letters to GSA Today *should be sent to*
GSA Today, *P.O. Box 9140, Boulder, CO 80301-9140,*
fax 303-357-1070, jhammann@geosociety.org.
GSA Today *reserves the right to edit for space.*

GeoVentures

For complete details on the following trips, see the January issue of *GSA Today*, also available at www.geosociety.org/pubs/. Trip details also are posted at www.geosociety.org (go to "Meetings," then to "GeoVentures"). GSA is committed to making GeoVentures accessible to all. If you require special arrangements or have special dietary concerns, contact Edna Collis, GSA Headquarters, (303) 357-1034.

GeoTrips

Iceland: Fire and Ice

August 1–15, 2002

Scientific leader: Haraldur Sigurdsson, Graduate School of Oceanography, University of Rhode Island. **Guest Lecturer:** Haukur Johannesson, Natural History Institute, Reykjavík, Iceland. This trip will reveal many unaltered and fresh geologic features that can be seen nowhere else on land. Expect to acquire an expanded understanding of volcanoes, hotspots, and rifts. View steep-walled and flat-topped hyaloclastite ridges derived from subglacial eruption, young hyaloclastite islands produced by submarine eruptions, great explosion craters, tephra cones, calderas, blocky obsidian flows, waterfalls descending into the rift valley and, of course, extraordinary glacial panoramas.
Fees and Payment: $3,400 for GSA members; $3,500 for nonmembers. A $400 deposit is due with your reservation and is refundable (less $100) through May 15. Fee is based on double occupancy. The single supplement, based on availability, is an additional $486. Total balance is due May 15. Min.: 20; max.: 40. Included: Classroom programs and materials; field trip transportation, lodging, all meals, guidebook and map. Not included: Airfare to and from Reykjavík, alcoholic beverages, and other expenses not specifically included.

Iceland: A Student Only–Oriented GeoTrip

August 1–15, 2002

Scientific leader: James Reynolds, Brevard College, Brevard, North Carolina. Designed for students *only*, this trip will visit classical geological localities of Iceland on a low-frills budget. Participants will camp and prepare meals in a group kitchen tent. Eighty kilometers of hikes will take us through spectacular volcanic and glacial scenery. The trip begins in Baltimore and will fly to Reykjavík to make a 12-day loop around the country.
Fees and Payment: $2,700 for GSA student members; $2,800 for nonmembers. A $200 deposit is due with your reservation and is refundable (less $100) through May 15. Total balance is due May 15. Min: 20; max: 35. Included: Roundtrip airfare to Reykjavík from Baltimore (currently the gateway city), classroom programs and materials, field trip transportation, lodging, all meals, guidebook and map. Not included: Airfare to and from Baltimore, camping equipment (tent and sleeping bag), alcoholic beverages, and other expenses not specifically included.

GeoHostel

Geology of Coastal Southern Maine

July 13–18, 2002

Scientific Leaders: Arthur M. Hussey II, Bowdoin College (retired), and Walter Anderson, Maine Geological Survey (retired). **Co-leaders:** Joseph T. Kelley, University of Maine, Orono; Thomas Weddle, Maine Geological Survey; and David West, Middlebury College. We'll examine Ordovician to Cretaceous-age metamorphic and igneous rocks, Late Pleistocene and Early Holocene sediments and landforms, modern sand systems of the scenic beaches of southwestern Maine, and three of the most photographed lighthouses along the New England coast.
Fees and Payment: $1,000 for GSA members; $1,100 for nonmembers. A $100 deposit is due with your reservation and is refundable through June 1, less a $20 processing fee. Total balance is due June 1. Min.: 15; max.: 32. Included: Classroom programs and materials; field trip transportation; lodging for six nights (*all* single occupancy sleeping rooms; quad-style dormitory rooms with shared bath and living room); all meals; and welcoming and farewell events. Not included: Airfare to and from Portland, Maine, transportation during hours outside field trips, alcoholic beverages, and other expenses not specifically included.

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Maine	$100	____	$________
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Positions Open

TEXAS A&M UNIVERSITY
TENURE-TRACK FACULTY POSITION
PETROLEUM GEOSCIENTIST

The Department of Geology and Geophysics at Texas A&M University invites applications for a tenure-track position in petroleum geosciences, preferably at the assistant professor level. A Ph.D. is required by the time employment begins. We anticipate filling this position by August 2002.

The successful candidate is expected to teach at both graduate and undergraduate levels and to develop a forward-looking, externally funded research program in fundamental petroleum geosciences. Candidates with experience in solving subsurface problems by integrating geological, geophysical, and petrophysical data are preferred. Previous experience with the petroleum industry is desirable but not a prerequisite.

The specific research field of the successful candidate is open, but we hope to find an individual who will complement existing departmental programs in reservoir characterization, basin studies, seismic interpretation, sequence stratigraphy, structure, tectonics, and sedimentary geochemistry. A record of accomplishment and a promising research program are more important than the specific study focus. Expertise with the latest technologies for characterization, modeling, and visualization of reservoirs and regional petroleum systems is desirable. Many opportunities exist to participate in and build on collaborative programs with colleagues in Petroleum Engineering, Chemical Engineering, Oceanography, Ocean Drilling Program, and Geochemical and Environmental Research Group.

Submit a curriculum vita, recent reprints, a statement of research and teaching interests, and the names, postal and e-mail addresses, and fax numbers of three references to: Dr. Wayne M. Ahr, Chair, Petroleum Geoscientist Search Committee, Department of Geology & Geophysics, Texas A&M University, College Station, TX 77843-3115.

Texas A&M University, a land-, sea-, and space-grant institution, is located in College Station, Texas, a dynamic community of 140,000 people. Texas A&M University is an affirmative action/equal opportunity employer committed to excellence through diversity and compliance with the Americans with Disabilities Act. Departmental facilities and programs can be reviewed at our Web site (http://geoweb.tamu.edu/).

TWO TENURE-TRACK POSITIONS IN GEOLOGY
PASADENA CITY COLLEGE

The Natural Sciences Division at Pasadena City College, California, seeks to fill two full-time, tenure-track geology faculty positions beginning August 2002. We are seeking individuals who are willing to work hard to maintain a 70-year tradition of excellence in geoscience education and are deeply committed to lower-division undergraduate teaching. One position requires the expertise to teach semester courses in crystallography/mineralogy and petrology. Both positions may include course assignments in physical geology, historical geology, planetary geology, geology of California, physical oceanography, environmental science, dinosaurs, and several related field courses. A master's degree in a geological science is required. Interested candidates may download a more complete job description (position #824) and application from our Web site at http://www.paccd.cc.ca.us. Applications will be accepted until March 15, 2002. EOE.

HASLEM POSTDOCTORAL PALEONTOLOGY FELLOWSHIP/ASSISTANT PROFESSOR OF GEOLOGY FACULTY POSITION ANNOUNCEMENT

A postdoctoral fellowship position in paleontology will be available in the Department of Geology and Geological Engineering and the Museum of Geology at South Dakota School of Mines and Technology (SDSM&T). The successful candidate will be expected to perform professional academic functions including research, instruction, and service, and will be expected to implement research in a field-based program in an appropriate aspect of vertebrate paleontology. A Ph.D. with specialization in paleontology is required. Preference will be given to candidates with research interests in the vertebrate paleontology of North America, particularly of the Northern Great Plains.

The nine-month appointment, renewable annually for up to three years with annual performance review, will include a competitive salary and field support. The Haslem Fellowship will begin September 1, 2002.

SDSM&T provides undergraduate and graduate degrees in science, engineering and interdisciplinary science. SDSM&T has a student population of approximately 2,400 traditional and adult learners representing nearly 40 states and 25 countries. SDSM&T is located at the foot of the beautiful Black Hills in Rapid City, South Dakota's second largest city. Twenty minutes from Mount Rushmore, Rapid City has a relatively mild climate and the Black Hills offer numerous opportunities for summer and winter outdoor experiences. For more information regarding the university, visit www.sdsmt.edu.

Applicants should submit a letter of application stating your interests and strengths, a curriculum vitae, evidence of teaching experience and effectiveness, and names, addresses, telephone numbers, and e-mail addresses (if available) of three professional references to: Dr. James E. Fox, Chair, Department of Geology and Geological Engineering, South Dakota School of Mines and Technology, 501 East St. Joseph Street, Rapid City, SD 57701-3995.

Review of applications will begin March 1, 2002, and will continue until the position is filled.

SDSM&T is an EEO/AA/ADA employer & provider.

GIS–SUBSURFACE GEOSCIENCE
TENURE-TRACK FACULTY POSITION
IDAHO STATE UNIVERSITY

The Department of Geosciences at Idaho State University (http://www.isu.edu/geology/) seeks an outstanding candidate for a tenure-track assistant professor in geographical information systems (GIS) and subsurface geoscience.

Applicants must have a Ph.D. in a geoscience field, experience in teaching and research in GIS and subsurface geoscience, the ability to perform effective research in a team, and the ability to develop cooperative programs with scientists at the D.O.E. Idaho National Engineering and Environmental Laboratory. Preference will be given to applicants with the ability to interact with students and faculty in other disciplines that use GIS and geospatial analysis. Good oral and communication skills are essential.

The successful candidate will be expected to participate in an effective teaching, research, and service program commensurate with normal tenure-track faculty duties at ISU. The position, available beginning academic year 2002–2003, will be located at ISU's Idaho Falls campus. Applicants will be expected to contribute substantially to the teaching and advising of students in the ISU GeoTechnology Certificate graduate program and the GeoTechnology undergraduate minor program (http://giscenter.isu.edu/) in Idaho Falls. The position requires collaborative teamwork with the main geosciences faculty in Pocatello, participation in regular faculty meetings, and possibly cross-campus teaching via distance learning. Immediate teaching duties will include Principles of GIS, Advanced GIS, and an upper division course in the candidate's field of research.

To apply, send a vita, personal statement of background and experience relevant to the position, including teaching and research philosophy, service activities, and names and contact information of three references to: Department of Geosciences, GIS Faculty Search, Campus Box 8072, Idaho State University, Pocatello, Idaho, 83209-8072. E-mail contact: hughscot@isu.edu. Review of applications began January 15, 2002, and will continue until the position is filled. Idaho State University is an equal opportunity employer.

ASSISTANT PROFESSOR, SKIDMORE COLLEGE

The Skidmore College Department of Geosciences invites applications for a tenure-track appointment at the assistant professor rank beginning September 1, 2002. Ph.D. required. Applicants should be broadly trained in the geosciences with expertise in environmental geology, geomorphology, and hydrogeology. Interests in climatology, limnology, and soil science are a plus. Teaching responsibilities include introductory geoscience courses, upper level courses in geomorphology and environmental geology, as well as the development of new courses in support of the college's Geosciences, Environmental Studies and Liberal Studies programs. The successful candidate is expected to demonstrate excellence in teaching, to maintain an active program of research and publication, to mentor student research in appropriate geoscience and environmental studies areas, and to participate in college service and student advising. Review of applications will begin immediately and continue until the position is filled. Applications should include a curriculum vitae and a concise statement of your teaching, research, and career goals. Send these materials and three letters of reference to: Eleanor Hutchins, Secretary, Department of Geosciences, File #GS, Skidmore College, 815 N. Broadway, Saratoga Springs, NY 12866.

Skidmore College encourages applications from women and men of diverse racial, ethnic, and cultural backgrounds.

VISITING ASSISTANT PROFESSOR
SKIDMORE COLLEGE

The Skidmore College Department of Geosciences invites applications for a two-year appointment at the visiting assistant professor rank beginning September 2, 2002. Ph.D. or ABD in geology required. Applicants should be broadly trained in the geosciences with expertise in mineralogy and petrology. Expertise in GIS and an interest in low-temperature or environmental geochemistry are a plus. Teaching responsibilities include introductory geosciences courses and upper-level mineralogy/petrology and structural geology courses, as well as participation in the college's Environmental Studies and Liberal Studies programs. The successful candidate is also expected to mentor student research in appropriate geoscience areas. Review of applications will begin immediately and continue until the position is filled. Applications should include a curriculum vitae and a concise statement of your teaching, research, and career goals. Send these materials and at least three letters of reference to: Eleanor Hutchins, Secretary, Department of Geosciences, File #GS, Skidmore College, 815 N. Broadway, Saratoga Springs, NY 12866.

Skidmore College encourages applications from women and men of diverse racial, ethnic, and cultural backgrounds.

THE COLORADO COLLEGE

The Department of Geology seeks applicants for two one-year non–tenure track positions beginning in August 2002. Ph.D. or ABD is required. Appointments will be at the assistant professor level for candidates with a Ph.D. Desired area of expertise for one position is structural geology with additional expertise in such fields as tectonics, petrology, and geodynamics welcomed. The second position is open in terms of expertise.

Expectations for both positions include teaching Introductory Geology and other courses in the candidates' areas of specialty. Undergraduate research is an integral part of our curriculum, and willingness to advise research in the candidates' areas of expertise would be a distinct advantage, as would an interest in interacting with the Environmental Sciences program. The college is committed to increasing diversity of the community and curriculum. Candidates who can contribute to that goal are particularly encouraged to apply.

Applicants must be committed to high-quality innovative undergraduate teaching, including field-oriented courses. The Block System of education at Colorado College, in which professors teach and students take only one course at a time for 3-1/2 weeks, lends itself to field and project-based teaching. The department has excellent field and laboratory facilities for teaching and research in both hard-rock and soft-rock geology.

Send statement of teaching and research interests, curriculum vitae, and names and letters from three referees to: Dr. Paul Myrow, Chair, Department of Geology, Colorado College, Colorado Springs, CO 80903, pmyrow@coloradocollege.edu. Review of applications will begin February 15, 2001. Applications will be accepted until the position has been filled.

The Colorado College welcomes members of all groups, and reaffirms its commitment not to discriminate on the basis of race, color, age, religion, sex, national origin, sexual orientation, or disability in its educational programs, activities, and employment practices. EQUAL OPPORTUNITY EMPLOYER.

**UNIVERSITY OF NEW ORLEANS
ENVIRONMENTAL SIMULATIONS
IT INITIATIVES POSITIONS**

Deltaic Framework Geology and Subsidence Processes, Assistant Professor. The Department of Geology and Geophysics within the College of Sciences at the University of New Orleans (UNO) seeks qualified applicants for a tenure-track position at the rank of assistant professor. This position will hold a joint appointment in the multidisciplinary Pontchartrain Institute for Environmental Sciences also within UNO's College of Sciences. This position is supported by the Louisiana Board of Regents Information Technology Initiative within the UNO College of Sciences for the Targeted Research Area of Environmental Simulation. The successful candidate must have a proven track record in the environmental simulation of subsidence processes at time scales ranging from the Quaternary through the Tertiary. Special preference is given to qualified applicants with environmental simulation experience in subsidence processes and the geologic framework of the Mississippi River delta plain. The successful applicant is expected to develop a research and educational program focused on the evolution and subsidence of the Mississippi River Delta plain as it relates to New Orleans, the Pontchartrain Basin, Louisiana's coastal land loss crisis, and the economic development of this region. The salary is budgeted for 9 months and start-up funds are negotiable. A full benefits package is provided by UNO, which is a member of the Louisiana State University System. UNO is an equal opportunity employer.

Send resume and 3 letters of recommendation to: Department Chair, Dept. of Geology & Geophysics, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148. Application closing date: March 15, 2002.

**UNIVERSITY OF NEW ORLEANS
ENVIRONMENTAL SIMULATIONS
IT INITIATIVES POSITIONS**

Coastal Processes: Waves, Tides, and Storm Surges, Assistant Professor. The Department of Geology and Geophysics within the College of Sciences at the University of New Orleans (UNO) seeks qualified applicants for a tenure-track position at the rank of assistant professor. This position will hold a joint appointment in the multidisciplinary Pontchartrain Institute for Environmental Sciences also within UNO's College of Sciences. This position is supported by the Louisiana Board of Regents Information Technology Initiative within the UNO College of Sciences for the Targeted Research Area of Environmental Simulation. The successful candidate must have a proven record in the environmental simulation of modern coastal processes. Special preference is given to qualified applicants with environmental simulation experience as it relates to storm surges and coastal hydrodynamics within the Mississippi River delta plain. The successful candidate is expected to develop a research and education program focused on the hurricane risk to New Orleans and the coastal land loss and water quality crisis as it relates to the Pontchartrain Basin and the Mississippi River delta plain, and the economic development of this region. The salary is budgeted for 9 months and start-up funds are negotiable. A full benefits package is provided by UNO, which is a member of the Louisiana State University System. UNO is an equal opportunity employer. Send resume and 3 letters of recommendation to: Department Chair, Dept. of Geology & Geophysics, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA 70148. Application closing date: March 15, 2002.

**ASSISTANT PROFESSOR
STRUCTURAL GEOLOGY/TECTONICS
UNIVERSITY OF CALIFORNIA, DAVIS**

The Department of Geology at the University of California, Davis, has an opening for a full-time tenure-track faculty position at the assistant professor level in structural geology/tectonics. We seek applicants with interests in one or more of the following: tectonics, especially neotectonics, analytic structural geology, regional structural geology/tectonics. The successful candidate will be expected to develop a vigorous program of research, participate actively in our undergraduate and graduate teaching programs, including our strong field geologic teaching program, and mentor graduate students. We seek someone to complement existing strengths in structure/tectonics, petrology, geophysics, and environmental geology. For more information about the U.C. Davis Geology Department, visit our Web page at http://www.geology.ucdavis.edu.

A Ph.D. in the geological sciences with an emphasis in structural geology/tectonics is required at the time of appointment. Applicants should send a curriculum vitae, a statement of research and teaching interests, and names, addresses, phone numbers, and e-mail addresses of at least three people who can be contacted for recommendations to: Chair, Structural Geology/Tectonics Search Committee, Department of Geology, One Shields Avenue, University of California, Davis, Davis, CA 95616; phone: (530) 752-0350; fax: (530) 752-0951; e-mail: StruTec-search@geology.ucdavis.edu.

The position will be effective starting July 1, 2002. To ensure full consideration, applications should be received by February 1, 2002. The position will remain open until filled.

The University of California is an affirmative action/equal-opportunity employer.

**ASSISTANT PROFESSOR
SOLID EARTH GEOPHYSICS
UNIVERSITY OF CALIFORNIA, DAVIS**

The Department of Geology is seeking an individual for a full-time tenure track faculty position at the assistant professor level. This person must have the background to establish a vigorous research program in the area of solid earth geophysics. Preference will be given to candidates who complement the research and teaching programs in the department. We are interested in candidates in a variety of fields, including, but not limited to: earthquake seismology, mathematical geophysics, modeling and observing deformation in the lithosphere, physical processes associated with volcanism, and structural seismology. Applicants are expected to have a strong interest and ability in undergraduate and graduate teaching and will be expected to supervise graduate students. A Ph.D. or equivalent degree in geophysics, geology with an emphasis in geophysics, or a closely related field is required. The appointment is 100% in the Department of Geology and the College of Letters and Science. For more information about the U.C. Davis Geology Department, visit our Web page at http://www-geology.ucdavis.edu. The position will be effective starting July 1, 2002. To ensure full consideration, applications should be received by February 1, 2002. The position will remain open until filled.

Applicants should send a curriculum vitae, a statement of research interests, a statement of teaching interests, and the names, addresses, phone numbers and e-mail addresses of at least three people who can be contacted for recommendations to: Chair, Geophysics Search Committee, Department of Geology, One Shields Avenue, University of California, Davis, Davis, CA 95616; phone: (530) 752-0350; fax: (530) 752-0951; e-mail: Geophys-search@geology.ucdavis.edu.

The University of California is an affirmative action/equal-opportunity employer.

GEOPHYSICIST, KNOXVILLE, TENNESSEE

Geophysicist needed for location in Knoxville, TN. Responsible for developing technical approach, conducting field investigations using magnetic, EM induction, CSAMT, GPR and seismic methods, data analysis and interpretation; manage technical aspects of project and prepare technical reports. Req. MS or equivalent in geophysics. Proficiency in SEISMIC, GPR, and CSAMT techniques. 40 hrs/week, 9–5, 45K/yr. Please send resume to IT Corporation, Dept. RJ/IMC, 2790 Mosside Blvd., Monroeville, PA 15146.

**HYDROLOGIC SCIENCES
WEST VIRGINIA UNIVERSITY**

West Virginia University seeks a research assistant professor in geology in surface-water hydrology, aqueous geochemistry, hydrologic modeling, vadose hydrology, or related fields. Appointment: two academic years (9 month), non–tenure track, starting August 2002, with potential for extension. Responsibilities: participation in applied research projects; graduate research design/advising; limited instruction (one course per semester including a graduate course in the candidate's specialty). Salary nationally competitive, with potential for supplement from contractual research. Details: http://www.geo.wvu.edu. Priority given to applications received by 1 April 2002. Application materials: vita, statement of interests, academic/publications record, and contact information for three references to Dr. Joseph Donovan, Search Committee Chair, Dept. of Geology & Geography, 425 White Hall, West Virginia University, Morgantown WV 26506-6300, (304) 293-5603, ext. 4308, e-mail donovan@geo.wvu.edu. WVU is an affirmative action, equal opportunity employer and strongly encourages applications from women, minority, and disadvantaged candidates.

**ASSISTANT PROFESSOR OF GEOLOGY
UNIVERSITY OF CALIFORNIA, DAVIS**

Assistant professor of geology with an interest in the physics and/or chemistry at mineral surfaces in modern and ancient earth systems. Research emphasis should be on the rates, mechanisms, and energetics of processes including, but not limited to biomineralization, isotopic fractionations, geomicrobiology, adsorption of organic and inorganic compounds, and transition metal redox reactions. The Department of Geology seeks a scientist who will expand upon, and complement, our existing strengths in biogeology and Earth System Science, low-temperature and stable isotope geochemistry, as well as environmental geology. This position is part of a campus-wide initiative on Nanophases in the Environment, Agriculture and Technology (NEAT), and the successful applicant will be expected to develop campus-wide, interdisciplinary research collaborations. For more information about the U.C. Davis Geology Department, visit our Web page at http://www.geology.ucdavis.edu.

A Ph.D. in the earth sciences is required at the time of appointment. Applicants should send a curriculum vitae, a statement of research and teaching interests, and names, addresses, phone numbers and e-mail addresses of at least three people who can be contacted for recommendations to: Robert Zierenberg, Chair, Geology/NEAT Committee, Department of Geology, One Shields Avenue, University of California, Davis, Davis, CA 95616; phone: (530) 752-0350; fax (530) 752-0951; e-mail: NEAT-search@geology.ucdavis.edu.

The position will be effective starting fall 2002. To ensure full consideration, applications should be received by April 1, 2002. The position will remain open until filled.

The University of California is an affirmative action/equal-opportunity employer.

Opportunities for Students

Up to Two Applied Geohydrology Summer Research Assistantships. Kansas Geological Survey (KGS), Lawrence, KS. These are 12-week summer positions open to students at any university. The individual will participate in a variety of field activities in support of KGS research programs. The themes of the activities in the summer of 2002 will be hydraulic test methods, direct push technology, and stream-aquifer interactions. Start approx. 5-13-02. Salary $5,500 for 12-week appointment. Required: Relevant coursework in earth sciences or engineering; interest in hydrogeology; and ability and willingness to participate in moderate physical activity in mid-summer temperatures in Kansas. First consideration given to applications postmarked by 3-1-02. For complete description, see #66146 at www.kgs.ukans.edu/General/jobs.html, or contact A. Delaney at (785) 864-2152 or adelaney@kgs.ukans.edu. For further technical information, contact Jim Butler at jbutler@kgs.ukans.edu. The University of Kansas is an EO/AA employer.

Graduate Student Research Assistantships, University at Buffalo. Research assistantships (tuition plus 12-month stipend) are now available through the Department of Geology. Assistantships are currently available in the following areas. (1) Simulation and visualization of gravity-driven flows: Field work and supercomputer modeling and visualization of flows, some interaction with civil protection officials in developing an interface. (2) Volcanic-related avalanches: Field work, experiments, and computer modeling of volcanic avalanches. (3) Hydrogeology: Integration of remote sensing with groundwater flow modeling. (4) Macroevolution: Field work in Nevada, quantitative analysis of graptolite species ranges, turnover rates, and phylogenetic patterns. (5) Structural geology: Fracture patterns and their relation to deep faults and remote sensing lineaments in Finger Lakes region and elsewhere in NYS and the northeast. (6) Near-surface geophysics: Using near-surface geophysics (seismic & GPR) for improved environmental site characterization, Alaska. (7) Geoscience education: Aid in enhancing diversity in the geosciences through recruiting, mentoring, and new-program development at a city community college. Interested candidates should contact Dr. Michael Sheridan (mfs@geology.buffalo.edu) and visit www.geology.buffalo.edu. Applications are due February 15th with official GRE score.

Graduate Fellowship in Sedimentary Geology. Potential Ph.D. students are invited to apply for a three-year Graduate Research Fellowship in the Department of Earth Atmospheric and Planetary Sciences, Massachusetts Institute of Technology. Student stipend and tuition are fully supported. The research focus will center on quantification of facies scaling relationships, in an effort to evaluate sedimentologic process and stratigraphic response. The successful candidate should have a keen interest in stratigraphically oriented field mapping of carbonate rocks and a desire to work with digital acquisition technologies. Field sites will include the Canning Basin (Devonian, Western Australia) and Oman (Cretaceous, Proterozoic). Graduate Admissions applications should be submitted to MIT, along with a letter of intent to be copied to Professor John Grotzinger (grotz@mit.edu). John Grotzinger, MIT, Department of Earth, Atmospheric, and Planetary Sciences, 77 Massachusetts Avenue, 54-816, Cambridge, MA 02139, 617-253-3498.

Executive Director

Division of Hydrologic Sciences
Desert Research Institute
Position #40-001

The Desert Research Institute (DRI), an internationally recognized environmental research institution and component of the University and Community College System of Nevada (UCCSN), seeks an Executive Director of its Division of Hydrologic Sciences (DHS). DRI offers outstanding faculty, the opportunity to build new research programs, opportunities for interdisciplinary collaboration, and a team-oriented environment.

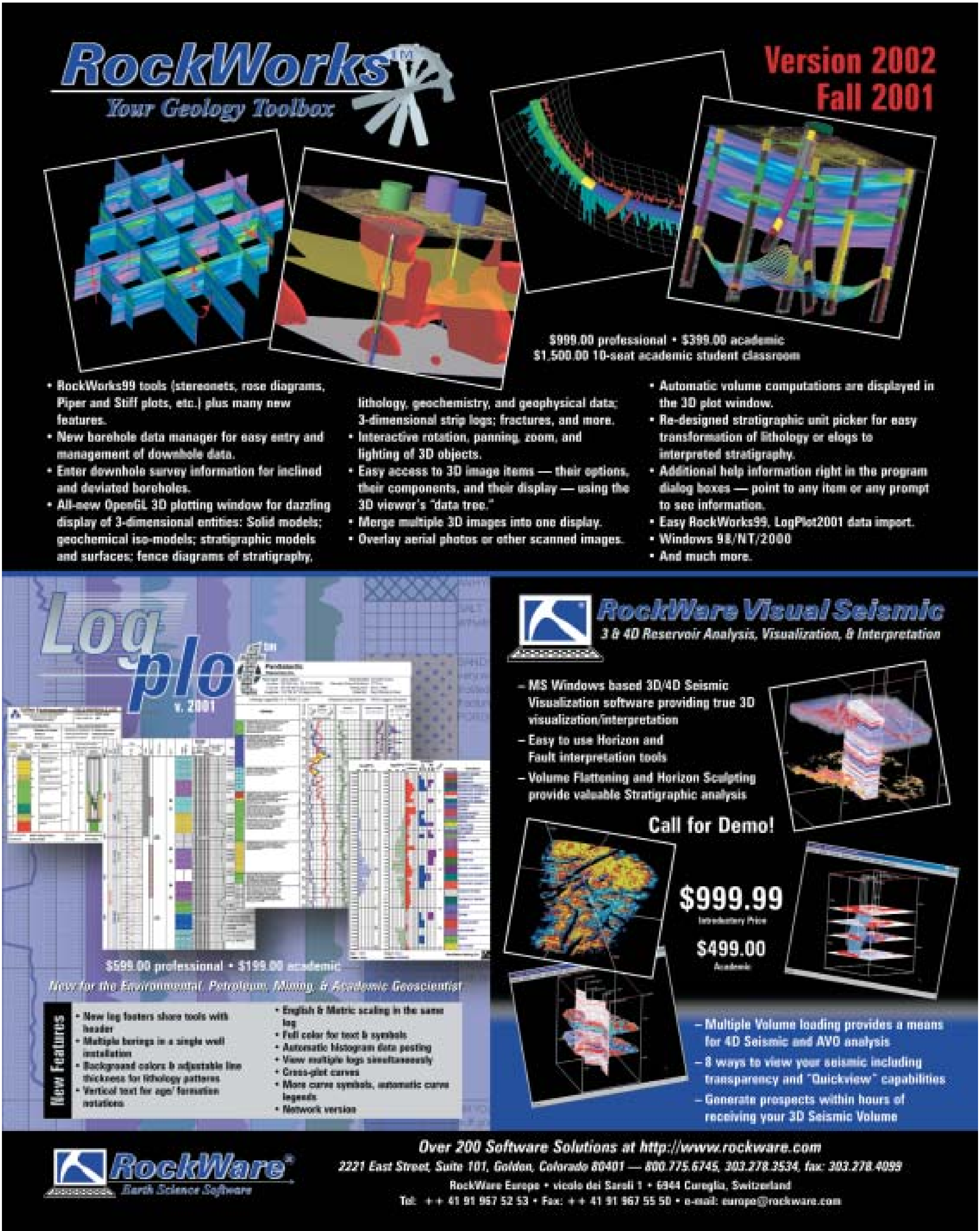
Position description: The Executive Director provides scientific direction for DHS through interactions with all DHS faculty. Key responsibilities include research and business development, personnel, and financial management. The DHS Executive Director reports to the President of DRI and holds a rank equivalent to a university dean. The Executive Director promotes the needs of all divisions, serves as faculty mentor and collaborator, fosters collaboration in teaching and research, and interacts directly with current and potential sponsors to further strategic goals.

Division scope: DHS has a unique mix of research grants and contracts with a total annual budget of approximately $7 million. Fifty faculty and support staff, as well as 40 graduate research assistants and hourly employees, are divided between DRI campuses in Reno and Las Vegas. Approximately 15 DHS faculty teach in graduate programs within the UCCSN. Faculty engage in basic and applied research in global environmental hydrology; climate change; watershed hydrology; groundwater hydrology and hydraulics; hydraulic engineering and surface water hydrology; contaminant transport; aqueous geochemistry; and snow, ice, and unsaturated zone hydrology. Sponsors include federal agencies, state and local governments, private industry, and foundations.

Qualifications: Candidates should have a Ph.D or equivalent graduate degree in a relevant field and must bring proven leadership, communication, administrative, and personnel skills to the position.

Compensation: The starting salary for this state funded position is expected to be $120,000-$140,000 with an excellent fringe benefits package.

Additional information: For a detailed position description, application procedures, and more about DRI, please visit www.dri.edu. Review of applications will begin on March 1, 2002. The desired start date is July 1, 2002.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