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Erosion, Himalayan Geodynamics, and the Geomorphology of Metamorphism

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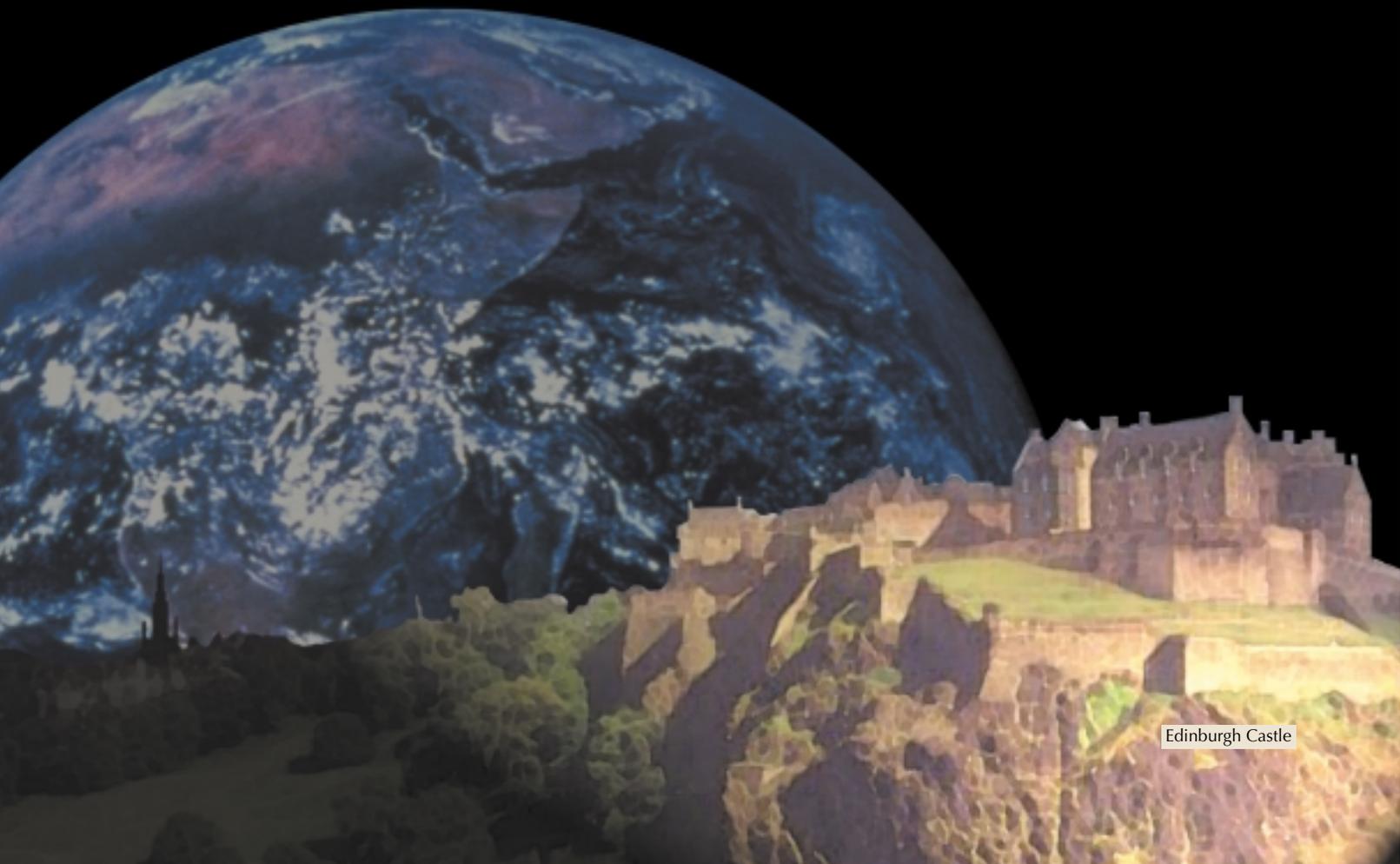
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Erosion, Himalayan Geodynamics, and the Geomorphology of Metamorphism

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ABSTRACT

Is erosion important to the structural and petrological evolution of mountain belts? The nature of active metamorphic massifs co-located with deep gorges in the syntaxes at each end of the Himalayan range, together with the magnitude of erosional fluxes that occur in these regions, leads us to concur with suggestions that erosion plays an integral role in collisional dynamics. At multiple scales, erosion exerts an influence on a par with such fundamental phenomena as crustal thickening and extensional collapse. Erosion can mediate the development and distribution of both deformation and metamorphic facies, accommodate crustal convergence, and

locally instigate high-grade metamorphism and melting.

INTRODUCTION

Geologists have long recognized the interplay between erosional unloading and passive isostatic response, but the past two decades have seen a new focus on the role of surface processes in active tectonic environments. Erosion's influence on structural evolution has been examined at a variety of spatial scales (e.g., Pavlis et al., 1997; Norris and Cooper, 1997; Hallet and Molnar, 2001). Thermal modeling yielded the fundamental result that variations in the timing and rate of erosion influence the thermal and hence metamorphic evolution of thickened crust (e.g., England and Thompson, 1984). Geodynamical models now link the mechanical and thermal evolution of orogens to lateral variations in erosion rate and magnitude and show how erosion can exert a strong control on particle paths through an orogen and thus on the surface expression of metamorphic facies (Koons, 1990; Beaumont et al., 1992; Willet

et al., 1993). To further explore interactions between surface and lithospheric processes during orogeny, three-dimensional geodynamic models have been developed to explain particular patterns of crustal deformation and metamorphic exposures (e.g., Koons, 1994; Royden et al., 1997; see below).

The general conclusion is that erosion can be a significant agent in active tectonic systems, particularly at larger spatial scales, and that interpretation of mountain belts past and present requires consideration of erosion (e.g., Hoffman and Grotzinger, 1993). The issue is complex, because, as pointed out by Molnar and England (1990), records of unroofing that have traditionally been viewed as evidence for tectonic activity, such as sedimentation or radiometric cooling ages, could in fact document erosion events driven by climate. Further, it can be argued that tectonics can force a climate response (e.g., Raymo and Ruddiman, 1992), and vice versa. Thus, to get beyond a "chicken and egg" controversy, we need to study specific processes, in specific settings, and look for feedback relationships between erosion and tectonism (e.g., Brozovic, et al., 1997). With their high elevations, great relief, and highly active surface and tectonic processes, the eastern and western syntaxial terminations of the Himalayan chain offer an opportunity to examine questions about the interplay between erosion and tectonics in the context of the India-Asia collision. In this article, we hope to stimulate debate by offering our conclusions and speculations about the role of erosion during collisional orogenesis, from a perspective grounded in the Himalayan syntaxes. In particular, we draw on results obtained from multidisciplinary study of the Nanga Parbat massif in the western syntaxis (Fig. 1), as well as preliminary work that has been done at the Namche Barwa massif in the eastern syntaxis.



Figure 1. View to south of Nanga Parbat and central Nanga Parbat massif. Indus River in foreground passes base of massif in middle distance, more than 7 km below summit of Nanga Parbat itself.

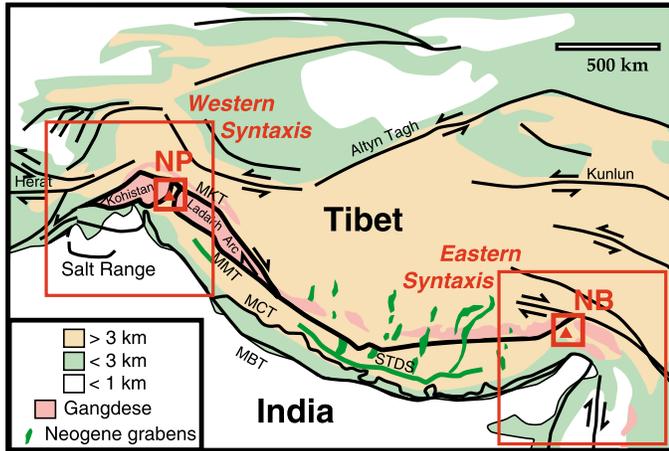


Figure 2. Tectonic sketch map of India-Asia collision (after Harrison et al., 1992). Approximate locations of western and eastern Himalayan syntaxes are shown, as are locations of Nanga Parbat (NP) and Namche Barwa (NB) metamorphic massifs. MKT—Main Karakoram thrust; MMT—Main Mantle thrust; MCT—Main Central thrust; MBT—Main Boundary thrust; STDS—Southern Tibetan detachment system.

CORNERS, SYNTAXES, AND SYNTAXIAL METAMORPHIC MASSIFS

Setting: Himalayan Syntaxes and Indenter Corners

The Himalayan syntaxes compose about one-third of the India-Asia collision zone and encompass a substantial part of the crustal deformation that occurs within the system (Fig. 2). Some of the most active orogenic processes on Earth occur within these syntaxes. For example, a broad zone of active strike-slip deformation throughout a large part of southeast Asia (Royden et al., 1997) is evident in a pronounced topographic grain dominated by the strong convergence and alignment of three of the great Asian rivers (Hallet and Molnar, 2001). Embedded within the syntaxes are unusual, highly active antiformal basement massifs (Nanga Parbat in the west [Fig. 1] and Namche Barwa in the east), where the deep gorges of the Indus and Tsangpo rivers expose, uniquely to our knowledge, ~7000 m of relief, actively deforming metamorphic rocks, and granites as young as Pleistocene (Burg et al., 1997).

The two Himalayan syntaxes are somewhat different in their regional tectonics. The eastern syntaxis spans a well-defined “indenter corner” generated at the eastern edge of the Indian plate (Koons, 1995). Intense deformation should start near the original corner of an indenting plate; through time, this deformation will evolve and propagate (e.g., Tapponnier et al., 1990; Royden et al., 1997; Enlow and Koons, 1998). As the indenter plows material into a two-sided orogen, material at the ends of the orogen slips around the indenter in a wake of strike-slip structures and mountains of diminishing elevation, generating a crustal syntaxis at shallow levels with well-defined structural and topographic trends. In contrast, the tectonics, geomorphic expression, and kinematics of the western Himalayan syntaxis are more diffuse, and regional strain patterns exhibit negligible vorticity (e.g., Bernard et al., 2001). The western syntaxis shows less influence of a lateral plate edge than does the eastern syntaxis, where large compressive and shear strains are clearly localized (Hallet and Molnar, 2001).

Despite significant differences in their tectonics, the eastern and western syntaxes each entrain one of the Himalaya’s two major orogen-traversing rivers. Both the Indus in the west and Tsangpo in the east cut cross-strike gorges through the Himalaya as they turn sharply from the Tibetan Plateau to head south into the foreland, establishing extreme local relief, and facilitating efficient removal of detritus. The cutting of these gorges may be recent, perhaps due to river capture within the syntaxes that diverted these rivers within the

past 10 m.y. (e.g., Seeber and Gornitz, 1983; Brookfield, 1998; Royden et al., 2000); thus, the history of these rivers, and the tectonics of the syntaxes, may be closely linked.

Syntaxial Metamorphic Massifs

One additional feature common to the Himalayan syntaxes is an active metamorphic massif developed in basement rocks of the Indian crust.

Nanga Parbat. Structural mapping and cooling-age patterns show the Nanga Parbat massif to be a crustal-scale pop-up structure delineated by active brittle faults and older shear zones into which granitoids were emplaced (Fig. 3A; Schneider et al., 1999a, 1999b; Edwards et al., 2000). Rocks of the massif include Proterozoic metamorphic basement having high radiogenic heat production and Lesser Himalayan affinity (Whittington et al., 1999). Several episodes of Himalayan metamorphism are shown by the presence of an anatectic granite ~18 m.y. old (Schneider et al., 1999b), small granite bodies less than 10 m.y. old scattered across the massif, and metamorphic monazite ages of 13 Ma or less. Very young metamorphism is documented by widespread anatectic granite dikes 1–3 m.y. old confined to its topographically high core (Zeitler and Chamberlain, 1991; Schneider et al., 1999c; Gazis et al., 1998), where low-pressure–high-temperature cordierite–K-feldspar gneisses (Poage et al., 2000) with metamorphic ages of ~3 m.y. are also present (Zeitler et al., 1993). Pervasive upper-crustal fluid flow occurs in the core region, as do steep thermal gradients of 60 °C/km within the top 3 km of the crust (Craw et al., 1994, 1997; Poage et al., 2000).

At or near Nanga Parbat, mapping shows no evidence for significant extensional exhumation having an age less than 15–20 m.y. (Schneider et al., 1999a), and thus this mechanism cannot explain the 15–20 km of unroofing seen within the past 3 m.y. Studies of denudation around the massif (Burbank et al., 1996; Shroder et al., 1999; Shroder and Bishop, 2000) indicate that erosion rates and processes are sufficient to provide the rapid exhumation required by petrologic and other studies. Geomorphic, petrologic, and geochronologic data all suggest that long-term erosion rates have been some 5 mm/yr (Gardner and Jones, 1993; Winslow et al., 1994; Zeitler et al., 1993).

A sharp lower cutoff in microseismicity, bowed upward 3 km beneath the summit region, indicates that the brittle-ductile transition is shallow, at ~2–5 km bsl (Meltzer et al., 1998). This pattern, together with tomographic results showing very low seismic velocities and higher attenuation throughout the crust in the region below the core of the massif (Meltzer et al., 1998; Sarker et al., 1999), is consistent with the thermal consequences of rapid advection at 5 mm/yr. This also suggests that the primary flow path of crust into the massif is from depth rather than along a shallow detachment. Magnetotelluric and seismic data rule out large magma bodies as the cause of the very young high-temperature metamorphism. The magnetotelluric data, surprisingly, show the lower crust to be atypically resistive for an active orogen, indicating the virtual absence or lack of connection of an aqueous fluid phase (Park and Mackie, 2000). These structural, geophysical, and petrological anomalies occur in a bull’s-eye pattern around the summit massif and are associated with focused exhumation, concentrated strain, and young igneous activity and metamorphism (Fig. 3A).

At a relatively low elevation of ~1000 m, the Indus River flows directly past the Nanga Parbat massif to its northwest, carving a deep, extensive valley parallel to the active massif-bounding thrust, creating extreme local relief, and efficiently removing detritus from the region. To the north, the Indus cuts across the massif and is generally accepted to be antecedent to it. Brookfield (1998) has argued that the ancestral Indus flowed northwestward from Ladakh to Afghanistan, where it deposited thick sedimentary sections during the interval ca. 30 to 10 Ma before being captured near Nanga Parbat and diverted south along its present course. At about 11 Ma, a change occurred in the Siwalik foreland with deposition of the Nagri Formation (Cerveny et al., 1989). This unit contains abundant blue-green hornblende sourced from the Kohistan terrane, which currently abuts the Nanga Parbat massif and is widely assumed to have overlain Nanga Parbat

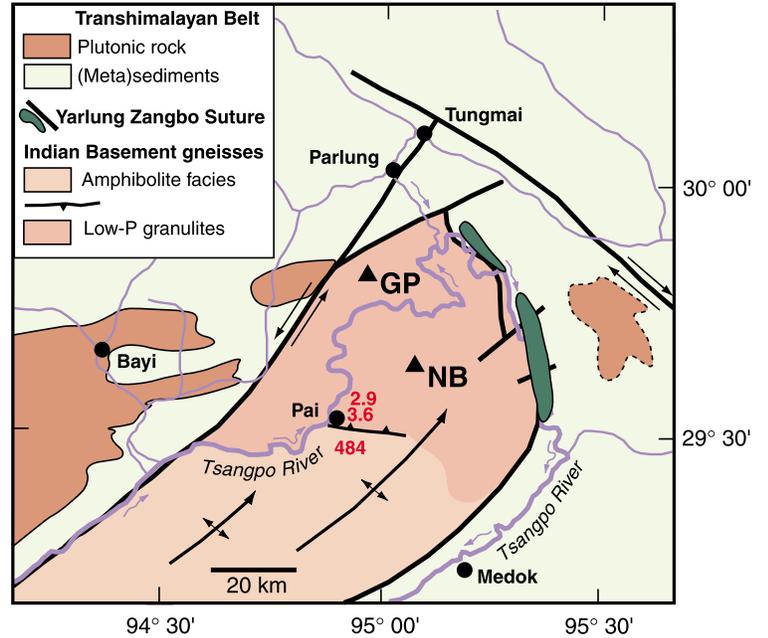
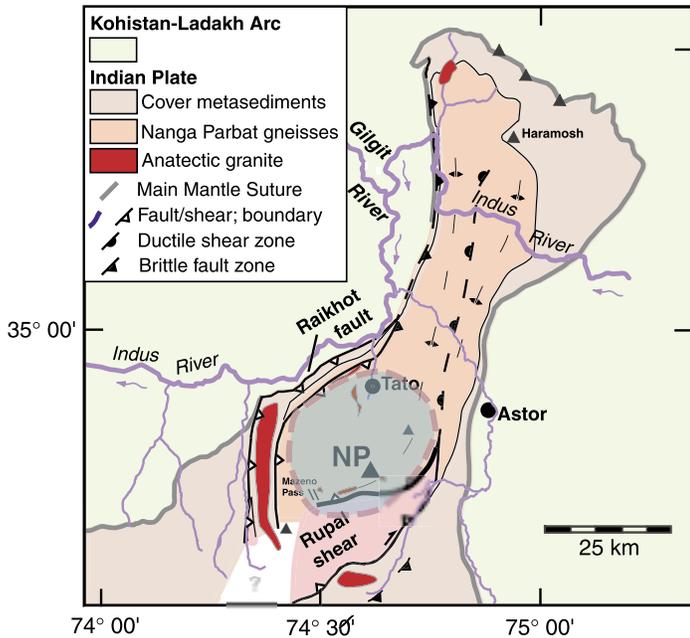


Figure 3. A: Geological sketch map of Nanga Parbat massif (after Schneider et al., 1999a). Colored region in core of massif (enclosed by heavy dashed lines) shows area characterized by young (<3 m.y.) granites, low-P cordierite-bearing granulites, low seismic velocities, resistive lower crust, shallow microearthquakes implying shallow brittle-ductile transition bowed upward by ~3 km, and other anomalies described in text. **B:** Geological sketch map of Namche Barwa metamorphic massif (after Burg et al., 1997; Liu and Zhong, 1997; see Fig. 2 for location). Metamorphic zonation within massif is only approximate; also, metamorphic grade decreases considerably toward southeast. Note remarkable 180° bend made by Tsangpo River, and stream capture that has occurred at apex of this bend. To west of Pai, river's grade is virtually nil, and sediments are accumulating; downcutting begins several kilometers downstream (northeast) of Pai.

before its emergence. In addition, in contrast to lower paleodischarges estimated for older units of the Siwalik molasse, values for the Nagri Formation suggest the arrival of a large Indus-sized river in the foreland at about 11 Ma (Zaleha, 1997a, 1997b).

Namche Barwa. The active Namche Barwa metamorphic massif in the eastern syntaxis shares several features with Nanga Parbat. These include rapid exhumation of an antiformal massif, which exhibits Pleistocene metamorphic and structural overprinting of Proterozoic Indian basement (Fig. 3B; Burg et al., 1997; Liu and Zhong, 1997). Where the Tsangpo River crosses the Namche Barwa antiform, a spectacular knickpoint is developed (Fig. 4), just at a point where local relief becomes greatest, suggesting that high rates of differential rock uplift are likely to occur around Namche Barwa. Just upstream of the knickpoint, considerable sediment is accumulating along some 30 km of the Tsangpo and also the Nyang Qu tributary, and just downstream of the knickpoint, the Tsangpo forms a great falls, dropping some 30 m across a bedrock lip. Regional drainage patterns suggest that an ancestral Tsangpo-Irrawaddy river was captured by the Brahmaputra network due to efficient headward cutting; this was likely caused by the river system's confinement within topography established by the tectonics of the eastern syntaxis (Koons, 1995). Brookfield (1998) suggested that this capture occurred a few million

years ago, on the basis of comparison of stream profiles of the current Tsangpo with those of other major Himalayan rivers.

MODEL: TECTONIC ANEURYSMS

To our knowledge, active metamorphic massifs like Nanga Parbat and Namche Barwa are unique to the Himalayan syntaxes. Even though the tectonics of each syntaxis are quite different, we think that

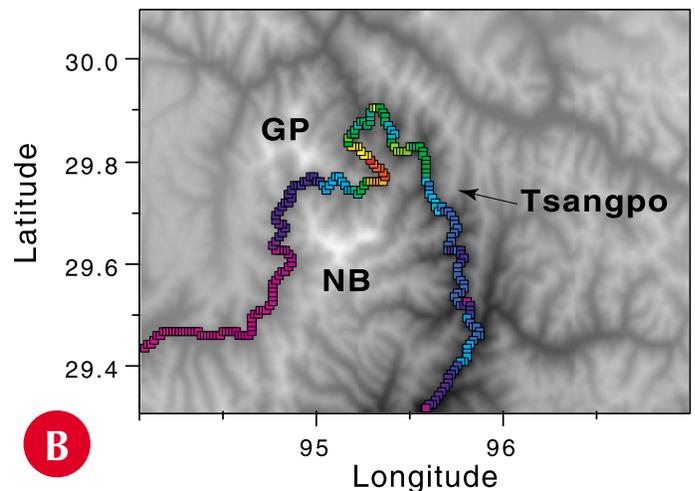
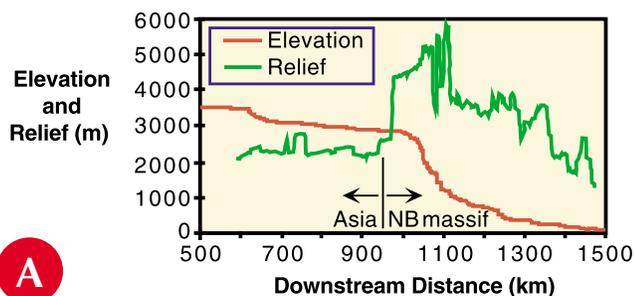


Figure 4. A: Elevation and relief profile along Tsangpo River as it traverses southeastern Tibet, Namche Barwa massif, and Big Bend gorge. Also shown is approximate position of massif's western boundary. Relief (maximum elevation difference within 20 km of river) jumps where river starts to slice its deep gorge through high peaks of easternmost Himalaya. **B:** Variation of river power along length of Tsangpo through Namche Barwa area showing local area of rapid energy expenditure (red) where river makes its steepest descent. Note how Tsangpo flows directly between >7000 m peaks Gya Peri (GP) and Namche Barwa (NB).

it is no coincidence that the two massifs occur within the syntaxial interiors. Rather, we think they owe their origin to rapid exhumation by great orogen-scale rivers (Indus and Tsangpo) as the rivers turn south and slice across the Himalaya.

On the basis of the observations from Nanga Parbat summarized above, we suggest that local feedbacks between tectonic and surface processes created these massifs: large-magnitude river incision focuses deformation of weak crust, leading to lower crustal flow into the region and creating what amounts to a “tectonic aneurysm” (see below). Alternative models have been proposed that attribute the Nanga Parbat and Namche Barwa antiforms to crustal-scale buckling related to syntaxial tectonics (Treloar et al., 1991; Burg et al., 1997), the major rivers being passively antecedent to these structures. However, such models do not explain the observed very young metamorphism nor the geophysical data from Nanga Parbat which show the massif to be developed atop weak crust that is hot, dry, and thin by overthickened Himalayan standards (Meltzer et al., 1998; Park and Mackie, 2000).

Coupled thermal-mechanical-erosional modeling (Koons, 1998) shows that in a deforming orogen, local rheological variations will arise from deep and rapid incision. The crust will weaken as the strong upper crust is stripped from above by erosion and the local geotherm is steepened from below by rapid uplift of hot rock. If this weakening occurs where the crust is already close to failure, it will focus particle paths such that local movement of material will be concentrated into the weaker zone. Provided that efficient erosion continues, a positive feedback develops in which flow of material into this weakened zone maintains local elevation and relief, reinforcing the concentrated exhumation and bowing up isotherms, further weakening the upper crust (Fig. 5). This focusing of strain and rapid exhumation leads to metamorphic and structural overprinting of the crust as high-temperature lower crustal rocks are isothermally decompressed, and also leads to development of large mountains of limited spatial extent perched atop hot, weak crust. It is this concentration of exhumation and redirection of strain, with associated thermal, petrological, and geophysical anomalies, that we have dubbed a “tectonic aneurysm,” in the sense of self-sustained failure of a normally strong boundary. Inherent in this model is the notion that feedback can amplify rather local geomorphic processes to the point where they can exert profound influence on the metamorphic and structural evolution of rocks at considerable depth.

Applying this model, especially to Nanga Parbat but also to Namche Barwa, our view is that rapid erosion and excavation of a deep gorge by the Indus River focused strain and triggered development of a tectonic aneurysm in high-grade Proterozoic basement that was weakened by early Himalayan thickening and high radioactive heat production. The emplacement of vapor-absent anatectic melts during recent erosional exhumation, development, and exposure of young low-pressure granulites, development of structural relief via antiform growth and thrusting, formation of a vigorous metamorphic-meteoric hydrothermal system, upward advection of isotherms as evidenced by a shallow brittle to ductile transition, and generally hot resistive crust are all consistent with advection of deep crustal material into a relatively weak crustal zone.

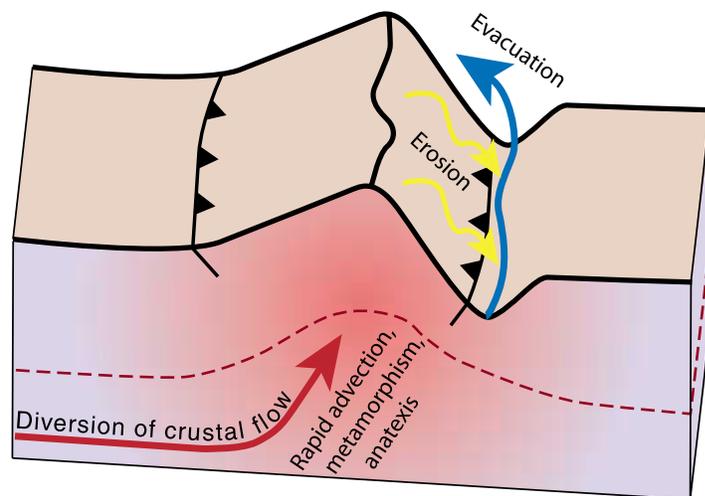


Figure 5. Cartoon illustrating dynamics of a tectonic aneurysm, shown at mature stage. Large river gorge weakens crust, encouraging failure and drawing in advective flow toward topographic gap. This builds elevation and, together with incising river, builds relief, leading to rapid erosion rates. Result is steepened thermal gradient, raising of brittle-ductile transition, and further weakening of crust. Deep and mid-crustal material can experience decompression melting and low-*P*-high-*T* metamorphism as it is moved rapidly to the surface.

CONSEQUENCES OF EROSION IN INDENTER CORNERS

Regional-Scale Control of Drainage Patterns and Mass Flux

The channeling of the two great Himalayan rivers through the eastern and western syntaxes is likely to be an inevitable consequence of orogenic evolution, because development of a syntaxis will bring focused erosion to bear within it. This will lead to enhanced headward cutting, which can efficiently capture any “outboard rivers” (Koons, 1995) that orogenic topography has compelled to run parallel to the orogen’s north side and off past its terminations. Thus, the localization of the great rivers within the syntaxes is linked to the tectonics of the crustal deformation field.

These are not one-way linkages. A large river provides a way to convey crustal material out of the orogenic system. In southeastern Tibet and in particular in the Three Rivers region directly east of the Himalaya, the rugged landscape traversed by large rivers flowing through deeply incised gorges strongly suggests that the area is undergoing significant erosion. Under these conditions, motion of the thickened Tibetan crust to the side of the Indian indenter could diminish eastward due to surficial mass removal in the Three Rivers region, a process that could be sustained indefinitely if rock uplift is balanced by erosion. Quite a modest erosion rate of only 0.2 mm/yr could account for a significant component of the eastward mass flux from Tibet (~10%), and 2 mm/yr would allow all easterly crustal advection to be consumed by erosion; erosion rates of this magnitude almost certainly pertain to high-relief regions like the hinterland of the active eastern syntaxis. Clearly, quantitative assessment of these erosional fluxes will be required before we understand the relative importance of erosion versus “tectonic escape” as mechanisms to accommodate mass removal in the India-Asia collision.

Local-Scale Dynamics of the Namche Barwa Knickpoint

Although modest in spatial extent, the Namche Barwa knickpoint may play a key role in controlling the geodynamic evolution of some 200 000 km² of the southern and southeastern Tibetan Plateau. The knickpoint currently maintains the upper Tsangpo River at a high base level of more than 3000 m (Figs. 4, 6), and by reducing available relief thus limits the degree to which southeastern Tibet can be exhumed.

The key issue that arises is whether the Namche Barwa knickpoint exists in a state of dynamic equilibrium between rapid uplift of its host massif and rapid incision by the Tsangpo, or whether the co-

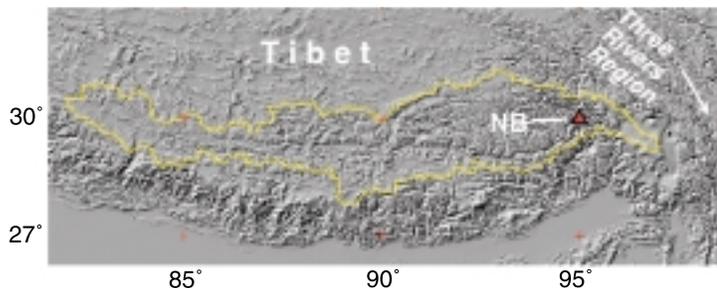


Figure 6. Topography of southeastern Tibet, showing extensive drainage basin (yellow line) of Yarlung-Tsangpo River above Namche Barwa knickpoint. NB—Namche Barwa massif.

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location of the knickpoint and massif is a coincidence. The Tsangpo knickpoint is remarkable for being the largest among the major knickpoints on Himalayan rivers (Brookfield, 1998), for its location on an active antiformal structure, for the significant deposition occurring immediately upstream of it, and for having peak erosion indices unsurpassed in the Himalayas, except for a few reaches of the Arun River. Simple two-dimensional models of fluvial bedrock incision show that the knickpoint would migrate upstream rapidly in the absence of rock uplift. This migration would uncover a swath of relatively shallow rocks; this is not consistent with the observed exposure at Namche Barwa of young metamorphic rocks originating from considerable depth. Knickpoint migration can be essentially halted, however, by offsetting the erosion with the uplift that would be predicted near the Namche Barwa antiform by our aneurysm model, in which local rock uplift and deep-gorge excavation are linked. In any case, the knickpoint would have to have been sustained and essentially stationary to erode the perhaps 15–20 km of crust that reconnaissance petrological and geochronological data (Burg et al., 1997) suggest has locally been removed at Namche Barwa in only the past 3–4 m.y.

The nature of the Namche Barwa knickpoint has broader ramifications, because development of an erosionally mediated metamorphic massif requires rapid cutting of a deep and extensive gorge, something that might be possible only in regions such as syntaxes offering the potential for focused erosion and capture of large rivers. This would suggest multiple links between surface and crustal geodynamics at two scales: at orogen scale, to explain the localization of the great Tsangpo gorge within the eastern syntaxis; locally, to explain the thermal-erosional weakening, extreme relief, and long-

sustained knickpoint at Namche Barwa; and again at orogen scale, as the dynamic knickpoint at Namche Barwa serves as a throttle on the exhumation of southeastern Tibet. If all this is true, then the geomorphic, structural, and metamorphic evolution of southeastern Tibet and the interior of the eastern syntaxis are all genetically related. If, on the other hand, the Namche Barwa knickpoint is merely migrating passively, then within a fairly short time the topography of the southeastern Tibetan Plateau would be doomed to deep and extensive dissection, removing the topographic buttress behind the eastern Himalaya with attendant alterations to the geodynamics of this part of the range.

SUMMARY

In the hinterland of orogens, direct records of erosion are cryptic and fleeting. Earth scientists have only recently begun to develop the insight, analytical methods, and modeling techniques required to assess the diverse ramifications of synorogenic erosion and to design field studies to determine its significance in collisional orogenesis. We acknowledge that we have probably raised more questions than we have answered, but we remain convinced that surface processes are of first-order importance in geodynamics, and that it does make sense to talk about the geomorphology of metamorphism as a new discipline at the interface between traditionally distant fields.

ACKNOWLEDGMENTS

This work was supported by grants from the National Science Foundation Continental Dynamics Program in support of the Nanga Parbat Continental Dynamics Project. We thank the many participants in this project for sharing their input and perspective over the past five years. We thank Karl Karlstrom, Rudy Slingerland, and an anonymous reviewer for their comments.

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In order to broaden our discourse in 2001, I'm sharing this column with GSA officers and Council members over the next 12 months. I look forward to reading what is sure to be an interesting and diverse series and hope you find it valuable.

—Sara Foland, CEO

DIALOGUE



Charting GSA's Course at the Start of the 21st Century

Sharon Mosher, President of GSA

In the next few years, GSA will face many decisions about its future course. These opportunities for change will challenge our vision of our role as a Society and as individual geoscientists and will influence the way we conduct and disseminate our science. Following is an outline of some of these challenges and a brief look at the direction GSA is taking. Future articles will explore GSA's response to the challenges ahead.

Our science has become increasingly interdisciplinary. How can we as a Society facilitate the interaction of diverse scientists, support new fields of research, and disseminate research results? Our upcoming Earth System Processes meeting (June 24–28, Edinburgh, Scotland, cosponsored with the Geological Society of London) will bring diverse scientists together to explore links between earth systems and changes in those links with time. Future global meetings will focus on different topics, but each should bring together scientists with different disciplinary perspectives. Our modification of the GSA annual meeting program structure has encouraged significantly more interdisciplinary sessions as demonstrated by the 1999 and 2000 technical programs, and we are planning future joint meetings with nongeoscience societies in related disciplines. A group of members met recently to organize a new division for geobiology and geomicrobiology. Perhaps we also can open membership to nongeoscientists, publish new journals, or cosponsor more conferences and meetings.

Decisions regarding publications may represent our most significant challenge, but also present one of our greatest opportunities. Rather than have our decisions be driven by constantly changing technology and the marketplace, we must decide how to best use new technology to optimize publication of information geoscientists require, to ensure the continued use of our past literature, and to increase interactive access to all geoscience journals.

How do we meet the broader mission of GSA? We have the potential to make an impact or to continue to let the geosciences be nearly invisible in the public arena. What role should we play? Education, used in the broadest sense, is the key to most of these goals. We need to use GSA's strengths in effective ways to educate ourselves through initiatives in the area of professional development and for students, K–16 educators, the public through outreach initiatives, and public policy makers.

Lastly, all of these challenges should not be addressed in a vacuum. Our voice and impact is muted because we are splintered into a multitude of geoscience societies; we waste our resources, both in terms of people and finances, by trying to address similar problems and goals independently. GSA is committed to increased collaboration and coordination of efforts within the geosciences and is actively pursuing stronger working relationships with our associated societies, geological societies from other countries, and other member societies, including the American Geophysical Union and the American Association of Petroleum Geologists.

The decisions that will shape GSA's future are in our hands. It is through our collective efforts as members that GSA's course at the start of the 21st century will be charted. GSA is able to take the initiative because we are financially sound and have a dedicated headquarters staff, but the input from members, guidance of committees, and the leadership of officers are required for us to meet the challenges ahead. Participate, volunteer, contribute suggestions—think about what we want GSA to do and be in the future. This is our Society. What will we accomplish in the next 112 years of our history?

The mission of the Geological Society of America is to advance the geosciences, to enhance the professional growth of its members, and to promote the geosciences in the service of humankind.

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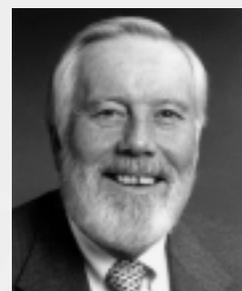
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GSA Offers Awards in Geomorphology and Micropaleontology

Two of GSA's most prestigious awards supporting research are made possible by the generosity of the late W. Storrs Cole. Qualified GSA Members and Fellows are urged to apply.

The Gladys W. Cole Memorial Research Award provides support for the investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. GSA Members and Fellows between the ages of 30 and 65 who have published one or more significant papers on geomorphology are eligible for the award. While the funds may not be used for work that is already finished, recipients of previous awards may reapply if they need additional support to complete their work. The 2001 award is for \$11,500.

The W. Storrs Cole Memorial Research Award supports research in invertebrate micropaleontology. This award carries a stipend of \$9,500 in 2001 and will go to a GSA Member or Fellow between the ages of 30 and 65 who has published one or more significant papers on micropaleontology.

For application forms or for more information, contact Leah Carter, Research Grants Administrator, GSA, P.O. Box 9140, Boulder, CO 80301-9140, lcarter@geosociety.org. Application forms are also available at www.geosociety.org.

Applications must be mailed and must be postmarked on or before February 1, 2001. Applications sent by facsimile or e-mail will not be accepted. The Committee on Research Grants will report its actions to each applicant in April 2001.

Call for Nominations

Nominations are due soon for the following medals and awards for 2001. Don't miss this chance to recognize your deserving colleagues for their contributions to the geosciences and to GSA. Make a note of the deadlines for nominations and send them in!

For details on the awards and nomination procedures, see the October 2000 issue of *GSA Today*, go to our Web site at www.geosociety.org, or call Leah Carter at (303) 447-2020, ext. 137. Materials and supporting information for any of the nominations may be sent to Leah Carter, Grants, Medals, and Awards, GSA, P.O. Box 9140, Boulder, CO 80301-9140.

National Awards

Nominations for the William T. Pecora Award, the National Medal of Science, the Vannevar Bush Award, and the Alan T. Waterman Award are due April 30, 2001. Nominations for these awards should be sent to GSA External Awards Committee, P.O. Box 9140, Boulder, CO 80301-9140.

Penrose Medal

Deadline:
February 1, 2001

Day Medal

Deadline:
February 1, 2001

Honorary Fellows

Deadline:
February 1, 2001

Young Scientist Award (Donath Medal)

Deadline:
February 1, 2001

GSA Public Service Award

Deadline:
February 1, 2001

Distinguished Service Award

Deadline: March 1, 2001

John C. Frye Environmental Geology Award

Deadline: March 31, 2001

Time is Running Out!



Charles Darwin

GSA Charges Two Panels With Work on Position Statements

GSA Council has approved a proposal to develop a new statement on GSA's position on evolution and creationism. This statement is intended to support the teaching of evolution and the centrality of evolutionary theory to the natural sciences.

In addition, the Council also approved a proposal to develop a position statement on scholarship and professional activity. Its intent is to communicate to academia that GSA values professional service activities in addition to scholarly activities.

The Council's decision to proceed with the development of these two important statements is an achievement of the presidency of Mary Lou Zoback, who appointed and charged panel chairs and members according to GSA policy. Final versions of each statement will be presented for the Council's approval in May 2001.

Both panels are now accepting comments from Council and GSA members. Please submit your comments on these issues by March 1, 2001, either electronically to Cathy Roam at croam@geosociety.org, or by mail to her attention at GSA, P.O. Box 9140, Boulder, CO 81301-9140, USA.

GSA supports efforts to increase awareness of the value of geoscience within the greater scientific community, society at large, and among our own members. This column will highlight efforts of members of the geoscience community that contribute to the claim that geoscience matters. We encourage readers to submit information about similar efforts to Chief Science Officer Cathleen May, cmay@geosociety.org.

Evolution is Good Science

Setting an historic precedent, 63 people, including representatives from more than 45 scientific and educational organizations, decision makers, and media professionals, gathered October 6–8, 2000, at the University of California at Berkeley to find ways to help students and the public understand that evolution is good science. The National Conference on the Teaching of Evolution (NCTE), supported by the National Science Foundation, the University of California Museum of Paleontology, and GSA, developed recommendations and action items that individuals and organizations can employ to support good science education, emphasizing evolution as a unifying theme across all scientific disciplines.

The conference centered on the benefits to society of teaching evolution and of public understanding of basic evolutionary concepts. Such benefits include a pool of competitive, well-prepared specialists for the biomedical, biotechnology, and pharmaceutical industries, interdisciplinary teams of scientists who can study global environmental and ecological change over time, and citizens to whom science is not a mystery.

Challenge and Relevance in Teaching Evolution

Challenges faced by those who teach evolution include politics at state and local levels, such as those made famous most recently in Kansas. Less obvious, but equally challenging problems include teachers who are not well prepared to teach evolutionary science and the lack of a centralized source of support materials.

Contributing to the social relevance of the conference, media professionals led discussions on how to help the general public understand the principles of evolution and its importance in their daily lives. Others described the need to help decision makers understand the importance of evolutionary science to the economy, to the health industry, and to national defense.

Scientific Phenomenon

The NCTE was an unusual phenomenon in the world of science. Gathering high-

level representatives—from physicists to biologists to geologists to classroom teachers—for three days is rare enough. Focusing the attention of 63 scientists, educators, media professionals, and public officials on a single topic is even more rare. For such a group to build a sense of community, achieve a unified voice, and determine a united course of action is almost unheard of. But then, evolution is good science, and for this group at this historic gathering, that was and is the bottom line.

GSA's Chief Science Officer Cathleen May served on the NCTE Steering Committee with Sam Donovan of the BioQUEST Curriculum Consortium, and three dedicated GSA members: Judy Scotchmoor and David Lindberg of the University of California Museum of Paleontology and Dale Springer of the Paleontological Society. In addition to the Paleontological Society, other GSA associated societies helped represent the earth sciences at the conference. Michael Howell participated on behalf of the National Association for Black Geologists and Geophysicists. Scott Linneman represented the National Association of Geoscience Teachers, and Lee Allison participated for the Association of American State Geologists. GSA member and former *GSA Bulletin* editor John Geissman represented the American Geophysical Union, and GSA member Mike Smith, education director of the American Geological Institute, represented the federated geoscience societies.

Visit the NCTE site at www.ucmp.berkeley.edu/NCTE for more information about the conference, future activities of the consortium, and planned publication of its results. GSA's participation and contributions to the NCTE and its goals are supported by the generosity of Carol Mann through the John F. Mann fund of the GSA Foundation.

—Submitted for the NCTE Steering Group
by Cathleen L. May

Medical Geology: An Emerging Discipline

About 40 earth and medical scientists gathered in Uppsala, Sweden, September 4–6, 2000, for the seminar Health and the Geochemical Environment. Participants agreed to join a medical geology network to share expertise and research in biology, biochemistry, geology, and geochemistry related to health issues with the aim of helping create a better quality of life for people all around the world.

This groundbreaking seminar, hosted by the Geological Survey of Sweden (SGU), explored the health-related scope and interrelatedness of the biogeochemical sciences by bringing together hydrologists,

soil scientists, mineralogists, geochemists, geologists, geographers, physicians, dentists, pathologists, epidemiologists, veterinarians, plant physiologists, and others. The gathering was international in its representation, with presenters from Zambia, South Africa, Australia, Sweden, Norway, Poland, the United Kingdom, Canada, and the United States, and global in scope, with illustrative research from South Asia, Kenya, Zambia, Maputoland, China, Japan, Bangladesh, Greece, Turkey, Poland, Sweden, Britain, and the United States.

External Pathways: Geochemistry and Geology

Presentations dealt with environmental toxicity, contaminant sources both natural (geogenic) and anthropogenic, and effects on organismal health. Illustrative research included archaeological work at an ancient mining and smelting site in Jordan and evidence of the absorption of copper into the skeletons of Byzantine metal workers. Copper uptake there continues today through bioaccumulation in local plants, people, and animals. Potential links between frequent and widespread dust storms in China and high incidences of upper respiratory diseases were presented, as well as documentation of the mobilization of arsenic and its effect on human health in Bangladesh.

Participants considered the geochemistry of urban environments including a recent example of tire wear as a contaminant source in New Orleans, Louisiana. A not-so-urban example of contamination via habitat choice came from Turkey, where people living in caves dug into tuffs rich in fibrous zeolites suffer high incidences of lung cancer. A session on external pathways emphasized that plant and animal health is also affected by the *absence* of elemental nutrients in the environment. Examples included the negative combined effects of natural soil degradation and habitat constriction on wildlife restricted to preserves in Africa.

Seminar co-organizer Tony Berger reminded participants of the importance of discriminating between human-caused and naturally occurring geochemical contamination and degradation. He argued that societies may regulate and attempt to mitigate human contributions to these problems, but only if anthropogenic causes are clearly distinguishable.

Internal Pathways: Biochemistry and Biology

Seminar participants also considered the biological expression of the geochemical environment. For example, bones and teeth record information about nutrient and contaminant bioavailability in the

environment throughout the life of a vertebrate animal. Paleontologists use such evidence to infer paleoenvironmental conditions at a gross scale in geologic time. But research into the connections between the mineral composition of bone and tooth tissues, the history of disease or developmental abnormality in an individual, and the geochemistry of the environment in which the individual lives is rare.

According to seminar co-organizer Catherine Skinner, medical researchers rarely investigate minerals essential to the normal function of these tissues, or detrimental to normal function. In a more explicit example of needed research, the possibility of dissolving combined mineral and cholesterol obstructions in human blood vessels illustrates the importance of understanding mineralization in animal tissues.

For animals, including humans, pathways of exposure to both mineral and elemental contaminants and nutrients are absorption through the skin, ingestion, and inhalation. Significant attention was paid to the indirect pathways into animal systems via ingestion. Illustrative research included studies in China and Japan on the relationship between breast and prostate cancer risk and endocrine disruptors found in dairy and other products from animals

fed with growth hormones. Other research from China presented the direct link between human health and cooking food over coal. More than 3,000 Chinese people have been severely poisoned by consuming chili peppers dried over high-arsenic coal fires. More than 10 million people suffer dental and skeletal fluorosis due to eating corn dried over briquettes made from high-fluorine coal and high-fluorine clay binders.

Geographic research and analysis through Geographic Information System (GIS) technology is part of the integrative scientific equation expressing the links between geoscience and medical science. GIS analysis can reveal correlations such as exist between the concentration of ground radon and the risk of leukemia in children. Regional geochemical mapping will be an increasingly important tool to teams of medical practitioners, medical researchers, and geoscientists studying the environmental causes of disease.

Medical Geology: Integrative and Relevant

This seminar was conceived and co-organized by Olle Selinus of SGU and GSA members Catherine Skinner, Yale University, and Tony Berger, codirector of the International Union of Geological

Scientists (IUGS) Geoinicator Initiative, under the auspices of the IUGS. The organizers hoped to foster direct collaboration among researchers and practitioners in geoscience and medicine. Such collaboration, in terms of the questions asked, the research necessary to answer the questions, and the application of emergent understanding is an example of truly integrative science applied to challenges facing our global society.

This seminar was made possible by financial support from the IUGS Working Group on Medical Geology, directed by Selinus; IUGS-IGCP Project 454—Medical Geology, codirected by Selinus and GSA member Peter Bobrowsky of the Geological Survey of British Columbia; and Project Paracelsus Revisited, funded by UNESCO-ICSU and the IUGS and lead by Skinner and Berger. SGU provided the site and logistic arrangements.

To contribute to the growing medical geology network, contact Olle Selinus, olle.selinus@sgu.se, or Catherine Skinner, catherine.skinner@yale.edu. For more information, see <http://home.swipnet.se/medicalgeology>.

—A.R. Berger, O. Selinus,
H.C.W. Skinner

NORTHEASTERN SECTION

March 12–14, 2001

Sheraton Burlington Hotel, Burlington, Vermont. Information: Tracy Rushmer, Dept. of Geology, University of Vermont, Perkins Hall, Burlington, VT 05405-0122, (802) 656-8136, trushmer@zoo.uvm.edu.
Preregistration deadline: Feb. 2, 2001.

SOUTHEASTERN SECTION

April 5–6, 2001

Sheraton Capital Center, Raleigh, North Carolina. Information: Edward Stoddard, Dept. of Marine, Earth & Atmospheric Sciences, North Carolina State University, Raleigh, NC 27695-8208, (919) 515-7939, skip_stoddard@ncsu.edu.
Abstract deadline: Jan. 2, 2001. Preregistration deadline: Feb. 23, 2001.

CORDILLERAN SECTION

April 9–11, 2001

Sheraton Universal Hotel, Universal City, California. Information: Peter W. Weigand, Dept. of Geological Sciences, California State University–Northridge, 18111 Nordhoff Street, Northridge, CA 91330-8266, (818) 677-2564, peter.weigand@csun.edu.
Preregistration deadline: Mar. 2, 2001.

NORTH-CENTRAL SECTION

April 23–24, 2001

Bone Student Center, Normal, Illinois. Information: Robert S. Nelson, Illinois State University, Dept. of Geography–Geology, Campus Box 4400, Normal, IL 61790-4400, (309) 438-7808, rnelson@ilstu.edu.
Abstract deadline: Jan. 17, 2001. Preregistration deadline: Mar. 16, 2001.

ROCKY MOUNTAIN & SOUTH-CENTRAL SECTIONS

April 30–May 2, 2001

Sheraton Old Town Hotel, Albuquerque, New Mexico. Information: John Geissman, University of New Mexico, Dept. of Earth & Planetary Sciences, 203 Northrop Hall, Albuquerque, NM 87131-1116, (505) 277-3433, jgeiss@unm.edu.
Abstract deadline: Jan. 24, 2001. Preregistration deadline: Mar. 23, 2001.

Final Announcement

Cordilleran Section, GSA

97th ANNUAL MEETING

Joint Meeting with Pacific Section—American Association of Petroleum Geologists

Sheraton Universal Hotel,
Universal City, California
April 9–11, 2001
www.geosociety.org

This convention is being jointly sponsored with Pacific Section—American Association of Petroleum Geologists. Convention hosts are the Department of Geological Sciences, California State University—Northridge, and the San Joaquin Geological Society. Participating organizations include Pacific Section—SEPM (Society for Sedimentary Geology), California Science Teachers Association, Paleontological Society—Cordilleran Section, American Association of Petroleum Geologists—Division of Environmental Geologists, Association of Engineering Geologists—Southern California Section, San Joaquin Well Logging Society, Society of Exploration Geophysicists, Los Angeles Basin Geological Society, and Dibblee Geological Foundation. The convention site will be the Sheraton Universal Hotel adjacent to family-oriented Universal Studios Hollywood and Universal CityWalk (see map).

Convention co-chairs are Peter W. Weigand, (818) 677-2564, peter.weigand@csun.edu, and

Jeff Shellebarger, (661) 395-6385, jshe@chevron.com.

REGISTRATION

Preregistration deadline: March 2, 2001

Preregistration will be handled by GSA headquarters, and discounts are given to members of GSA and the associated societies listed on the preregistration form. Online registration is encouraged at www.geosociety.org; go to Meetings, then Cordilleran Section Meeting, then to Registration. You can also use the registration form inserted in this issue or download the PDF version from the Web site. Guest registration is required for those attending guest activities, or exhibits. Students and K–12 teachers must send or show *current ID* in order to obtain reduced rates. On-site registration at the Sheraton Universal will start in the late afternoon, Sunday, April 8.

The *Abstracts with Program* book will be distributed to all registrants, free of charge, at the meeting.

TECHNICAL PROGRAM

Besides the usual discipline-related technical sessions, 29 Theme Sessions have been organized for this meeting. Only titles and chairs are listed below; see <http://geology.csun.edu/gsa/> for session descriptions. Most Theme Sessions will include both invited and volunteered papers.

Oral sessions will allow 15 minutes for presentation and five minutes for discussion. Equipment for each technical session will include two 35 mm slide projectors, one overhead-transparency projector, and one

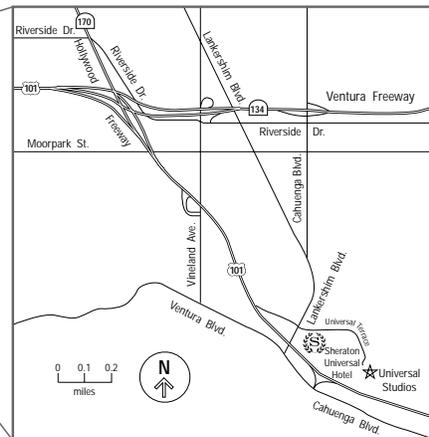
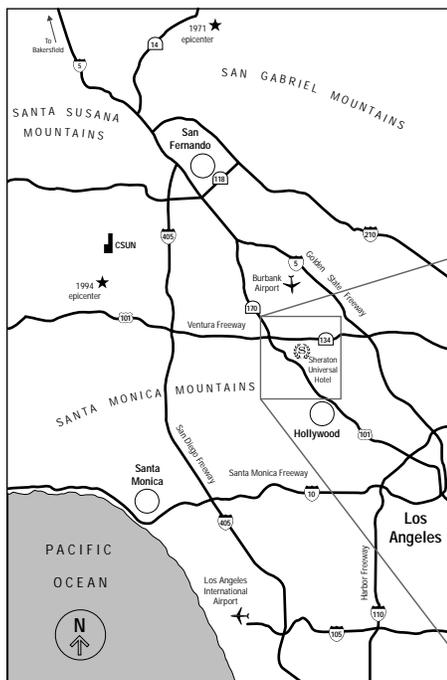
LCD digital projector; *presenters must bring their own computer for the latter*. Extra carousel slide trays will be available in the speaker-ready room, however speakers are encouraged to bring their slides already loaded into a carousel tray.

Posters will be on display for four hours; authors must be present for two hours. Each poster booth will contain three 4 × 6 foot tackable boards.

Address general questions to Technical Chair Gene Fritsche, (818) 677-3541, a.eugene.fritsche@csun.edu, Presentations Chair Mike Clark, (661) 395-6493, mscl@chevron.com, or Poster Chair Kathie Marsaglia, (818) 677-6309, kathie.marsaglia@csun.edu.

Theme Sessions

- 3-D Visualization and Geologic Modeling.** Marc Kamerling, (805) 893-8435, marc@crustal.ucsb.edu.
- Active Tectonics and Paleoseismology of the San Andreas Fault System.** Doug Yule, (818) 677-6238, j.d.yule@csun.edu.
- Active Tectonics of the Los Angeles Basin.** Scott Lindvall, (661) 775-4990, lindvall@lettis.com.
- Advances in Petrophysics in California Reservoirs.** (*Sponsored by the San Joaquin Well Logging Society.*) Bob Davis, (661) 864-4724, bdavis@bakersfield.oilfield.slb.com.
- Tectonics of Eastern Asia, with Emphasis on China and Mongolia.** Greg Davis, (213) 740-6106, gdavis@usc.edu.
- Climate, Tectonics, and Lakes of the Cenozoic Cordillera.** Vicki Pedone, (818) 677-2046, vicki.pedone@csun.edu; with Paul Buccheim.
- Engineering Geology of Southern California: In Memory of Perry Ehlig.** Kim Bishop, (323) 343-2409, kbishop@calstatela.edu, with Forrest Hopson.
- Gulf of California: NSF MARGINS Focus Site for Rupturing of the Continental Lithosphere.** Gary Axen, (310) 825-6928, gaxen@ess.ucla.edu, with A. Martin-Barajas.
- Hector Mine and Other Major 1999 Earthquakes.** Tom Rockwell, (619) 594-4441, tom.rockwell@geology.sdsu.edu.
- Magnetostratigraphy of the California Tertiary.** Don Prothero, (213) 825-6928, prothero@tiger.cc.oxxy.edu.



11. **Miocene Reservoirs of California.** Tony Reid, (661) 763-6052, tony_reid@oxy.com, with Jon Schwabach.
12. **Neogene Geology and Paleoclimate.** Rob Negrini, (661) 664-2185, Rob_Negrini@firstclass1.csusbak.edu.
13. **Paleontology of the West Coast.** (*Sponsored by the Paleontological Society, Cordilleran Section.*) Dick Squires, (818) 677-2514, richard.squires@csun.edu.
14. **Petroleum Geology of California Basins.** Frank Cressy, (805) 323-6828, fcressy@prodigy.net, with Tom Hopps.
15. **Successful Grant Writing.** Dottie Stout, dstout@nsf.gov, with George Brimhall.
16. **Provenance Studies: Geochemistry, Petrology, Paleotectonics, and Geoarchaeology.** Gordon Goles, (541) 346-5588, goles@oregon.uoregon.edu, with Ray Ingersoll.
17. **San Fernando Valley Geology and Tectonics (Including Results from Larse II).** Gary Fuis, (650) 329-4758, fuis@andreas.wr.usgs.gov, with Tom Wright and Bob Yeats.
18. **Sequence Stratigraphy.** Dan Steward, (661) 763-2008, sted@chevron.com, with Mike Clark.
19. **Tertiary Tectonic History of California.** (*In Honor of Gene Fritsche.*) Ivan Colburn, (323) 343-2413, icolbur@calstatela.edu.
20. **Update of Pacific Coast Geochronology.** Don Prothero, (213) 825-6928, prothero@tiger.cc.oxy.edu.
21. **Argentina: From the Andes to the Atlantic.** Jim Reynolds, (828) 230-8405, magstrat@gte.net.
22. **What's New in the Mesozoic?** Mario Caputo, (909) 594-5611, ext. 4439, mvcaputo@earthlink.net.
23. **What's New in the Paleozoic?** John Cooper, (714) 278-2662, jcooper@fullerton.edu.
24. **Geology and Tectonics of the Mojave Desert and Transverse Ranges: A Tribute to Perry Ehlig.** Forrest Hopson, (805) 964-5041, forrest@geology.ucsb.edu, with Kim Bishop.
25. **Geology Beyond Earth—Recent Results of Solar System Exploration.** Albert Haldeman, (818) 354-1723, albert@shannon.jpl.nasa.gov.
26. **Environmental Geology, Engineering, and Hydrogeology.** (*Sponsored by AAPG—Division of Environmental Geology.*) Bob Menzie, (907) 564-6372, rjmenzie@marathonoil.com, with Jim Waldron.
27. **Geophysical Application and Interpretation.** (*Sponsored by the Society of Exploration Geophysicists.*) Louis Klonsky, (661) 395-6304, lflkl@chevron.com, with Gary Myers.
28. **History of Geology.** Mike Nelson, (805) 933-0076, info@oilmuseum.net.
29. **Quaternary Framework of the Los Angeles Basin.** Daniel Ponti, (650) 329-5679, dponti@usgs.gov.
30. **Undergraduate Research Poster Session.** (*Sponsored by the Council on*

Undergraduate Research.) Karen Grove, (415) 338-2061, kgrove@sfsu.edu.

FIELD TRIPS

Preregistration Deadline: March 2, 2001

Cancellation Deadline: March 9, 2001

All trips leave early morning from the Sheraton Universal Hotel unless otherwise noted. Further specifics will be sent to registrants. Trip fees include transportation during the trip and a guidebook. Other included services are indicated by letter code: B—breakfast, L—Lunch, R—refreshments, D—dinner, N—overnight lodging. We recommend that registrants not make plane reservations until field-trip participation is confirmed. More extensive trip descriptions are provided on the Web at <http://geology.csun.edu/gsa/>. For additional information, contact the field trip leader or Field Trip Chair George Dunne, (818) 677-2511, george.dunne@csun.edu.

A limited number of **field-trip scholarships are available for students** (excluding #6). These provide a 50% reduction in trip fees. Students should register for field trips with GSA and separately submit a letter of request giving your student status and e-mail address and explaining your interest in the field trip. Awards will be based on (1) merit, and (2) funds availability. Send letter to George Dunne, Geological Sciences, CSUN, Northridge, CA 91330-8266, by March 2. Awards will be announced by March 9.

Premeeting Trips

1. **Regional Deformation by Strike-Slip Faulting, Southern Death Valley: The Eastern California Shear Zone Meets the Garlock Fault.** 6 p.m. Thurs.–Sun., April 5–8. Matt McMackin, San Jose State University, (408) 924-5053, mcmackin@geosun.sjsu.edu. Limit: 29. Cost: \$290 (all meals, desert camping, 4WD). Neogene strike-slip faults in southern Death Valley with large, lateral displacements and mutually cross-cutting relationships have produced heterogeneous deformation at a regional scale. We will look at examples of fault intersections, traverse the complexly strained domains they produced, and evaluate regional crustal strain.
2. **Construction and Tectonic Evolution of Cordilleran Continental Crust: Examples from the San Gabriel and San Bernardino Mountains.** Sat. and Sun., April 7 and 8. Andrew Barth, Indiana and Purdue University, (317) 274-1243, ibsz100@iupui.edu, with Carl Jacobson, Iowa State University. Limit: 33. Cost: \$145 (1N, 2L, R, vans). Overview of crystalline terranes of these two mountain ranges. We will examine the high-*P-T*, eugeoclinal Pelona Schist and diverse units in the overlying upper plate of North American continental crust,

including early Proterozoic high-grade plutonic-metamorphic complexes, Upper Proterozoic to Paleozoic metasediments of the Cordilleran miogeocline, and Mesozoic magmatic arc rocks.

3. **Late Neogene Evolution of Indian Wells Valley and the Coso Range, Inyo County.** Fri.–Sun., April 6–8. Doug Walker, University of Kansas, (785) 864-2735, jdwalker@ku.edu, with Frank Monastero, Naval Air Weapons Station, and Diane Kamola, University of Kansas. Limit: 27. Cost: \$220 (2N, 2B, 3L, 1D, R, vans). We will examine the stratigraphic, structural, and geothermal evolution over past 7 m.y. of this part of the western margin of the Basin and Range province. Includes results of new field studies of the Coso Formation and evaluation of over 200 km of seismic lines across region. Note: Trip starts and ends in Ridgecrest, CA; participants will be given transportation options to and from Ridgecrest.
4. **Active Tectonics and Paleoseismic Record of the San Andreas Fault, Wrightwood to Indio: Working Toward a Forecast for the Next Big Event.** Sat. and Sun., April 7 and 8. Doug Yule, California State University—Northridge, (818) 677-6238, j.d.yule@csun.edu, with Tom Fumal (USGS) and Gordon Seitz (LLNL). Limit: 24. Cost: \$160 (2B, 2L, 1D, 4R, vans, dorm-style accommodations). We will visit open trenches cut across the San Andreas fault between Wrightwood and Indio, each revealing histories of large earthquakes that span the past 1,500–2,000 yr. This exceptional earthquake record provides an opportunity to explore the possible role of fault segmentation and to forecast the next large San Andreas event in this region.
5. **Geology and Tectonics of the San Fernando Valley.** (*Sponsored by the San Joaquin Geological Society.*) Sat., April 7. Tom Wright, San Anselmo, CA, (415) 456-9244, tomwrightgeo@aol.com, with Bob Yeats, Oregon State University. Limit: 48. Cost: \$70 (L, R, bus). The San Fernando Valley is located at the hinge of Miocene rotation of the western Transverse Ranges block. Examine the results of this extensional rotation and the setting of the Sylmar (1971) and Northridge (1994) earthquakes. Also visit the Santa Susana, Verdugo, and Northridge Hills faults and the Aliso Canyon and Pacoima oil fields.
6. **To Plate's Edge: San Fernando Valley to Palmdale.** (*Sponsored by the Dibblee Geological Foundation.*) Sat., April 7. Peter Weigand, California State University—Northridge, (818) 677-2564, peter.weigand@csun.edu, with Karen Savage, Helmut Ehrenspeck, Tom Dibblee, and Eric Hendrix. Limit: 150. Cost: \$100 (L, R, bus). Participants can join trip either at the Sheraton Universal or CSUN. The geology between the San Fernando Valley and Palmdale is wonder-

fully exposed, featuring rock types, rock ages, and geologic structures of great diversity. Geologic resources include oil, gold, water, and sand and gravel. We'll travel north on Hwy 14, make stops at renowned Vasquez Rocks and the dramatic Pacific-North American plate boundary, then return through Soledad Canyon with catered lunch at Placerita Canyon Park.

7. Geology and Tectonics of the East Ventura Basin. (*Sponsored by the San Joaquin Geological Society.*) Sun., April 8. Bob Yeats, Oregon State University, (541) 737-1226, yeats@geo.orst.edu, with Brian Swanson, Jim Dolan, Tom Hopps, and Dale Kunitome. Limit: 48. Cost: \$70 (L, R, bus). The East Ventura basin originated in the middle Miocene as a rift basin, changed to contractional tectonics in the Pliocene, and is now the site of active downwarping, shortening, and thrusting. Extensive exploratory drilling has discovered several major oil fields and thoroughly documented the basin's subsurface geology. Trip stops include the San Gabriel and San Cayetano faults and several Quaternary folds.

8. Engineering Geology of the Palos Verdes Hills: A Memorial to Perry Ehlig. (*Sponsored by the Association of Engineering Geologists, Southern California Section.*) Sun., April 8. Kim Bishop, California State University—Los Angeles, (323) 343-2409, kbishop@calstatela.edu, with Keith Ehlert. Limit: 36. Cost: \$60 (L, R, vans). Examine world-famous Portuguese Bend landslide and results of stabilization attempts, South Shores landslide, Valley View and Silver Spur grabens, Palos Verdes fault, and other engineering geologic features.

Postmeeting Trips

9. Neotectonics of the Santa Barbara Fold and Thrust Belt. 4:30 p.m. Wed.–Fri., April 11–13. Larry Gurrola, (805) 893-2260, gurrola@geol.ucsb.edu, with Amy Selting and Tim Tierney, all Dept. of Geological Sciences and Institute for Crustal Studies, University of California—Santa Barbara. Limit: 30. Cost: \$220 (2N, 2L, R, vans, boat). This linear zone of active folds and (mostly) blind faults formed on the coastal piedmont of the western Transverse Ranges. Topographically well expressed folds form anticlinal hills with intervening synclinal basins. A number of active folds are pristinely exposed in sea-cliff outcrops. Several flights of late Pleistocene marine terraces are uplifted and preserved on the flanks of the anticlinal folds, and age dates provide estimated rates of folding, faulting, and surface uplift.

10. Transverse and Peninsular Ranges Connections—Evidence for the Incredible Miocene Rotation. (*Sponsored by Pacific Section—SEPM.*)

Thurs.–Sat., April 12–14. Eugene Fritsche, California State University—Northridge, (818) 882-8468, a.eugene.fritsche@csun.edu, with Ivan Colburn, Pedro Ramirez, and Peter Weigand. Limit: 46. Cost: \$250 (2N, 2B, 3L, R, vans). Examine early and middle Tertiary stratigraphic similarities between the Transverse and Peninsular Ranges, the Catalina Schist basement and the extended terrane at Palos Verdes, and other structural evidence for rotational extension of the western Transverse Ranges block away from the Peninsular Ranges during the Miocene.

11. Geology of Santa Cruz Island: Key to Understanding the Evolution of the Southern California Borderland.

Thurs.–Sat., April 12–14. Janet Gordon, Pasadena City College, (626) 585-7026, jggordon@paccd.cc.ca.us, with Jim Boles, University of California—Santa Barbara. Limit: 25. Cost: \$295 (2B, 3L, 2D, boat, vans, 4WD, dorm-style accommodations). Tertiary units and Jurassic basement rocks link the island to its former position near San Diego and record the exhumation of blueschist basement and accompanying volcanic activity. We will evaluate the island's rotation in the southern California framework and view the work of active faults today.

12. Structure and Sedimentology of Ridge Basin. Thurs., April 12. Martin H. Link, Core Petrophysics Inc., (713) 896-4499, mhlink@yahoo.com. Limit: 42. Cost: \$70 (L, R, vans). Late Miocene Ridge basin contains a shingled stacked stratigraphic thickness of ~14,000 m adjacent to the San Gabriel fault. We will examine the fault and a variety of sedimentary facies in the basin, including the Violin Breccia next to the fault, marine and nonmarine facies within the basin, and coarse deposits along its northeastern margin. Emphasis will be on tectonostratigraphic relations and sedimentary facies in the basin and paleogeographic history along this part of the San Andreas transform belt.

13. Urban Oil Fields of Los Angeles. (*Sponsored by the L.A. Basin Geological Society.*) Thurs., April 12. Don Clarke, City of Long Beach Department of Oil Properties, (562) 570-3915, doclarke@ci.long-beach.ca.us; with Jim Slosson and Gordon Stewart. Limit: 55. Cost: \$75 (L, R, bus). Active and inactive oil fields along the northern edge of the Los Angeles basin will be visited to consider the social, political, geotechnical, and environmental health issues that must be addressed when oil fields operate in urban areas and then are redeveloped for other purposes following the end of production.

13. Urban Oil Fields of Los Angeles.

(*Sponsored by the L.A. Basin Geological Society.*) Thurs., April 12. Don Clarke, City of Long Beach Department of Oil Properties, (562) 570-3915, doclarke@ci.long-beach.ca.us; with Jim Slosson and Gordon Stewart. Limit: 55. Cost: \$75 (L, R, bus). Active and inactive oil fields along the northern edge of the Los Angeles basin will be visited to consider the social, political, geotechnical, and environmental health issues that must be addressed when oil fields operate in urban areas and then are redeveloped for other purposes following the end of production.

WORKSHOPS

All workshops will be held at the Sheraton Universal Hotel. The workshop chair is Jan Gillespie, (661) 664-3040, jan@cs.csusbak.edu.

Premeeting

1. Fundamentals of Paleogeographic Reconstruction. (*Sponsored by Pacific Section—SEPM.*) Sat. and Sun., April 7 and 8, 8 a.m.–5 p.m. Eugene Fritsche, California State University—Northridge, (818) 882-8468, a.eugene.fritsche@csun.edu, with Rick Behl. Limit: 28. Cost: \$60, students \$30 (includes course notes, snacks; lunches not included). Contact Fritsche by March 31 if interested in academic credit. Lectures and laboratory problems cover the creation of paleogeographic maps in structurally deformed areas. Topics include construction of palinspastic base maps; analysis and interpretation of basin sequences and unconformities; construction of chronostratigraphic diagrams; creation of paleogeographic maps; analysis of tectonics and sedimentation; and paleotectonic maps. Stratigraphy and structural geology courses are prerequisites.

2. Cased-Hole Nuclear Technology Made Easy. (*Sponsored by the San Joaquin Geological Society.*) Sat., April 7, 8 a.m.–5 p.m. Ahmed Badruzzaman, Chevron, (925) 842-1043, ahmb@chevron.com. Limit: 40. Cost: \$155 (includes course notes, snacks, lunch). Cased-hole nuclear logging plays an integral role in reservoir monitoring, ROS determination, enhanced oil recovery practices, and well-performance monitoring. This introductory workshop discusses the fundamentals of pulsed neutron measurements, characteristics of modern tools, their interpretation and limitations, the caveats in complex field conditions, job planning, and best practices to optimally use these tools. Field logs and exercise problems are used to strengthen concepts. The workshop is aimed at geologists, formation evaluation specialists, and engineers, who either use or propose to use pulsed neutron measurements.

3. Horizontal Well Technology for Geologists. (*Sponsored by Pacific Section—AAPG and Maurer Engineering.*) Sun., April 8, 8 a.m.–5 p.m. Bob Knoll, Maurer Engineering, (403) 239-4168, htech@cadvision.com. Limit: 48. Cost: \$270 (includes course notes, snacks, lunch). The rapid evolution and application of horizontal wells, multibranch, ERD, and other novel exploitation technologies have resulted in the requirement of new and critical skill sets. This multimedia program will expose participants to critical elements required for optimal exploitation technology applications: (1) demands placed on the earth scientist in site-specific multidisciplinary asset teams, (2) basic principles of geology and reservoir engineering with direct respect to horizontal well applications, (3) the new role of the well-site geologist, and (4) evaluation and simulation technologies.

During Meeting

- 4. Roy J. Shlemon Mentor Program in Applied Geology.** (Sponsored by GSA.) Mon. and Tues., April 9 and 10, 11:30 a.m.–2 p.m. Karlon Blythe, GSA, (303) 447-2020, kblythe@geosociety.org. Limit: 25. Cost: free (includes lunch). This workshop for undergraduate and graduate students will be led by four professional geologists (petroleum, engineering, and hydrogeology). Plan to attend both free luncheons to hear different presenters each day. Interactive and informal workshops led by practicing geoscientists will cover real life issues such as the professional opportunities and challenges that await students after graduation. Pre-registration is encouraged to secure a seat; however, convention registration is not required to attend only these workshops.
- 5. Writing a Good NSF Geoscience or Geoscience Education Proposal.** (Sponsored by the National Science Foundation.) Tues., April 10, 6:30–9:30 p.m. Dottie Stout, Division of Undergraduate Education/HER, dstout@nsf.gov. Limit: 50. Cost: free. Learn how to write a winning proposal for programs in the Directorate for Education and Human Resources (EHR) and Directorate for Geosciences (GEO) at the NSF. Preregistration is encouraged to secure a seat; however, convention registration is not required to attend only this workshop.

Postmeeting

- 6. Formation Microimaging (FMI) Workshop.** (Sponsored by the San Joaquin Geological Society.) Wed., April 11, 4–10 p.m. Chris Presmyk, Schlumberger, (661) 326-1017, presmyk1@slb.com. Limit: 40. Cost: \$150 (includes course notes, snacks; dinner). Electrical microimage logs are revolutionizing the ability of earth scientists to provide precise reservoir descriptions. Textural features previously only described in outcrop or cores are now routinely described in almost any wellbore. Our short course on FMI sponsored by Schlumberger is your opportunity to use the power of this technology to see lamination, cross stratification, vugular porosity, formation dip, unconformities, drilling-induced stress indicators, and faults. Featured will be a worldwide atlas of geologic features and descriptions of the impact of these observations on projects.
- 7. Exploration in the San Joaquin Valley—A Core Workshop.** (Sponsored by the San Joaquin Geological Society.) Thurs., April 12, 8 a.m.–5 p.m. Mark Wilson, Chevron, (661) 395-6364, MALW@chevron.com, with Bill Long, Occidental of Elk Hills. Limit: 80. Cost: \$230 (includes course notes, snacks, lunch). The San Joaquin Valley is rapidly becoming one of

the hottest exploration areas in North America. The San Joaquin Geological Society's Core Workshop will feature cores from the target horizons as well as expert testimony, core photos, analysis, and correlation to electric logs. Don't miss this opportunity to see what all the excitement is about.

K–12 EDUCATIONAL ACTIVITIES

- 1. Evolution: Investigating the Evidence—Workshop for K–12 Teachers.** (Sponsored by the California Science Teachers Association.) Sat., April 7, 8 a.m.–5 p.m. Judy Scotchmoor, (510) 642-4877, judys@ucmp1.berkeley.edu. Limit 50. Cost \$25 (includes the 400-page book *Evolution—Investigating the Evidence*, snacks; lunch not included). What is the evidence for evolution? Why the controversies? How can teachers present major evolutionary concepts in their classrooms in meaningful ways? This full-day, hands-on workshop will concentrate on what science is and what it is not, the importance of teaching evolution, and the best teaching strategies. It will include a lecture by John Harris, Chief Curator at the Page Museum, on fossil evidence of Pleistocene life from La Brea.
- 2. Field Trip for Teachers to Urban Oil Fields of Los Angeles.** (Sponsored by the L.A. Basin Geological Society.) Sun., April 8. Don Clarke, City of Long Beach Department of Oil Properties (562) 570-3915, doclarke@ci.long-beach.ca.us, with Jim Slosson and Gordon Stewart. Limit 55. Priority will be given to active teachers. Cost: \$75; teachers \$10 (includes lunch, snacks, guidebook; travel by bus). Active and inactive oil fields along the northern edge of the Los Angeles basin will be visited, with emphasis on topics of interest in K–12 educational applications. We will consider the social, political, and geotechnical issues that must be addressed when oil fields operate in urban areas and then are redeveloped for other purposes following the end of production.

EXHIBITS

Exhibits will be located in the Grand Ballroom with the poster sessions. The exhibits chair is Chris Presmyk, (661) 326-1017, presmyk1@slb.com.

SPECIAL EVENTS

Unless otherwise indicated, all special events will be held at the Sheraton Universal Hotel. The chair for these activities is Linda Specht, (661) 392-8600, lspecht@corelabusa.com.

Guest Program

Universal Studios Hollywood Studio Tour and Theme Park. Daily. Discount coupons available.

Universal CityWalk. Daily. Free.
The J. Paul Getty Museum. Tues., April 10, 11:30 a.m.–5 p.m. Cost: \$15 (includes transportation; lunch available at the museum).

Social Events

Welcoming Icebreaker. Sun., April 8, 6–9 p.m., Grand Ballroom.
Mini Breaker. Mon., April 9, 5:30–7:30 p.m., Grand Ballroom.
Alumni and Company Get-Togethers. Tues., April 10, 5:30–7:30 p.m. Roof Garden. If interested, contact Linda Specht.

Featured Presentations

Rockin' 'n' Rollin' in Southern California—What's Shaking and How We Measure It. *Kate Hutton, California Institute of Technology,* Mon., April 9, 4:45–5:45 p.m.
Sliding and Spinning—How Our Plates have Moved Over the Past 30 Million Years. *Tanya Atwater, University of Santa Barbara,* Tues., April 10, 4:45–5:45 p.m.

Business Meetings

- 1. AAPG Division of Environmental Geologists Luncheon.** Mon., April 9, 11:30 a.m.–1:30 p.m. Cost: \$30.
- 2. AAPG Division of Professional Affairs Luncheon.** Mon., April 9, 11:30 a.m.–1:30 p.m. Cost: \$20.
- 3. All-Convention Luncheon.** Tues., April 10, 11:30 a.m.–1:30 p.m. Cost: \$30. Keynote addresses by Sharon Mosher, President of GSA, and Robbie Gries, President-Elect of AAPG.
- 4. GSA Cordilleran Section Business Meeting and Luncheon.** Wed., April 11, 11:30 a.m.–1:30 p.m. Cost: \$30.

STUDENT AWARDS AND SUPPORT

Scholarships are available to assist students who are attending field trips; see introductory comments in field-trips section.

The GSA Cordilleran Section has monies available for partial support of Student Members or Associates who are presenting papers or posters. Applications are available from Section Secretary Bruce Blackerby, Dept. of Earth and Environmental Science, California State University—Fresno, CA 93740, (559) 278-2955, bruceb@csufresno.edu. The student must be a GSA Student Associate or Member of the Cordilleran Section as of Jan. 31, 2001. *Applications must be received by the secretary by Feb. 15, 2001.* 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 papers (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.

ACCOMMODATIONS

Meeting participants will receive a special rate (\$129 plus tax) at the Sheraton Universal Hotel, Universal City, (818) 980-1212 or 1-800-325-3535; single or double. Reservation deadline is *March 19* (be sure to identify yourself as a GSA/AAPG meeting participant). The hotel provides an exceptionally dignified convention environment, and is adjacent to family-oriented Universal Studios Hollywood Studio Tour and Theme Park as well as Universal CityWalk. The Sheraton serves as a single venue for all talks, exhibits, workshops, social events, and field-trip departures. More than 30 restaurants in City Walk and Universal Studios theme Park are easily accessible from the hotel. Very limited student accommodations are available in the area. See <http://geology.csun.edu/gsa/housing/> for details.

GETTING AROUND

Southwest Airlines is offering a 10% discount on most of its fares to convention participants. You or your travel agent may call Southwest Reservations at 1-800-433-4368

and reference meeting ID #R2055 five or more days prior to travel. Most Southwest fares do not require a Saturday night stayover.

United Airlines is offering a 10% discount on reservations made 60 days prior to departure and a 5% discount on those made between 60 and 7 days prior to departure. You or your travel agent may call United Reservations at 1-800-521-4041 and reference meeting ID #592XC. This discount also applies to travel on Shuttle by United and United Express.

The most convenient airport to the Sheraton Universal is Burbank Airport, 10 km (6 mi) north of the hotel. Taxis take 10–15 minutes and cost \$10–\$15. Los Angeles International Airport is 40 km (24 mi) south of the Sheraton Universal. The hotel has a contract with Super Shuttle van service for \$17; trip time can be up to 1.5 hrs.

CANCELLATIONS, CHANGES, AND REFUNDS

All requests for registration additions, changes, or cancellations must be made in

writing and received at GSA by *March 9, 2001*. 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 and ticket sales.

FURTHER INFORMATION

For further information, contact one of the convention co-chairs: Peter Weigand (818) 677-2564, peter.weigand@csun.edu, or Jeff Shellebarger, (661) 395-6385, jshe@chevron.com. Also see the convention Web sites at www.geosociety.org or <http://geology.csun.edu/gsa/>.

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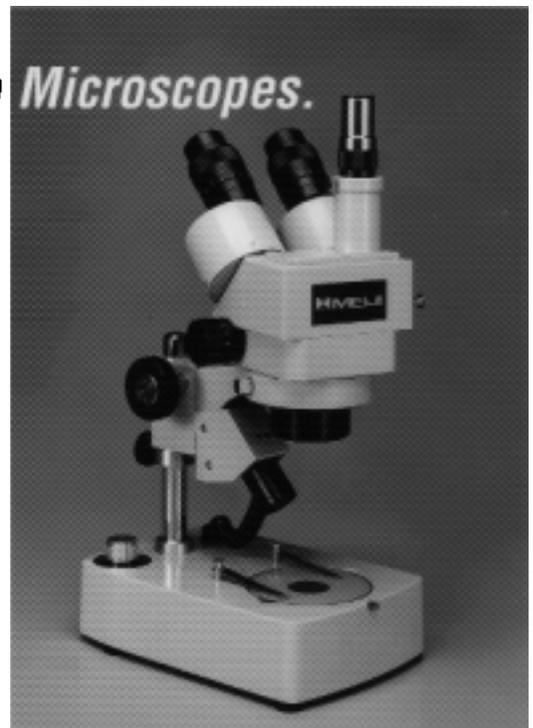
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Final Announcement

North-Central Section, GSA

35th Annual Meeting

**Bone Student Center,
Illinois State University
and Holiday Inn, Normal, Illinois
April 23–24, 2001
www.geosociety.org**

The 35th Annual Meeting of the North-Central Section, GSA, is hosted by the Department of Geography-Geology, Illinois State University and the Illinois State Geological Survey.

Illinois State University, founded in 1857, is the oldest public institution of higher education in the state. Currently, about 18,000 undergraduates and about 2,500 graduate students are enrolled. The university is located in the heart of central Illinois, about halfway between Chicago and St. Louis and within a 450-mile radius of 12 major metro areas. With a combined metro population of 141,200, Bloomington-Normal is large enough to offer the amenities of a big city while maintaining a friendly, small-town attitude.

REGISTRATION

Preregistration deadline: March 16, 2001

Preregistration will be handled by GSA headquarters, and discounts are given to members of GSA and the societies listed on the preregistration form. Online registration is encouraged at www.geosociety.org; go to Meetings, then North-Central Section Meeting, then to Registration. You can also use the registration form inserted in this issue or download the PDF version from the Web site. Guest registration is required for those attending guest activities, or exhibits. Students and K–12 teachers must send or show current ID in order to obtain reduced rates. On-site registration will be held in the Bone Student Center Ballroom, starting in the afternoon, Sunday, April 22.

ACCOMMODATIONS

Blocks of rooms have been reserved at three properties located on Trader's Circle in Normal. Holiday Inn is the headquarters (309-454-6722, \$75 per room). Adjacent properties are Best Western University Inn (309-454-4070, \$50 per room), and Super 8 Motel (309-454-5858, \$44–54 per room for two). In addition, room tax is 8.5%.

Meeting registrants and guests are responsible for making their own lodging arrangements. Reservations should be made **no later than March 20, 2001**, to guarantee the special room rates that have

been negotiated for the meetings. Be sure to indicate that you are participating in the North-Central Section meeting of the Geological Society of America to receive these special rates.

PARKING

Parking on campus is extremely limited. Some metered parking will be available in the parking lot north of the Bone Student Center. Because of the limited amount of on-campus parking, shuttle bus service between the listed motels and the Bone Student Center will be provided from 7:30 a.m.–9 p.m. on Monday, and 7:30 a.m.–5:30 p.m. on Tuesday.

TECHNICAL PROGRAM

Questions regarding the technical program should be addressed to James G. Kirchner, North-Central Section Program Coordinator, Department of Geography-Geology, Campus Box 4400, Illinois State University, Normal, IL 61790, jgkirch@ilstu.edu, (309) 438-8922. Technical sessions will begin at 8 a.m. on Monday, April 23, 2001.

SYMPOSIA

1. **Contrasting Records of Different Glacial Episodes or Different Glacial Lobes.** Ardith Hansel, (217) 333-5852, hansel@isgs.uiuc.edu, fax 217-244-2785, and Andrew Phillips, (217) 333-2513, phillips@geoserv.isgs.uiuc.edu, Illinois State Geological Survey, 615 E. Peabody

Drive, Champaign, IL 61820. A look at how the landforms and sedimentary successions of different glacial episodes or different lobes of the same episode vary and what such variation means in terms of ice sheet dynamics and glacial history.

2. **Paleozoic Bioevents.** (*Cosponsored by the Paleontological Society and Society for Sedimentary Geology.*) James E. Day, (309) 438-7865, jeday@ilstu.edu, fax 309-438-5310, Dept. of Geography-Geology, Illinois State University, Normal, IL 61790-4400; Gordon Baird, baird@fredonia.edu; and Carl Brett, carlton.brett@uc.edu. A symposium with a focus on the record of Paleozoic bioevents.

3. **Probing the Precambrian in the Midwest: Reconciling Geological, Geochemical, and Geophysical Observations.** James Walker, T60JAW1@wpo.cso.niu.edu, fax 815-753-1945, Department of Geology and Geophysics, Northern Illinois University, DeKalb, IL 61115; John McBride, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820. The basement in the Midwest consists of extensive Precambrian terranes. In this symposium we hope to assemble a wide collection of geologists, geophysicists, and geochemists for a discussion and summation of the latest information on these terranes.

4. **Inquiry-Based Learning: Field Work to High Tech.** (*Sponsored by the Central Section of the National Association of*



Geoscience Teachers.) Lynette Seigley, (319) 335-1598, lseigley@igsb.uiowa.edu, fax 319-335-2754, Iowa DNR—Geological Survey Bureau.

5. **Response of the Upper Great Lakes Coasts to Holocene Lake Level Change.** Walter L. Loope, walter_loope@usgs.gov, (906) 387-3116; fax 906-387-5148, U.S. Geological Survey, Munising Biological Station, P.O. Box 40, Munising, MI 49862. Issues of origin and dynamics of coastal features related to lake level have implications for the way we view them as subjects for scientific inquiry and as biological, cultural, and recreational resources.
6. **Groundwater Problems in Expanding Suburban Areas.** (*Sponsored by the Illinois Groundwater Association.*) Steve Bennett, (309) 298-1256, SW-Bennett1@wiu.edu, fax 309-298-3399, Dept. of Geology, Western Illinois University, 1 University Circle, Macomb, IL 61455; Colin Booth, (815) 753-7933, colin@geol.niu.edu, fax 815-753-1945, Dept. of Geology and Environmental Geosciences, Davis Hall, Northern Illinois University, DeKalb, IL 60115. The increasing spread of suburban development across previously open areas puts new stresses on the quality and replenishment of shallow groundwater resources, at the same time as new demands for water supply are placed on them. This symposium invites papers describing hydrogeological studies and solutions about this topic.
7. **Hydrogeological and 3-D Mapping Using Geophysics.** Philip J. Carpenter, (815) 753-1523, phil@geol.niu.edu, fax 815-753-1945, Dept. of Geology and Environmental Geosciences, Davis Hall, Northern Illinois University, DeKalb, IL 60115; Timothy H. Larson, (217) 244-2775, tlarson@isgs.uiuc.edu, fax 217-244-2785, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820. This symposium will focus on the use of geophysics in hydrogeological investigations, from mapping surficial deposits to identifying hydraulic connections in the subsurface (e.g., buried channels, fractures, karst conduits).
8. **Environmental Site Assessments: Applications, Methods, and Resources.** Mark Yacucci, (217) 265-0747, yacucci@isgs.uiuc.edu, and John Sieving, (217) 244-2406, sieving@isgs.uiuc.edu, Center for Transportation and the Environment, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820. This session will foster discussion of issues related to environmental site assessments. Presentations are encouraged which address the impact of environmental site assessments on the public sector, educational initiatives, case histories, applications of new technology, information sources, and the influence of

site geology on contaminant transport and remediation efforts.

9. **Pander Society Symposium.** James E. Barrick, (806) 742-3107, Jim.Barrick@ttu.edu, fax 806-742-0100, Dept. of Geosciences, Texas Tech University, Lubbock, TX 79409-1053. Oral presentations and posters on all aspects of conodonts.

PROJECTION EQUIPMENT

Two standard 35-mm carousel projectors for 2 x 2 inch slides and two viewing screens will be provided for each session room. An overhead projector for transparencies will also be provided for each session room. A speaker ready room with projectors will be available for review of slides and transparencies. Computer-projection systems **will not** be available at this meeting.

POSTER SESSIONS

Students and professionals are encouraged to take advantage of this means of communication of their research endeavors. Please indicate Poster Session on the GSA abstract form. Each poster booth will contain two attached 4 x 4 foot panels made of particle board and arranged at table height. Poster sessions will be in the same room as exhibits and breaks. Posters will be available for viewing for four hours during each scheduled session.

Special Poster Session on Undergraduate Research. (*Sponsored by the Council on Undergraduate Research—Geology Division.*) Robert D. Shuster, (402) 554-2457, Robert_Shuster@unomaha.edu, fax 402-554-3518, Dept. of Geography-Geology, University of Nebraska—Omaha, Omaha, NE 68182-0199; David J. Matty, (517) 774-3179, david.j.matty@cmich.edu, fax 517-774-3537, Department of Geology, Central Michigan University, Mount Pleasant, MI 48859. These posters are written and presented by undergraduate students. The posters may form a separate poster session or be part of another poster session, depending on the response. Coauthored papers for which the student is senior author will also be considered. Undergraduate students who have been involved in research are strongly urged to submit abstracts on their research projects, activities, techniques, and/or preliminary results.

WORKSHOPS

Workshops are scheduled for Sat., April 21, Sun., April 22, and Tues., April 24, 2001. Registration for workshops is limited. For additional information contact the conveners.

1. **Geological Models for Groundwater Flow Modeling.** Richard C. Berg, (217) 244-2776, berg@isgs.uiuc.edu, fax 217-244-7004, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820; and L. H. Thorleifson, (613) 992-3643, thorleifson@gsc.nrcan.gc.ca, fax 613-992-0190, Geological Survey of Canada, 601 Booth St., Ottawa, ON K1A

0E8. This workshop is designed for those working on geologic models for groundwater flow modeling, particularly concerning the development and management of the large diverse data of variable quality that are required for 3-D geologic models. There will be emphasis on the Quaternary and pre-Quaternary deposits that host potable groundwater and that are the context of most waste-disposal issues. 8:30 a.m.–4 p.m., Sun., April 22. \$15; limit 40.

2. **Touch Another World.** Brian Poelker, (309) 352-2300, bpoelker@ntslink.net, Midwest Central Middle School, 121 N. Church Street, Green Valley, IL 61546. This workshop is designed for middle and high school teachers. Meteorites and moon rocks can play an integral role in the secondary school earth science curriculum. Activities include: diagnostic analysis of physical characteristics to distinguish meteorites from earth rocks, manipulation of experimental variables in crater formation, petrologic comparisons of crystal structure to identify moon rocks on loan from NASA, and observations and descriptions of several types of meteorites including meteorites from Mars. 8:30–4, Sat., April 21. Free to K–12 teachers; limit 30.
3. **Roy J. Shlemon Mentor Program in Applied Geology.** Arthur C. Pincomb, (630) 443-7027 Associated Geologists, Inc. 311 South Charles, IL; Karlon Blythe, (303) 447-2020, ext. 136, kblythe@geosociety.org. Workshop for graduate and advanced undergraduate students about professional opportunities and challenges in resource exploration and evaluation. Noon–1:30 p.m., Mon., April 23. Free (includes lunch); limit 25. *Meeting registration is not required to attend only this workshop.*
4. **MSHA Part 46 Safety and Hazard Recognition.** Jim Papenhausen and David Sivill, Illinois Association of Aggregate Producers. The Mining Safety and Health Administration requires that as of October 2000, all persons entering a quarry, pit, or mine be escorted or have annual safety and hazard recognition training. This workshop outlines the operator requirements and provides information to develop the required training. 1:30–3 p.m., Tues., April 24. Free; limit 40.
5. **Sequence Stratigraphy for Graduate Students.** (*Sponsored by ExxonMobil Exploration Company.*) Arthur Donovan, (713) 431-7184, fax 713-431-4114, art.d.donovan@exxon.sprint.com. Free; by invitation.
6. **Advocacy Workshop.** (*Sponsored by the American Institute of Professional Geologists.*) Learn how your professional expertise and concerns can be effectively communicated to legislators and regulators. 8:30 a.m.–4 p.m., Sun., April 22. \$20; limit 40.

7. **RockWare Overview.** Jim Reed, RockWare, (303) 278-3534, ext. 113, jim@rockware.com, 221 East St., Suite 101, Golden, CO 80403-1563. This workshop introduces students and professionals to RockWare products such as RockWorks 99, LogPlot 2001, 3D Visual Pro Advanced Visualization, and Geochemists Workbench. 8 a.m., Sat., April 21, Felmley Hall of Science, Room 200. Repeated at 1 p.m. \$5; limit 18 per session.

FIELD TRIPS

Field Trips (all premeeting) will be scheduled for Friday, Saturday, and Sunday, April 20–22, preceding the regular meeting sessions. Registration for field trips is limited. Questions regarding the field trips should be addressed to David Malone, North-Central Section Field Trips Coordinator, Department of Geography-Geology, Campus Box 4400, Illinois State University, Normal, IL 61790, dhmalon@ilstu.edu, (309) 438-2692. For additional information contact the field trip convener.

1. **The St. Francois Mountains of Missouri: Window into the Mesoproterozoic.** Leader: Jim Walker, jim@geol.niu.edu, (815) 753-7936, Dept. of Geology and Environmental Geosciences, Northern Illinois University, DeKalb, IL 60115. Co-leaders: Gary Lowell, Southeast Missouri State University, and V. Max Brown, University of Toledo. The St. Francois Mountains of Missouri host the only surface outcrops of an extensive belt of Mesoproterozoic rocks that stretches from northeastern Arkansas to southern Michigan. The two-day field trip will highlight the variable lithologies and entire magmatic history of the St. Francois Mountains. Depart from Holiday Inn, 8 a.m., Sat., April 21. \$125; limit 35.
2. **Quaternary and Environmental Geology of the Lower Illinois River Valley and Metro East St. Louis Area.** Leader: David A. Grimley, grimley@geoserv.isgs.uiuc.edu, (217) 333-4747, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820. Coleaders: Andrew C. Phillips, Hong Wang, and Leon R. Follmer, Illinois State Geological Survey. This two-day field trip will highlight the Quaternary deposits of southwestern Illinois, their paleoenvironmental records, and their relevance to societal issues. A high-resolution loess-paleosol record, fossiliferous lacustrine sediments (Illinoian), and older till deposits will be viewed. Slope stability, soil erosion, wetland remediation, resource, and groundwater issues also will be discussed. Depart from Holiday Inn, 8 a.m., Sat., April 21. \$125; limit 35.
3. **Sequence Stratigraphy of Pennsylvanian Cyclothem Strata in Central Peoria County, Illinois.** Leader:

C. Pius Weibel, weibel@isgs.uiuc.edu, (217) 333-5108, Illinois State Geological Survey, 615 E. Peabody Drive, Champaign, IL 61820. On this one-day field trip, participants will have the opportunity to examine middle (Desmoinesian Stage and Westphalian D Series) Pennsylvanian cyclothem strata, adjacent to the field areas where both Udden and Wanless interpreted cyclic deposits. Topics of discussion will include: (1) how and if cyclothem deposition fit within "Slossian" sequence stratigraphy, (2) whether a standard lithostratigraphic hierarchy is possible for cyclothem strata, and (3) the local and regional sedimentologic and stratigraphic characteristics of the strata. Depart from Holiday Inn, 8 a.m., Sun., April 22. \$50; limit 50.

4. **Carboniferous Whitewater: A Raft Trip Through the Pennsylvanian Strata of the Vermilion River Gorge Near Oglesby, Illinois.** Leader: Steve Simpson, ssimpson@highland.cc.il.us, (815) 599-3474, Natural Science Dept., Highland Community College, 2998 W. Pearl City Road, Freeport, IL 61032. From a starting point directly on the Ordovician-Pennsylvanian unconformity, the Vermilion River will take us past excellent exposures of several cyclothem as we weave along the axis of the La Salle Anticline. This one-day field trip should be of particular interest to geoscience educators looking for innovative ways to spark student interest. Depart from Holiday Inn, 8 a.m., Sun., April 22. \$75; limit 35.

STUDENT PAPER AWARDS

The North-Central Section of GSA will award \$100 each for up to eight papers judged to be the best student paper in their respective technical session. The principal author and presenter must be a graduate or undergraduate student. Abstracts of papers submitted for consideration for these awards must note a desire to be considered for an award.

TRAVEL ASSISTANCE GRANTS

The North-Central Section of GSA, in cooperation with the GSA Foundation, will provide grants of up to \$200 for travel assistance (exclusive of field trip fees) to Student Members and Associates of GSA. Assistance will be offered on a first-come, first-served basis, with priority given to students presenting papers at the meeting. Application information is available from GSA campus representatives.

EXHIBITS

Exhibits, registration, poster sessions, and hospitality room will be held in the Bone Student Center Ballroom. Exhibit space must be reserved by April 1. For further information, contact Robert Corbett, (309) 438-7832, fax 309-438-5310, rcorbett@ilstu.edu.

BUSINESS MEETINGS AND SOCIAL EVENTS

Welcome Reception. Sun., April 22, 5–8 p.m., Bone Student Center Ballroom. Free.

GSA North-Central Section

Management Board Business Meeting and Breakfast. Mon., April 23, 7–8:30 a.m., Holiday Inn North.

North-Central Section of the Paleontological Society, SEPM, and Pander Society Annual Luncheon. Mon., April 23, noon–1:15 p.m., BBC Activity Room. \$12.

Illinois Groundwater Association Spring Business Meeting and Luncheon. Mon., April 23, noon–1 p.m., Bone Student Center Faculty Club. \$12.

North-Central Section Banquet and Business Meeting. Mon., April 23, 6:15–7:15 p.m., Bone Student Center Circus Room. \$22.

Featured Speaker: Steve Ingebritsen, U.S. Geological Survey, 2001 Birdsall-Dreiss Distinguished Lecturer, **Land Subsidence,** Mon., April 23, 7:15 p.m., Bone Student Center Circus Room. Free.

Campus Representatives Breakfast. Tues., April 24, 7–8:30 a.m., Holiday Inn North. Free.

National Association of Geoscience Teachers Luncheon. Tues., April 24, noon–1 p.m., Bone Student Center Faculty Club. \$12.

Association for Women Geoscientists Luncheon. Tues., April 24, noon–1 p.m., Bone Student Center Founders Suite. \$12.

Needed: Officer and Councilor Nominations

The GSA Committee on Nominations requests your help in compiling a list of GSA members qualified for service as officers and councilors of the Society. The committee requests that each nomination be accompanied by basic data and a description of the qualifications of the individual for the position recommended (vice president, treasurer, councilor). Nominations are due by February 1, 2001.

Please send nominations and back-up material to Administrative Services Dept., GSA, P.O. Box 9140, Boulder, CO 80301-9140.



GSA Foundation Adopts New Stewardship Policy

Julie A. Wetterholt, Director of Development

Recently, there has been considerable debate in the media over the increased need for accountability from the charitable sector. Many state nonprofit associations are adopting guidelines for ethical behavior, and even more nonprofits are endorsing a donor bill of rights, as developed by the American Association of Fund-Raising Counsel (AAFRC), the Association of Healthcare Philanthropy (AAHP), the Council on the Advancement and Support of Education (CASE), and the National Society of Fund Raising Executives (NSFRE).

At a recent meeting, the GSA Foundation Board of Trustees proposed adopting a stewardship policy that states how our donors' rights will be respected and upheld. The GSA Foundation is committed to being accountable to our donors and members and to being responsive to their needs. If you have any questions or comments about this new policy that is being further refined as of this printing, I invite you to contact the Foundation at 1-800-472-1988, ext. 154.

Stewardship Policy for GSA and GSA Foundation

Preamble

To assure that voluntary giving merits the respect and trust of the Society's members and friends, and that donors and prospective donors to the Society's Foundation can have full and complete confidence in the programs and activities they are asked to support, we declare that all contributors have the following rights:

1. To be informed of both the Society's and the Foundation's missions, of the way these two closely linked organizations intend to use contributed resources and their mutual capacity to use contributions effectively for the intended purposes.
2. To be assured that their gifts will be used for the specific purposes for which they were given and that each donor be kept informed of said use.

3. To receive appropriate acknowledgement and recognition.
4. To be assured that information about their contributions is handled with respect and with confidentiality to the extent provided by law.
5. To be informed of the identity of those serving on the Foundation's governing board, and to expect the board to exercise prudent judgment in all its stewardship responsibilities.
6. To feel free to ask questions when making a contribution and to receive prompt, truthful, and forthright answers.
7. To have access to the organization's most recent financial statements.
8. To be informed as to whether or not those seeking contributions are volunteers, employees of the organization, or hired solicitors.
9. To expect that all relationships with individuals representing the Society and Foundation will be professional in nature.

The GSA Foundation is seeking a president.
See page 27 for details.

Digging Up the Past

Most memorable early geologic experience

"Examining erratic boulders in the glacial terrains near Madison, Wisconsin. My problem? I called them 'erotic' boulders on a freshman exam at the University of Wisconsin—Madison!"



—*Kenneth W. Ciriacks*



GSA Foundation

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Cordilleran Section Endowment

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To learn more about the Fellow experience, contact David Verardo, 1997–1998 GSA Congressional Science Fellow, at (703) 625-6105 or dverardo@geosociety.org.

For application information, check our Web site at: www.geosociety.org/science/csf/scifello.htm or contact Karlon Blythe, Program Officer, GSA Headquarters, (303) 447-2020, ext. 136, or kblythe@geosociety.org.

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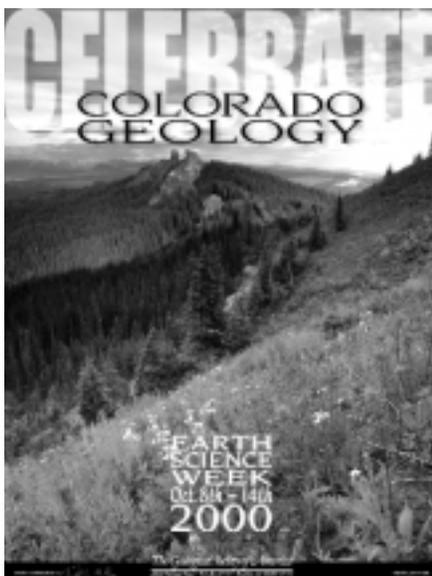
Expanded Opportunities Available in National Parks

GSA's student internship program is expanding to include graduate students, postgraduate students, earth science teachers, geology professors, professional geologists, and retired professionals. These temporary positions are available primarily in the summer, but expansion will add opportunities throughout the year. This expansion is part of the GeoCorps America™ program.

If you are interested in applying for a position during 2001, check the GSA Web site, www.geosociety.org, for position descriptions and a list of participating national parks, forests, monuments, and public lands. Applications are due February 12, 2001. For more information, contact Katie KellerLynn (303) 447-2020, ext. 194, kkellerlynn@geosociety.org.



Adventure Geology is a Hit During Earth Science Week 2000



Earth Science Week provides an opportunity for geoscientists to share their knowledge and enthusiasm about Earth. Three geoscientists did just this during GSA's "Adventure Geology" presentations, which were co-hosted with Recreation Equipment, Inc. (REI). Scientists and recreationists alike participated in these presentations.

Ronal C. Kerbo, National Cave Management Coordinator, National Park Service, took participants on a voyage via slides to some of the great cave areas of the world. Locations ranged from the lava tube caves in the Azores to southeastern New Mexico and the wonders of Lechuguilla.

Russell Dubiel, U.S. Geological Survey, helped his audience discover why Colorado has such a wide range of geologic features—from high mountains and steep cliffs to deep canyons—that attract climbers, mountaineers, and other outdoor enthusiasts.

Halsted Morris, Colorado Avalanche Information Center, examined the anatomy of an avalanche, taught about avalanche accidents and rescues in Colorado, and helped participants discover ways to enjoy Colorado's winter backcountry safely.

In addition, GSA sent more than 2,200 Earth Science Week posters that celebrate Colorado geology to Colorado public school librarians and public librarians. The librarians were encouraged to create a display using the poster and books from a GSA member-recommended reading list. The librarians were given the opportunity to receive a reimbursement of \$50 if they purchased geology books or books with geology as part of the major story line. GSA has received 160 requests for reimbursement to date. The recommended reading list has been posted on our Web page and will be updated as our members suggest additional titles.

YET ANOTHER CASE OF POTOMAC FEVER

Melody Brown Burkins, 1999–2000
GSA–U.S. Geological Survey
Congressional Science Fellow
excerpted from her semiannual
report to the GSA Council

procedural jargon announced over a phone line. I let everyone know there was a “Giant Resolution at 5 p.m.” I soon found out that the speaker’s accent had led me astray, and that the Democrats and Republicans were debating a (much smaller) “Joint Resolution.”

Despite Giant Resolution announcements, my office had enough faith in me to ask if I would step in as an acting legislative assistant when my immediate mentor left for another position just at the end of my “clueless” phase. I at first politely declined. After all, I thought, I am a geoscientist and an adjunct professor, not a legislative aide. However, I realized the opportunities I would have to learn more about the budget process, governmental programs, policy making, and Vermont, and I decided to accept the position as the senator’s acting legislative assistant–congressional fellow. It was a wonderful decision that I have not regretted.

As the legislative aide for energy, environment, natural resources, and agriculture for a senior senator on the appropriations committee, I worked on issues ranging from dam safety to national park maintenance, heating oil to zebra mussels, and crop insurance (!) to acid rain. Time after time, my geoscience training helped me understand and explain the fundamental scientific questions underlying the policy issues whether they encompassed geologic hazards, energy supplies, watershed management, carbon



I loved Dartmouth College. The school’s New England setting was idyllic, my colleagues were clever and engaging, and my students were always eager to learn. Yet on September 1, 2000, exactly thirteen months after I left the Dartmouth Green for a “temporary” stint on Capitol Hill, I held up my right hand and took an oath to serve as a permanent staff member in the U.S. Senate in Washington, D.C.

I am not the first GSA–U.S. Geological Survey (USGS) Congressional Science Fellow to catch Potomac Fever—the Washingtonian phrase for becoming ensnared in the political world—and I am sure I will not be the last. Many of us have realized that the chance to use our geoscience background to inform policy issues is a once-in-a-lifetime opportunity that cannot be wasted.

I believe, even more firmly after my year on the Hill, that the GSA–USGS fellowship is an extremely valuable opportunity, both for the individual fellows and for GSA and the USGS, who gain a politically informed scientist and effective liaison to governmental affairs.

Three weeks of orientation by the American Association for the Advancement of Science (AAAS) introduced all the science and technology fellows to the procedures, personalities, and customs of the legislative and executive branches. We were told by several famous guest speakers, from dignitaries to cabinet members, that they wished they, too, could take the orientation. Evidently, the buzz in Washington is that the AAAS orientation is the best of any out there. The fact that GSA–USGS fellows have the opportunity to take part in it is a great privilege.

Orientation was followed by two to three high-adrenaline weeks when all 32 congressional fellows tried to match with an office. As I had just moved from Norwich, Vermont, and greatly admired Senator Patrick Leahy, I was excited to see that he was looking for a fellow interested in energy, environment, and natural resource issues. He was also interested in someone who knew agriculture and, although I had worked with ecologists at Dartmouth, I admitted I knew little about farms. Still, I applied and was happy to find that Senator Leahy’s office and I were mutually interested in each other.

The AAAS orientation staff had warned us that our first three months on the Hill would be our “clueless” months, the second three months would be our “less clueless, but still pretty out of it” months, and after six months we might know what we were doing—but just barely. I found this time line to be consoling after my first time covering Senate floor procedures. After straining to understand strange

sequestration, or air quality.

True, my geoscience training did fail me slightly when I was thrown into Senator Leahy’s agricultural issues—especially when I needed to debate disaster insurance for apples, winter wheat prices, and the price of organic milk. But I have survived and learned more than I ever dreamed about science and policy (and cows). As a geologist, I have also had an incredible opportunity to meet and work with state geologists, geologic engineers, and earth and ecosystem scientists throughout Vermont, the nation, and even internationally.

Working for the senator on appropriations issues constantly taps my basic science background. Funding initiatives launched on behalf of basic research this year included efforts to double the National Science Foundation budget in five years, to increase funding at the Department of Energy’s Office of Science, and to increase funds for Community and Federal Information Partnerships and the National Mapping programs—all of which expand earth science initiatives and programs to states and universities. Ultimately, after review of the proposals, Senator Leahy was in strong support of increased funding for all of these initiatives.

My continuing education about the budget process impressed me so much and seemed so important for other geoscientists to understand that I tried to summarize it for *GSA Today* in my second article for the fellowship (June 2000). Appropriations and the scientists’ role in urging funding for basic research also were the focus of my talk at Summit 2000 in Reno. The topic is bipartisan, timely, and extremely important. While specific policies on climate change, energy alternatives, agricultural practices, and air quality may be contentious, the need for funding of basic scientific research remains an issue I believe most scientists can support. If I do nothing else after being a GSA–USGS fellow, I hope I can help answer questions from geoscientists about the best way to urge their representatives to fund needed scientific initiatives.

I close by expressing my gratitude and appreciation for this opportunity given me by GSA and the USGS. As a permanent staff member in Senator Leahy’s office, I look forward to continuing my relationship with geoscientists and geoscience leaders. I also hope that both organizations will consider me a resource for information about budgets and policies that affect the geoscience community. I do not know if I will be here three years or five—perhaps more depending on the severity of my Potomac Fever—but I will always remember the fellowship sponsors who brought me here. ▲



Field Forum Report

Correlating Volcanic and Plutonic Perceptions of Silicic Magma Chamber Processes: Evidence from Coastal Maine Plutons

Conveners:

Bob Wiebe, Geological Sciences, Franklin and Marshall College, Lancaster, PA 17604

Don Snyder, Geological Sciences, University of Michigan, Ann Arbor, MI 48109

David Hawkins, Geology and Geography, Denison University, Granville, OH 43023

This second GSA Field Forum brought together volcanologists, experimentalists, field petrologists, structural geologists, and theoretical fluid dynamicists, specialists who think about silicic magmas from diverse vantage points. We felt that this forum was needed because those who work on the volcanic and plutonic silicic rocks generally make very different assumptions about the character of silicic magma, and the two kinds of records should be complementary. We hoped that these two communities would discuss to what degree inferences about silicic volcanism can be drawn from silicic plutons, and vice versa. Some key questions appeared to be: Are erupted products typical of the chambers they sample, or are they peculiar samples? How much of the observed compositional variation in silicic rocks is produced in upper crustal magma chambers? How should geochemical data be interpreted in light of the rich structures observed that appear to record floor accumulation in silicic chambers? What are the relative roles of fractionation and mixing?

The forum was convened in Ellsworth, Maine, September 14–18, 2000. Field excursions concentrated on the evidence for silicic magma chamber processes in nearby coastal exposures of shallow granitic plutons and associated volcanic rocks. Parts of these plutons contain stratigraphic sections that record crystal accumulation and periodic injection of mafic magma and preserve spectacular magma mingling relationships. These layered sections appear to be the plutonic record of mafic replenishment events so widely inferred from the study of silicic eruptive systems. The forum explored the implications of these stratigraphic sequences for the mineralogical and geochemical evolution of silicic magma chambers and the possible impact of the magma chamber processes on the chemical and mineralogical evolution of silicic volcanic rocks and granitic plutons. Other features in these plutonic rocks that may be connected to volcanic phenomena included two kinds of composite (mafic-felsic) dikes, mafic enclaves, extensive zones of felsic

enclaves near a pluton roof, and a major “shatter zone” along the margin of the Cadillac Mountain granite.

We spent the first two days on Mount Desert Island (Acadia National Park), examining the Cadillac Mountain intrusive complex and the spatially and temporally associated Cranberry Island volcanic series. For the last two days we examined a wide range of structures in the Gouldsboro, Corea, and Pleasant Bay intrusions, which lie farther northeast along the coast. Informal sessions before dinner focused on themes relevant to the day’s field trip stops—e.g., processes operating when mafic magma enters a silicic chamber, possible evidence in plutons for eruptive events. Sessions after dinner extended these discussions and included presentations relating to participants’ work in other field areas.

The forum brought together scientists who might not otherwise converse at regular meetings, despite common themes that underlie their research interests. The need for such interchange was illustrated by the voluminous electronic correspondence among the participants after the meeting. Both the discussions at the forum and the subsequent correspondence reveal how all of us see these problems through the lens of our own experiences or field areas, causing us to have different sets of prejudices that we may consider implicitly understood. Informal communication, like this forum, can make these prejudices explicit in a way that formal publication cannot. Exposing and examining these predispositions must precede a general understanding of the problems.

We think that these predispositions create an impediment to arriving at a group consensus on some of the issues—each scientist places different weight on different kinds of evidence. Some are not willing to accept that a certain process occurred unless they see structures in the field that record it. Others may be willing to accept the same hypothesis because it explains geochemical evidence, even without seeing direct evidence in the rocks. Some require a specified physical mechanism for a process

such as magma mixing, while others are willing to infer its occurrence on the basis of geochemical evidence, leaving the mechanism unspecified, certain that future work will reveal its identity. Some require that interpretations of plutonic systems also fit the observed volcanic ejecta, while others are satisfied to explain one without the other, uncertain that they are related. Despite these contrasting criteria for substantiation, we feel that many of the participants came away at least challenged to defend their ideas against a wider range of tests, and that other field settings might shed light on their own field areas.

If H.H. Read was correct when he said that the best geologist is the one who has seen the most rocks, then the experience of seeing the rocks in Maine and the slides and discussion of similar rocks elsewhere made us all better geologists. ▲

Forum Participants

Fred Anderson
Rachel Beane
Keith Benn
Wendy Bohrson
Mary Beth Cheversia
Drew Coleman
Scott Dreher
Frank Dudas
John Eichelberger
Lang Farmer
Riley Flanagan-Brown
Jim Gardner
Allen Glazner
Lew Gustafson
David Hawkins
Takehiro Koyaguchi
Rebecca Lange
Alison Leitch
Monica Lopez de Luchi
Dan Lux
Michelle Markley
Brooks McKinney
Virginia McLemore
Rod Metcalf
Calvin Miller
Jim Mills
Anne Peschler
Siegfried Siegesmund
Don Snyder
Steve Tait
Glen Wallace
David Westerman
Bob Wiebe

Shlemon Mentor Workshops in Full Bloom this Spring—100% of GSA Sections to Participate

All six GSA Sections are participating in the Roy J. Shlemon Mentor Program in Applied Geology for 2001. These interactive workshops for undergraduate and graduate students are presented by practicing geoscientists who address real-life issues such as the professional opportunities and challenges students will face after graduation. The workshops are scheduled as extended luncheons at each Section meeting, and the cost is nominal. (Lunch is included!) While meeting registration is not required, preregistration for the workshops is encouraged to secure a seat. Additional information is available in the Section meeting announcements and at www.geosociety.org.

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GSA Foundation is Seeking a President



The GSA Foundation seeks a geoscientist, preferably with national recognition for achievements in the geosciences and administration, to be its president. The individual should have a strong interest and experience in, or working knowledge of, fund-raising and development. Primary responsibilities will include oversight and direct participation in fund-raising for GSA programs and activities; identifying, cultivating and soliciting major donor prospects, including individuals, corporations, and foundations; stewardship of funds; and staff administration. This person will be expected to have a major role in designing and implementing a strategic fund-raising and development plan for the Foundation and to closely and regularly interact with the GSA's chief executive officer, members of GSA's staff, the GSA Foundation Board of Trustees, and the GSA Council. The president reports to the GSA Foundation Board of Trustees and is assisted in the Foundation by a full-time director of operations and a data manager.

The position could range from three-quarter time to full time, with the bulk of the activities to be conducted from the Society's headquarters in Boulder, Colorado, although full-time relocation to the Boulder area may not be required. A range of compensation options exists, depending on experience and qualifications of the candidate and the length of the appointment. Interested persons should send a letter of application, resume or curriculum vita, and the names, addresses, and telephone numbers of three references to GSA Foundation Board of Trustees Search Committee, c/o Donna Russell, GSA Foundation, P.O. Box 9140, Boulder, CO 80301-9140. Nominations of potential candidates by members of the geoscience community also are encouraged. Effective closing date for the applications is March 15, 2001, with a target starting date of July 1, 2001. The GSA Foundation is a nonprofit corporation and an Equal Opportunity, Affirmative Action Employer.

Conference on the History of Geologic Pioneers, August 2–5, 2000

Gerald M. Friedman, Past Chair, GSA History of Geology Division, Brooklyn College and Graduate School of the City University of New York, and Northeastern Science Foundation, P.O. Box 746, Troy, NY 12181

Following in the footsteps of geologic pioneers, the History of Geology Division of GSA welcomed this meeting on the history of geology in the Northeastern Science Foundation, affiliated with Brooklyn College and Graduate School of the City University of New York, in Troy, New York.

Along with sessions on theme-oriented and volunteered papers, the meeting included field trips to the field locations, work stations, and graves of Amos Eaton (1776–1842), James Hall (1811–1898), Ebenezer Emmons (1800–1863), and Henry B. Nason (1831–1895). The visiting geologists honored these pioneers with bronze plaques placed next to their headstones. Grateful thanks are extended to the GSA Foundation for funding these memorial plaques.

President Terry Page of the Oakwood Cemetery, the second largest rural cemetery in the United States, received the geologists and inspired them with its history. During the early nineteenth century, the Capital District of New York, and Troy in particular, had the distinction of being the birthplace of the study of geological science in America. The understanding of geology was in its infancy at that time. It was largely through the

work of Eaton, founder and first professor of the Rensselaer School in 1824, that the study of geological science in America took a giant leap forward. Eaton was so influential during these early years that in American geology, 1818–1836 is known as the Eatonian era.

Among the most influential students of Eaton was Hall, State Geologist of New York, who was known as the father of the geosyncline. In 1857 (published in 1859), Hall observed that, where the Paleozoic marine strata are thin (a few hundred or a few thousand meters thick), they are flat lying. In contrast, within the Appalachians, thicknesses of equivalent age strata amount to tens of thousands of meters, and the strata are not horizontal. Hall hypothesized that the subsidence of the strata within a trough, where they would be extra thick, provided the mechanism for folding them (Friedman and Sanders, 1978, p. 435). Hall became known as father of American stratigraphy and similarly, father of American paleontology. Probably no other single person exerted a more influential role in the development of paleontology in North America. Hall became the first president of GSA as well as of the International Geological Congress.

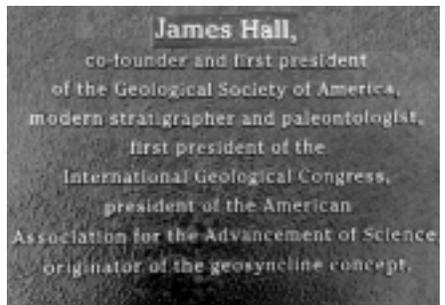
Emmons served as junior professor under Eaton at the Rensselaer School (Rensselaer Polytechnic Institute, or RPI) in 1830, a position he held for 10 years. Schnerer (1969) notes that Emmons was principally responsible for the transformation in American geology; through him, New York became the model standard for the stratigraphic surveys of

much of the rest of the United States. With Emmons, Hall was cofounder of the American Association of Geologists, the predecessor of the American Association for the Advancement of Science.

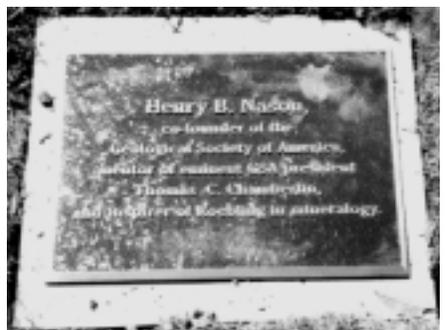
Edgerton was one of the geologists Eaton and Emmons had trained. He was born in Burlington, Vermont, and was 21 years old (1825), when he entered RPI. In 1826, he became adjunct to Eaton and remained in this position until after graduation (fall 1828; Nason, 1887). After leaving RPI, he became professor of natural science at the Utica Gymnasium, where James D. Dana (1813–1895) became his student.

Edgerton's title almost matched Dana's choice of a profession: He wanted to pursue his interest in natural history (Dana, 1835; Newell, 1997). Following Eaton's methods and Emmons' textbook, Edgerton not only stimulated Dana's interest in geology, but also provided "his first role model of what it meant to be a scientist" (Prendergast, 1978; Pirsson, 1919; Champlin, 1994). Edgerton's enthusiasm affected Dana, who may be considered Eaton's and Emmons' "grand student." Edgerton died at 29 on April 18, 1832. No pictures of him seem to exist. As a student of Eaton and Emmons, and as the professor who kindled Dana's interest in geology and mineralogy, he joins the rank of the effective early pioneers of our science (Friedman, 1998).

Nason, cofounder of GSA, became one of America's influential geologists (Friedman, 1979). The nestor of American geology, Thomas C. Chamberlain



Bronze memorial plaques attached to the graves of geologic pioneers and GSA founders Henry B. Nason (Oakwood Cemetery, Troy, New York), Ebenezer Emmons, and James Hall (both at Albany Rural Cemetery, Albany, New York). The GSA Foundation funded the cost of the plaques.



(1843–1928), became a geologist as a student of Nason. Chamberlain's father was a Methodist Episcopal minister and, despite theologic and religious prejudice, Chamberlain came under Nason's spell in Nason's geology course. Chamberlain became one of the great original thinkers in geology.

Nason was the de facto curator of the vast mineral collection of RPI, acquiring specimens and, with Hall, arranging and labeling them. Maintaining the tradition of fieldwork, he led extremely popular extended geological field trips. His interest in mineralogy had a profound influence on the scientific advance of mineralogy. Washington A. Roebling (1837–1926) took Nason's course at RPI. Inspired by Nason, he embarked on a study of systematic mineralogy. The Roebling collection was donated to the National Museum of the Smithsonian Institution. In 1877, President P. Hayes appointed Nason juror for the U.S. government at the Paris Exposition in the Department of Mineralogy. Nason's impact was such that he received honorary degrees from Amherst College, Union College, and Beloit College. Nason's dedication to RPI is memorialized by his private collection of 5,000 minerals, which he donated to the institute in 1883.

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2001 Research Grants Program for Students

The primary role of the Research Grants Program is to provide partial support for research in earth science by graduate students at universities in the United States, Canada, Mexico, and Central America. GSA strongly encourages women, minorities, and persons with disabilities to participate fully in this grants program. **Eligibility is restricted to GSA members.** New application forms are available each fall in the geology departments of colleges and universities offering graduate degrees in earth sciences. Forms are mailed to GSA Campus Representatives, department secretaries, and chairpersons in the United States, Canada, and Mexico. Application forms and information are available on GSA's Web page, www.geosociety.org. Applications may be downloaded from the Web but may not be submitted by facsimile or e-mail. They are also available upon request from the Research Grants Administrator, GSA, P.O. Box 9140, Boulder, CO 80301 or lcarter@geosociety.org. Please use only the current 2001 application and appraisal forms.

Confidential evaluations from two faculty members are required from candidates and must accompany applications submitted. **PLEASE USE THE "APPRAISAL OF APPLICANT" FORMS, WHICH ACCOMPANY THE 2001 APPLICATION FORMS. APPLICATION FORMS WILL NOT BE ACCEPTED BY FACSIMILE OR E-MAIL.**

GSA awarded more than \$400,000 in grants in 2000. The grants went to 245 students doing research for advanced degrees. The average amount awarded was \$1,622. The largest grant was \$3,175, but there is no predetermined maximum amount. Grants supported 41 percent of the applicants. Funding for this program is provided by a number of sources, including GSA's Penrose and Pardee endowments, the National Science Foundation, industry, individual GSA members through the GEOSTAR and Research Grants funds, and numerous dedicated research funds that have been endowed at the GSA Foundation by members and families.

The Committee on Research Grants will meet soon after the deadline to evaluate applications and award grants. In late April, GSA's Chief Science Officer will inform all applicants for grants of the committee's actions.

APPLICANTS MUST BE MEMBERS OF GSA TO APPLY.

**ALL APPLICATIONS MUST BE SUBMITTED ON THE 2001 FORMS AND
POSTMARKED BY FEBRUARY 1, 2001.**



The Geological Society of America

NORTHEASTERN SECTION STUDENT GRANT PROGRAM

UNDERGRADUATE STUDENT RESEARCH GRANTS FOR 2001

The Northeastern Section's student research grant program for 2001 is competitive and available only to undergraduate students.

To be considered for a research grant:

- ◆ The student must be enrolled at an institution within the Northeastern Section.
- ◆ The student must be a student associate or member of GSA.
- ◆ Applications must be postmarked no later than February 12, 2001.
- ◆ Grants will be awarded following the Northeastern Section Meeting in Burlington, Vermont, in March 2001.

For further information or a copy of the application form please contact:

Kenneth N. Weaver, Secretary, NEGSA Maryland Geological Survey
2300 St. Paul Street • Baltimore, MD 21218
(410) 554-5532 • Fax: 410-554-5502 • kweaver438@aol.com

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ANNOUNCEMENTS

2001 MEETINGS

- March 31–April 5 Glacial-Interglacial Sealevel Changes in Four Dimensions: Sea-Surface Changes and Coastal Flood Hazards in Europe, St. Andrews, United Kingdom. Information: J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France. 33-388-76-71-35, fax 33-388-36-69-87, euresco@esf.org, www.esf.org/euresco. (Application deadline: Jan. 10, 2001.)
- June 20–23 History of the Oil Industry—Symposium and Field Trips, Oil City, Pennsylvania. Information: William R. Brice, Geology & Planetary Science, University of Pittsburgh at Johnstown, Johnstown, PA 15904, (814) 269-2942, fax 814-269-2022, wbrice@pitt.edu, www.pitt.edu/~upjgeol/. (Abstract deadline: April 20, 2001.)
- August 29–September 3 European Science Foundation Programme: Response of the Earth System to Impact Processes, Svalbard, Norway. Information: Henning Dypvik, Dept. of Geology, University of Oslo, P.O. Box 1047, Blindern, N-0316 Oslo, Norway, 47-228566597, fax 47-22854215, henning.dypvik@geologi.uio.no. (Registration deadline: Jan. 31, 2001. Abstract deadline: May 1, 2001.)
- December 18–19 International Conference on Engineering for Ocean and Offshore Structures, Singapore; and December 20–21, International Conference on Coastal Engineering Development, Singapore. Information: Conference Secretariat, CI-Premier PTE Ltd., 150 Orchard Road #07-14, Orchard Plaza, Singapore 238841, (065) 733-2922, fax 065-235-3530, cipremie@singnet.com.sg, www.cipremier.com.

2002 MEETINGS

- March 20–22 3rd International Conference on Dam Engineering, Singapore. Information: Conference Secretariat, CI-Premier PTE Ltd., 150 Orchard Road #07-14, Orchard Plaza, Singapore 238841, (065) 733-2922, fax 065-235-3530, cipremie@singnet.com.sg, www.cipremier.com. (Abstract deadline: May 30, 2001.)

In Memoriam

Alexander R. Cameron
Calgary, Alberta
September 11, 2000

Arthur W. Cleaves II
Stillwater, Oklahoma

G. Arthur Cooper
Raleigh, North Carolina
October 17, 2000
GSA Fellow since 1932

Neil B. Crow
Pleasanton, California
August 22, 2000

Arthur T. Fernald
Lakewood, Colorado
October 24, 2000

Mark A. Jones
Taylors, South Carolina

Edward McFarlan Jr.
Houston, Texas
July 17, 2000

Paul R. Shaffer
Marysville, Ohio
November 4, 2000

Call for Papers!

Submissions on all facets of John McPhee's career, including literary nonfiction, environmentalism, geology, and travel writing are solicited by O. Alan Weltzien and Susan N. Maher for the scholarly anthology, *John McPhee and the Art of Literary Nonfiction*. Submissions of no more than 30 pages should be sent to: O. Alan Weltzien, Dept. of English, University of Montana–Western, 710 S. Atlantic St., Dillon, MT 59725, a_weltzien@wmc.edu, or Susan N. Maher, Dept. of English, University of Nebraska, Omaha, NE 68182-0175, susan_maher/cas/uno/unebr@unomail.unomaha.edu. (Deadline for submissions: April 1, 2001.)

Grants Available

The Society of Economic Geologists Foundation will be awarding about \$80,000 to help support student and M.S. and Ph.D. thesis research in economic geology. Information and application forms: Chair, SEG Student Research Grants, 7811 Shaffer Parkway, Littleton, CO 80127, (720) 981-7882, ext. 204, fax 720-981-7874, seg@segweb.org, www.segweb.org. (Application deadline: Feb. 1, 2001.)

The International Centre for Diffraction Data (ICDD) Grant-in-Aid Program gives financial support to institutions interested in supplying high-quality experimental powder diffraction patterns to the ICDD's Powder Diffraction File database. Information: Shelley Wolkov, Grant Coordinator, ICDD, 12 Campus Blvd., Newtown Square, PA 19073-3272, (610) 325-9814, fax 610-325-9823, wolkov@icdd.com, www.icdd.com.

The Shamsheer Prakash Foundation solicits nominations for the 2001 Shamsheer Prakash Research Award for young geotechnical and geotechnical earthquake engineers, scientists, and researchers. Information: Sally Prakash, Honorary Secretary, Shamsheer Prakash Foundation, Anand Kutir, 1111 Duane Ave. Rolla, MO 65401, prakash@umr.edu.

GeoVentures

GeoVentures 2001 for GSA Members and Friends

Here are the great GeoTrips and GeoHostels GSA has planned for 2001. Trip descriptions and registration information will be published in the February issue of *GSA Today*. Or, contact Edna Collis at GSA headquarters, (303) 447-2020, ext. 134, or ecollis@geosociety.org.

GeoHostels

Impacts of Coastal Development on the Barrier Islands—Beaufort, North Carolina

April 21–26, 2001

Leaders: David M. Bush, State University of West Georgia; and Robert S. Young, Western Carolina University.

Geology of Glacier Park—Columbia Falls, Montana

July 14–19, 2001

Leaders: Robert C. Thomas and Sheila Roberts, Western Montana College.

GeoTrips

Awesome Forces on an Active Plate Boundary North and South Islands, New Zealand

March 1–22, 2001

Leaders: Brad Ilg and Les Singh, Great Explorers Ltd.; Hamish Campbell, Te Papa and New Zealand Institute of Geological and Nuclear Sciences; and Rodney Grapes, Victoria University of Wellington.

(See November *GSA Today* for a complete description of this *GeoTrip*.)

Northern Sierra Madre Occidental Province—The Copper Canyon Country

August 2001

Leaders: Kenneth F. Clark, University of Texas at El Paso; and David C. Fitch, consultant, Reno, Nevada.

New Year's at the End of the World: The Geology of Southern Patagonia, Including Tierra del Fuego

December 26, 2001–January 10, 2002

Leaders: Jim Reynolds, Brevard College, Magstrat, LLC, Webster, North Carolina; and Dorothy L. Stout, National Science Foundation.

Boston 2001:

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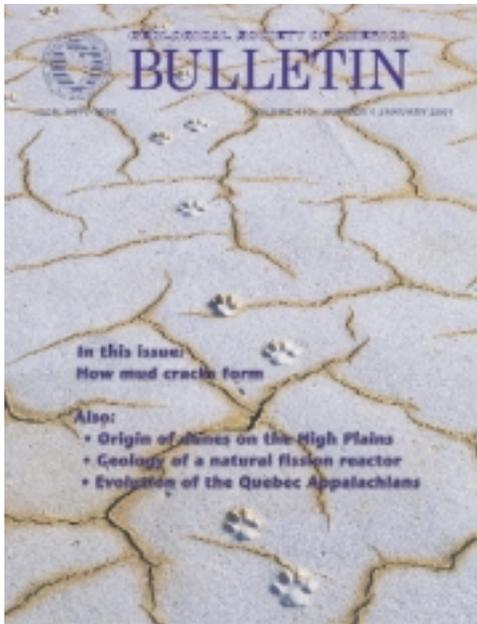
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The Geological Society of America

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For more information: Contact Brenda Martinez, GSA Exhibits Sales Coordinator, 303-447-2020 (ext. 138). E-mail: bmartinez@geosociety.org.
Submit your application on-line at www.geosociety.org.



In January *Bulletin*
 How mud cracks form
 Origin of shales on the High Plains
 Geology of a natural fission reactor
 Evolution of the Quebec Appalachians

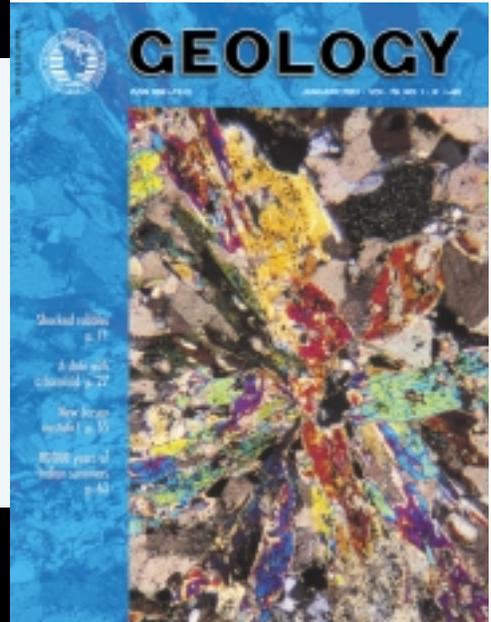
GSA Bulletin and Geology

HIGHLIGHTS

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In January *Geology*
 Shocked cobbles
 A date with a hominid
 New Jersey eustatic!
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POSITION ANNOUNCEMENTS *(from employers using GSA's Employment Service at the 2000 Annual Meeting)*

Senior-Level, Mid-Level, and Entry-Level Geologists and Environmental Scientists

IT Corporation, a member of The IT Group, the nation's largest and leading environmental infrastructure company, has immediate employment opportunities for geologists and environmental scientists for positions nationwide. Candidates will be assigned office- and field-based tasks on multidisciplinary environmental investigation and restoration projects. Candidates must be willing to take short- and long-term field assignments. IT will provide OSHA and on-the-job training for entry-level candidates. **Requirements for entry-level:** B.S. or M.S. degree in geology or related science. A driver's license and excellent driving record are required. Must be able to lift 40 lbs. Superior oral and written communications skills are required and the successful candidate must possess the ability to work well with others. **Requirements for mid-level:** In addition to above, the candidate is required to have a minimum of five years of related experience in the environmental industry. Up-to-date OSHA training is preferred. The candidate must be proficient on general computer and network applications. Experience with GIS and/or familiarity with databases is desirable. Working knowledge of RCRA and CERCLA environmental regulations is required. **Requirements for senior-level:** In addition to above, five to nine years of applicable experience. Professional registration and/or certification requiring demonstrated expertise is strongly recommended. Very strong general geologic skills commensurate with education and work experience; developing or developed expertise in areas such as hydrology, hydrogeology, and chemical fate and transport required. Ability to manage medium to large technical projects and to develop client contacts within and outside project framework. Ability to understand project financial reports and the relationships between project financials and corporate goals. Ability to select staff to meet project objectives and supervise a wide range of technical and non-technical personnel within the project framework. Career aspirations should

include internal technical consulting, senior project, resource, or business management. EOE, M/F/D/V. Visit our Web site at www.theitgroup.com. Contact Tom Battaglia, Director Professional Staffing, (949) 660-5357, fax 949-261-0861, tbattaglia@theitgroup.com.

Environmental Geoscience University of Pennsylvania

The Department of Earth and Environmental Science at the University of Pennsylvania invites applications for a tenure-track faculty position in environmental geoscience. The candidate may join established research programs in paleoclimatology, biogeochemistry, terrestrial geobiology, marine ecology and paleoecology, and/or geologic engineering, or may pursue some other aspect of environmental geoscience. The successful candidate will be expected to maintain an active research program while teaching graduate courses in his/her research specialty to Ph.D. candidates and to degree candidates in a professional Master of Environmental Studies (MES) curriculum; and undergraduate courses to majors in environmental studies, geology, paleobiology, and/or oceanography. The successful candidate will be expected to assume, over the next few years, administrative responsibility for B.A. and MES programs in environmental studies; thus, this appointment will be made at the level of associate or full professor. Further information about programs in the Department of Earth and Environmental Science at the University of Pennsylvania may be sought at www.sas.upenn.edu/earth/. Applicants should submit resumes, statements of research and teaching interests, and a selection of representative reprints to: Robert Giegengack, Environmental Geoscience Search Committee, Department of Earth and Environmental Science, University of Pennsylvania, Philadelphia, PA, 19104-6316 USA. earth@sas.upenn.edu. The Search Committee began to evaluate applications in December 2000; the search will remain open until the position is filled. The University of Pennsylvania is an equal-opportunity employer. Women and minorities are encouraged to apply.

University of Texas at El Paso Assistant Professor

The Department of Geological Sciences at the University of Texas at El Paso invites applications for an appointment at the rank of assistant professor to begin September 2001. A Ph.D. and a strong commitment to teaching and research at both the undergraduate and graduate levels are required. We seek candidates with research and teaching interests that complement existing programs in geological sciences and interdisciplinary programs in environmental science. Preference will be given to candidates with demonstrated expertise in Geographic Information Systems (GIS). The successful applicant would be expected to teach introductory courses in geology or geography as well as upper division undergraduate and graduate courses in his/her specialty. El Paso, located on the Mexican border within the Rio Grande rift, provides one of the most diverse and striking geological settings in the world. The University of Texas at El Paso is a doctoral and research institution with a student population of over 15,000. The department is housed in an attractive, 90,000 sq. ft. building that contains faculty and student offices, laboratory and classroom space with analytical facilities that include: electron microprobe, DCP, ICPMS, INAA counter, XRD, geophysical field equipment, and extensive computing facilities. More information about the activities and facilities in the department can be found at our web site: <http://www.geo.utep.edu>. Applicants should send a CV, short description of teaching and research interests and the names of three people willing to provide professional references to: Kate C. Miller, Chair, Department of Geological Sciences, University of Texas at El Paso, El Paso, Texas 79968-0555, (915) 747-5424, fax 915-747-5073, miller@geo.utep.edu. We will begin reviewing applications on Jan. 15, 2001 and will accept applications until the position is filled. The University does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services.

Faculty Position, Assistant Professor—Tenure Track Vanderbilt University

The Department of Geology at Vanderbilt University invites applications to fill a tenure-track faculty position to begin in the fall of 2001. Applicants should be individuals whose interests are in the general area of surface processes but with expertise to teach and do research in one or more of the specialized areas of environmental geology/low-temperature geochemistry/hydrogeology. The Ph.D. is required by the time of appointment. We are seeking an energetic and creative individual who can enthusiastically engage students in the classroom and in research. The successful applicant will be expected to develop and maintain an active, externally funded research program involving undergraduates and graduate students (Masters) and to collaborate, where possible, with other faculty members in the department and with appropriate faculty in other departments. Vanderbilt is a major research university with a small but active geology program. For more information about the department and university visit our Web site at: <http://geo.cas.vanderbilt.edu/>. The deadline for receiving applications is Jan. 10, 2001. Women and minorities are especially encouraged to apply. Applicants should send resume (including statements of teaching and research interests) and transcripts and arrange to have three letters of recommendation sent to: John C. Ayers, Department of Geology, Box 35-1805 Station B, Vanderbilt University, Nashville, TN 37235, (615) 322-2158, fax: 615-322-2138, john.c.ayers@vanderbilt.edu. Vanderbilt University is an Affirmative Action—Equal Opportunity Employer.

College of Charleston Tenure-Track Assistant Professor Ground Water Hydrogeology

The Department of Geology invites applications for a tenure-track assistant professor position beginning August 2001. We are seeking a ground-water hydrogeologist with the following qualifications: (1) a Ph.D. in geology with emphasis in applied ground-water hydrogeology; (2) demonstrated excellence in teaching; (3) commitment to field-based studies; and (4) supervision of graduate and undergraduate research. The successful applicant will be expected to: (1) teach undergraduate and graduate courses in hydrogeology, ground-water modeling, environmental geology, and other courses in his or her specialty; (2) develop a successful research program, and (3) seek external funding for research. Applicants having research interests in the fields of water resources, regional ground-water modeling, or contaminant hydrogeology are encouraged to apply. Interested persons should send a letter stating their interest in the position, curriculum vitae, statements of teaching philosophy, research interests, unofficial transcripts and names of three references to: Hydrogeology Search Committee, Department of Geology, College of Charleston, Charleston, SC 29424. Review of applications will begin Jan. 8, 2001, and continue until the position is filled. The College of Charleston is an AA/EQ/ADA employer and does not discriminate in employment or the provisions of services on the basis of disability.

Tenure-Track Assistant Professor Geohazards and Neotectonics

The Department of Geology of the College of Charleston invites applications for a tenure-track assistant professor position in geohazards and neotectonics beginning August 2001. We are seeking a broadly trained geophysicist with a Ph.D. and experience in geohazards and shallow crustal processes using seismology and other geophysical techniques. Candidates having experience in earthquake hazard assessment, neotectonics, geophysical field or well-logging techniques, and with research interests in geohazards and environmental hazards of the southeastern U.S. coastal region are particularly encouraged to apply. The successful candidate will have a strong background in computer applications and an evidence of a strong commitment to undergraduate teaching. Experience with GIS and remote sensing is a plus. The candidate will be expected to: (1) teach an undergraduate-level course in neotectonics and geophysical methods, a course in his or her area of specialty, one or more graduate courses in geohazards and environmental hazards, and an undergraduate introductory geology course; (2) develop a successful research program; and (3) seek external funding for research. Interested persons should send a letter stating their interest in the position, curriculum vitae, statements of teaching philosophy and research interests, unofficial transcripts, and names of three references to: Geohazards Search Committee, Department of Geology, College of Charleston, Charleston, SC 29424. Review of applications will begin Jan. 8, 2001, and continue until the position is filled. The College of Charleston is an AA/EQ/ADA employer and does not discriminate in

employment or the provision of services on the basis of disability. The Department of Geology currently has nine full-time faculty, 60 undergraduate majors, and 10 graduate students. The department supports an interdisciplinary Masters program in Environmental Studies; and has a strong record of incorporating research into the undergraduate curriculum. For more information, visit our departmental Web site at <http://www.cofc.edu/~geology/>, or contact Dr. Mitchell Colgan at (843) 953-7171, mcolgan@loki.cofc.edu.

Open Rank Search

W. Hilton Johnson Professorship in Surficial Geology University of Illinois, Urbana-Champaign

The Department of Geology at the University of Illinois, Urbana-Champaign, invites nominations and applications for an open-rank tenured or tenure-track faculty appointment in surficial geology to begin Aug. 21, 2001. A tenured appointment carries the title W. Hilton Johnson Professor or Associate Professor of Geology. Specialties of interest include, but are not limited to geomorphology, neotectonics, glacial geology, glaciology, Quaternary geology, paleoclimatology, remote sensing, geosphere-atmosphere-biosphere interaction, and earth-system modeling. To be appointed at the tenured level, the successful applicant will have a distinguished record of scholarship and disciplinary leadership in the field. To be appointed at the assistant professor level, the successful applicant will have demonstrated potential to establish a vigorous, internationally recognized research program. The successful candidate, at any rank, must demonstrate an ability to build excellence in educational programs and must hold an earned Ph.D. or equivalent. Rank and salary will be commensurate with experience. Applicants should submit a curriculum vitae, record of research funding, list of publications, description of research and teaching interests, and the names of at least three referees to: Prof. R. James Kirkpatrick, Search Committee Chair, Department of Geology, University of Illinois, 1301 West Green Street, Urbana, IL 61801. Questions about the position can be directed to Prof. Kirkpatrick, (217) 333-7414, kirkpat@uiuc.edu. Nominations of potential candidates can be transmitted by e-mail. For full consideration, applicants should submit materials no later than Jan. 15, 2001. The University of Illinois is an Equal Opportunity/Affirmative Action employer. Women and minorities are encouraged to apply.

Assistant Professor, School of Geology Oklahoma State University

The Oklahoma State University, School of Geology invites applications for a tenure-track assistant professor position beginning fall 2001. A Ph.D. degree is required at the time of appointment. Preference will be given to a field-oriented hard-rock geologist with prior college teaching and research experience. Applicants must show the ability and commitment for excellence in instruction and research. Applicants should be well trained in every aspect of hard rock geology including igneous-metamorphic mineralogy, petrography, and radiometric age-dating methods. This position is intended to complement the expertise of the faculty at the School of Geology. Therefore, it is also desirable that candidates have expertise in application of igneous-metamorphic geology to one of the following areas: (a) environmental geology; (b) tectonics; (c) numerical modeling, and (d) planetary geology. We are seeking an individual who demonstrates the potential for developing a successful research program relating to his or her areas of expertise. Teaching of undergraduate and graduate courses and participation in extension activities related to field classes are also required. The candidates must have published refereed articles in his or her discipline. The successful candidate will be expected to develop a research program that will generate funding to support the program and graduate student involvement. The successful candidate will be teaching introductory geology courses along with courses related to his or her specialty and will be expected to supervise M.S. graduate students. He or she should also be willing to participate in teaching a capstone summer field camp course. Candidates should submit a letter of application, including a description of research interests and his or her approach to teaching. A curriculum vita, academic transcripts, and the names, addresses, e-mail addresses, and phone numbers of three references are also required. For full consideration, applications must be received by Jan. 10, 2001; however, applications will be accepted until the position is filled. Please send all materials to: Assistant Professor Search, Hard-Rock Geologist Position, School of Geology, Oklahoma State University, 105 Noble Research Center, Stillwater, OK 74078-3031. For more information on the OSU School of Geology, please visit our Web site at www.okstate.edu/geology. OSU is an affirmative action/equal employment opportunity employer, committed to multicultural diversity.

Tenure-Track Assistant Professor University of Arkansas at Little Rock

The Department of Earth Sciences invites applications for a tenure-track position to begin Aug. 15, 2001, contingent upon funding. A Ph.D. in geoscience is required at the time of appointment. We desire a person who is broadly trained in the geosciences with expertise in environmental/Cenozoic geology or geoscience education. The successful applicant will provide evidence of commitment to undergraduate teaching and develop a research program that involves undergraduate students. Applicants should include a description of their teaching philosophy and research interests, curriculum vitae, copies of transcripts of all academic work, and names and addresses of at least three references by Jan. 15, 2001, to: Dr. Jeffrey Connelly, Chair, Department of Earth Sciences, University of Arkansas at Little Rock, Little Rock, AR 72204-1099. The University is committed to the policy of providing equal opportunity for all persons and will not discriminate in admissions, age, race, national origin, color, disability, or religion. The University follows the principles of Affirmative Action and operates within federal laws and executive orders prohibiting discrimination. Under Arkansas law, all applications are subject to disclosure. Persons hired must have proof of legal authority to work in the U.S.

Earlham College Surface Processes, Tenure Track

The Department of Geology at Earlham College invites applications for a tenure track assistant professor position in the general area of surface processes. Responsibilities include instruction and co-instruction of introductory geology courses and some combination of alternate-year upper-class courses in geomorphology, water resources or hydrogeology, sedimentology/stratigraphy, and perhaps GIS or some other course of common interest to the successful applicant and the department. Geology faculty members also participate in a geology senior seminar and supervise independent research projects that are required of all geology majors. Faculty research that involves students is strongly encouraged. A Ph.D. is preferred, but ABD candidates will be considered. The successful candidate must have a strong commitment to undergraduate teaching in a liberal arts atmosphere. Earlham is a small, selective, national liberal arts college with an outstanding record as a source of future geology and biology Ph.D.s. The college is well known for its unique off-campus programs, and faculty members have ample opportunities to lead domestic and foreign off-campus study programs (e.g., Japan, Kenya, Great Britain, Latin America, and others). In addition, geology faculty members have the opportunity to lead foreign or domestic off-campus "May Term" field geology courses on an alternate year basis. The geology department at Earlham currently has two full-time geologists—a hard-rock geologist and a paleontologist/Earth historian. With the addition of the third faculty member, we hope to broaden the expertise of the geology faculty into the general area of earth surface processes. The geology of east-central Indiana and adjacent Ohio offers excellent opportunities for the study of Pleistocene glacial processes, as well as studies of the hydrologic characteristics of a wide range of surficial materials. Earlham College especially encourages applications from women, underrepresented minorities and persons sympathetic to Quaker principles. Interested candidates should submit curriculum vitae, a letter discussing their qualifications, and names and addresses of at least three references to: Dave West, Department of Geology, Earlham College, Richmond, IN 47374. Review of completed applications will begin on Jan. 31, 2001. To find out more information about Earlham College and the geology department, please visit the college and department Web sites at <http://www.earlham.edu>.

Hobart and William Smith Colleges

Tenure-Track Faculty Position: Hobart and William Smith Colleges, private coordinate liberal arts colleges in the Finger Lakes region of upstate of New York, seek a new colleague to join the Department of Geoscience at the assistant professor level. This person must demonstrate the potential to become an outstanding teacher with a commitment to involving undergraduate students in his or her research in an area which complements our strengths and which takes advantage of the local and/or regional environment. Teaching responsibilities in the department include introductory geoscience courses and laboratories as well as intermediate and advanced courses relevant to the candidate's expertise. Additionally, we expect that this new colleague will play an important and developing role in the Colleges' Environmental Studies Program, initially offering courses relevant to the program, but within a few years joining other faculty in leading the program. Geoscience faculty also teach in the institution's general curriculum. The teaching load is five course-units

(labs count as 1/2 unit) over a two semester academic year. The position is tenure-track and is in addition to the earlier announced position in introductory and sedimentary geology (see below).

Physical Geology, Sedimentary Geology, Paleontology: Hobart and William Smith Colleges seek a colleague to join the Department of Geoscience to teach introductory physical/environmental geology as well as courses in the field of sedimentary geology, historical geology and/or paleontology, depending on the candidate's expertise and the department's needs. Departmental faculty members also assume leadership roles in the colleges' environmental studies program and are expected to teach in the institution's general curriculum. Faculty members in the department are research-active and strongly encourage undergraduate research. The position is tenure-track. The Colleges are located at the north end of Seneca Lake, largest of New York's Finger Lakes. Research by faculty and students on Seneca Lake, Lake Ontario and other Finger Lakes accessible via the New York state barge canal system is possible with the colleges' well-equipped, 65-foot research vessel, the *HWS Explorer*. For further information see our Web site, www.hws.edu/aca/depts/geo. The Colleges actively seek to increase the diversity among their faculty and welcome applications from women, minorities and other under-represented groups. We do not discriminate on the grounds of race, color, religion, sex, marital status, national origin, age, disability, veteran's status or sexual orientation. Applicants are to send a letter of application and curriculum vitae and arrange for three letters of recommendation to be sent (e-mail applications will not be considered). Review of applications will begin on Feb. 1. All correspondence should be sent to: William F. Ahrensbrak, Chair, Geoscience Department, Hobart and William Smith Colleges, Geneva, NY 14456, (315) 781-3603, fax 315-781-3860, ahrensbrak@hws.edu.

Louisiana State University

Assistant Professor in Geology and Geophysics

The Department of Geology and Geophysics at Louisiana State University invites applications for a junior, tenure-track position, to begin in the fall semester of 2001. A hire at the associate level may be considered for an exceptional candidate. The successful candidate must have a Ph.D. at the time of appointment, and postdoctoral experience is preferred. We desire an outstanding, process oriented, quantitative geoscientist with demonstrated expertise in one of five general research areas: carbonate sedimentology, geomorphology, groundwater hydrogeology, stable-isotope geochemistry, or structural geology. We anticipate filling at least three positions over the next three years. The successful candidate is expected to contribute to our undergraduate and graduate teaching programs, which may include teaching at field camp, and also develop courses in their area of specialization. Development of a strong research program including supervision of graduate student research, active publication and the generation of external funding is required. The department consists of 20 faculty members covering a wide range of expertise with many well-equipped analytical and computational laboratories. Geology and geophysics has strong support from the LSU administration as evidenced in our selection as one of the twelve priority departments at the University. For more information about our department, see our Web site at <http://www.geol.lsu.edu>. Interested persons should send a copy of their vita, a statement of their research and teaching interests, and the names, addresses, and phone numbers of at least three references to: Chair, Faculty Search Committee, Department of Geology and Geophysics, Louisiana State University, Ref. Log #0617 Baton Rouge, LA 70803. The review process will begin Feb. 1, 2001. The search will be continued until a suitable candidate is found. Louisiana State University is an equal access employer.

University of North Dakota Earth Surface Processes

The Department of Geology and Geological Engineering at the University of North Dakota invites applications for a tenure-track faculty position in earth surface processes, at the assistant professor level. We are particularly interested in candidates with strengths in global change, remote sensing, or soil science. A Ph.D. in the geological sciences is required. The successful applicant will be expected to teach undergraduate and graduate courses in his or her area of specialty and to develop a strong research program. The position is available Aug. 16, 2001. Closing date for applications will be Jan. 15, 2001, or as soon thereafter as a suitable pool of applicants is obtained. The successful applicant must have the Ph.D. degree at the time of appointment. Salary will depend on qualifications and experience. Interested applicants should send a letter of application, resume, and the names of three referees to:

Richard D. LeFever, Chair, Department of Geology and Geological Engineering, University of North Dakota, Grand Forks, ND 58202-8350, (701) 777-2811, fax 701-777-4449. For further information, please visit our Web site at <http://www.und.nodak.edu/dept/geology/>. The University of North Dakota is an Equal Opportunity/Affirmative Action Employer.

University of Nebraska Sedimentary Geology

The Department of Geosciences at the University of Nebraska-Lincoln invites applications for the newly endowed Mr. and Mrs. J.B. Coffman Chair in Sedimentary Geology. We seek an outstanding geoscientist with a solid record of scholarly achievements within the broad field of sedimentary geology. Candidates may present any area of specialization, but experience in, or association with, the petroleum industry will be considered a plus. We expect to make the appointment at the full professor level with tenure, but strong applicants at the advanced associate professor level will also be considered. The successful candidate will be expected to conduct a vigorous program of research and to participate in teaching and other academic activities appropriate for a senior faculty member at the University of Nebraska-Lincoln. The University of Nebraska—Lincoln is an AAU, Research-I land-grant institution with a distinguished tradition of research, education, and service. It has approximately 23,000 students and is designated as the principal research and graduate institution in the state. The Department of Geosciences currently includes 14 full-time faculty and eight part-time faculty shared with other UNL units, and has strong associations with the State Museum, Conservation and Survey Division, and the School of Natural Resource Sciences. The department has solid undergraduate programs in geology and meteorology and approximately 40 active graduate students (Masters and Ph.D.). For further information about the Department of Geosciences, see our Web site at <http://www.unl.edu/geology/geohome.html>. Questions concerning the position or the department can be addressed to Department Chair Norman D. Smith, (402)-472-2663, nsmith3@unl.edu. Applicants should send a letter of interest, current resume, and the names and addresses of at least four references to: Professor David Loope, Chair, Coffman Chair Search Committee, Department of Geosciences, 214 Bessey Hall, University of Nebraska, Lincoln, NE 68588-0340. The review of applicants will begin Jan. 8, 2001, and continue until the position is filled. The University of Nebraska—Lincoln is committed to a pluralistic campus community through Affirmative Action and Equal Opportunity and is responsive to the needs of dual career couples. We assure reasonable accommodation under the Americans with Disabilities Act: contact David Loope at (402) 472-2647 for additional information.

Penn State University

The Commonwealth College invites applications for the tenure-track position of assistant professor of earth sciences at its Delaware County campus beginning August 2001, or as negotiated. The campus is located in the greater Philadelphia area, with a heterogeneous, commuting student body. Qualified applicants will possess a Ph.D. in geology, earth sciences or related field. Evidence of potential in research and publication is expected. Interest in active and collaborative learning and in instructional use of technology is an advantage, as is experience in teaching at the collegiate level. The successful applicant would be expected to teach non-major courses in geology, earth sciences and related fields. Research and scholarship expectations include publication in refereed journals; interest and participation in course, curriculum, and program development; active participation in professional organizations; advising students, career guidance, and service activities. For more information regarding the college and campus, please visit <http://cwchome.psu.edu>. To apply, please submit a cover letter, resume, and complete contact information (including e-mail if possible) of three references to: Commonwealth College Faculty Searches, The Pennsylvania State University, 111 Old Main, Box GEO, University Park, PA 16802. Applications will be accepted until the position is filled. Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce.

University of South Florida Professor and Chair, Geology

The College of Arts and Sciences and the Geology Department of the University of Southern Florida (www.cas.usf.edu/geology) are inviting applications for the tenure-eligible position of professor and chair of the Geology Department. A Ph.D. and experience commensurate with the rank of full professor, including appropriate administrative experience, are required. Preference will be

given to candidates with a record of demonstrated excellence in research and education. The area of research specialization is open. Salary and startup costs are negotiable. The successful candidate will be expected to teach courses in his/her specialty; maintain an active, externally funded research program and mentor MS and Ph.D. candidates. The USF Geology department currently includes nine full-time faculty and two instructors, and expects to add several additional members in the next few years. The department instituted new and innovative B.S. and B.A. curricula for the 2000-2001 academic year, and is an active departmental participant in the interdisciplinary environmental science and policy B.S. and M.S. programs at USF. Current research strengths in the department are in various aspects of environmental geology (including hydrogeology, coastal geology, applied geophysics, and Quaternary geology), as well as in petrology/geochemistry and sedimentary geology/paleontology. To be considered for the position, send a letter of interest, a curriculum vita, a description of your teaching, research and administrative experiences and expertise, and names and contact information for four referees to: Dr. Jeff Ryan, Chair, Geology Chairperson Search Committee, Department of Geology, University of South Florida, 4202 East Fowler Ave, Tampa, FL 33620

Applications must be received by Jan. 31, 2001. Inquiries about this position may be addressed to Jeff Ryan, ryan@chuma.cas.usf.edu. USF is an equal opportunity/affirmative action employer. Women and minorities are strongly encouraged to apply. Those persons requiring reasonable accommodation under the Americans with Disabilities Act should contact Jeff Ryan at the mail or e-mail addresses above. Under Florida Law, applications and meetings regarding them are open to the public.

San Francisco State University Hydrogeologist

The Department of Geosciences invites applications for a tenure-track faculty position at the assistant professor level in hydrogeology, beginning August 2001. The position requires a Ph.D. in geology or a related field and a strong commitment to excellence in teaching undergraduate and graduate courses in hydrogeology and groundwater contamination, with secondary involvement in engineering geology and/or geophysics. Responsibilities will include maintaining an active research program that involves graduate and undergraduate students. We seek someone who will work with local environment firms and agencies and assist in building our new graduate program in Applied Geosciences. Some teaching and industry experience is preferred; strong quantitative skills are essential. To apply, send a curriculum vita, a statement of teaching and research interests, and names and addresses of three references to: Karen Grove, Dept. of Geosciences, San Francisco State University, San Francisco, CA 94132. Applications should be received before Jan. 15, 2001. San Francisco State University is an Equal Opportunity/Affirmative Action employer.

University of Wisconsin—Madison Faculty Position in Geobiology

The Department of Geology and Geophysics at the University of Wisconsin—Madison seeks a Geobiologist with expertise in marine microfossils for a tenure-track, assistant professor position, beginning August 2001. We are interested in individuals with strong research programs in one or more of these areas: the dynamics of the earth-life system over time, paleoceanography, paleoclimatology, biogeochemistry, and the molecular phylogenetics of microorganisms in relation to earth history. Strong quantitative skills and broad interdisciplinary training are desirable. A Ph.D. is required at the time of appointment. The successful candidate will be expected to develop a vigorous research program, including the supervision of graduate students. Teaching duties will include courses in geobiology at the undergraduate and graduate levels. Applicants should submit a resume, statement of research and teaching interests, and the names and addresses of at least three references to Prof. Dana Geary, Geobiology Search Chair, Dept. of Geology & Geophysics, UW—Madison, 1215 W. Dayton Street, Madison, WI 53706-1692. Application deadline: Jan. 2, 2001. For additional information, please visit www.geology.wisc.edu. UW—Madison is an equal opportunity/affirmative action employer and encourages applications from women and minorities. Unless confidentiality is requested in writing, information regarding applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

CLASSIFIED ADVERTISING

Published on the 1st of the month of issue. Ads (or cancellations) must reach the GSA Advertising office one month prior. Contact Advertising Department (303) 447-2020, 1-800-472-1988, fax 303-447-1133, or e-mail: acrawford@geosociety.org. Please include complete address, phone number, and e-mail address with all correspondence.

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Positions Open

UNIVERSITY OF PITTSBURGH SEDIMENTARY GEOLOGY

The Department of Geology & Planetary Science at the University of Pittsburgh invites applications for a tenure track assistant professor position in sedimentary geology to begin September 2001, pending budgetary approval. We seek an outstanding person who is undertaking significant field based research in the area of sedimentology/sedimentary processes and stratigraphy. Research specialties may include, but are not limited to, studies of global change as recorded in the sedimentary record, the interaction of sedimentary and climatic processes, basin analysis in both ancient and modern systems, and clastic sedimentology. Preference will be given to candidates whose expertise will complement ongoing research in the department (see www.geology.pitt.edu) especially in surficial processes, Quaternary geology and global change, low-temperature geochemistry and isotope geology, hydrogeology, regional tectonics, and geomorphology of planetary surfaces.

The successful candidate will be expected to develop a vigorous, externally funded research program, and participate actively in undergraduate (B.A. and B.S.) and graduate (M.S. and Ph.D.) teaching. Completion of the Ph.D. by the start date is required.

Our department consists of nine faculty, two lecturers, 130 undergraduate majors and 20 graduate students. Department resources include paleomagnetism lab, remote sensing and planetary geology labs, GIS/computer lab, and geochemistry facility with clean lab, ICP-AES, and thermal ionization mass spectrometer.

To apply, send curriculum vitae, statement of research and teaching interests, copies of up to five publications, and the names, addresses, email and phone numbers of at least three references to: Sedimentary Geology Search Committee Chair, Dept. of Geology and Planetary Science, 321 EH, University of Pittsburgh, Pittsburgh, PA 15260. The closing date for applications is February 15, 2001.

The University of Pittsburgh is an Affirmative Action, Equal Opportunity Employer. Women and members of minority groups under-represented in academia are especially encouraged to apply.

UWM GEOSCIENCES ASSOCIATE INFORMATION PROCESSING CONSULTANT

The Department of Geosciences at the University of Wisconsin—Milwaukee seeks to hire an academic staff member into the position of Associate Information Processing Consultant. Applicants must hold a bachelors degree in geosciences or computer science. A masters degree or post-baccalaureate experience is desirable. The successful candidate will act as a resource for information technology and computer applications related to teaching and research, operate and manage data from UWM's seismograph systems, and support departmental outreach/educational activities. A more complete description of the position and information regarding the Department is available online at <http://www.uwm.edu/Dept/Geosciences/>. Candidates must mail a resume, a statement of application, and the names of three references to Mark Harris, Chair, Department of Geosciences, University of Wisconsin—Milwaukee, P.O. Box 413, Milwaukee, WI 53201, fax 414-229-5452, mtharris@uwm.edu, and post-marked by March 1, 2001. The University of Wisconsin—Milwaukee is an Equal Opportunity/Affirmative Action Employer.

UNIVERSITY OF NEBRASKA WATER SCIENCE

The University of Nebraska—Lincoln invites applications for a faculty position in water science in the Department of Geosciences. This position will be filled at the rank of associate or full professor. Ph.D. is required. The successful candidate will have a substantial record of research, a history of external funding, and the potential to become a

leader in the hydrological sciences. Our department emphasizes hydrogeology, meteorology/climatology, sedimentary geology, and surficial processes. Preference will be given to water scientists with research specialties that will promote interactions with one or more of these fields. We especially seek applicants with expertise in geochemistry or surface hydrology. Examples of research areas that would be of interest include (but are not limited to) physical and chemical interactions between surface and ground water, low temperature water-rock interactions, numerical modeling of hydrological systems, atmosphere-hydro-sphere interactions, and watershed hydrology and geochemistry. The University of Nebraska—Lincoln is the principal research institution in the four-campus University of Nebraska system. The Department of Geosciences resides within the College of Arts and Sciences, the oldest, largest, and most diverse college in the University and state. The department has grown from 13 faculty members (9.6 FTE) in 1996 to 22 faculty members (16.1 FTE) today. Some faculty members share appointments with the University of Nebraska State Museum, the Conservation and Survey Division, or the School of Natural Resource Sciences. The department offers B.A., B.S., M.S., and Ph.D. degrees, with graduate specializations in geology, meteorology/climatology, and hydrogeology. Additional information on the Department and two other faculty searches now in progress is available at www.unl.edu/geology/geohome/html. Applicants should submit a letter of interest, current resume, and contact information for five references to: Dr. Vitaly Zlotnik, Chair, Water Science Search Committee, Department of Geosciences, 214 Bessey Hall, University of Nebraska-Lincoln, Lincoln NE 68588-0340, (402) 472-2663, fax 402-472-4917, vzlotnik1@unl.edu. Review of applications will begin Feb. 28, 2001, and continue until the position is filled. The University of Nebraska—Lincoln is committed to a pluralistic campus community through Affirmative Action and Equal Opportunity, and is responsive to the needs of dual career couples. We assure reasonable accommodation under the Americans with Disabilities Act: contact Vitaly Zlotnik at (402) 472-2663 for further information.

ICDD EXECUTIVE DIRECTOR POSITION

The International Centre for Diffraction Data (see www.icdd.com), a scientific database corporation near Philadelphia, PA, USA, is seeking an executive director. The not-for-profit corporation operates from a modern headquarters facility and serves a worldwide scientific community. Required qualifications include proven managerial and business experience, a degree (minimum B.S.) in physical or materials sciences or engineering, and experience in X-ray diffraction, modern databases, and business and scientific use of the Internet. Duties are interesting and diversified and include supervision of 40 employees, cooperation with about 300 international scientific volunteers, and teaching at workshops and conferences worldwide. The deadline for applications is Feb. 26, 2001.

Send resumes and names of at least three references to: Dr. Charles Prewitt, Search Committee Chair, c/o Ms. Theresa Maguire, Corporate Secretary, International Centre for Diffraction Data, 12 Campus Boulevard, Newtown Square, PA 19073-3273, USA.

EARTH SURFACE PROCESSES DUKE UNIVERSITY

The Division of Earth and Ocean Sciences of the Nicholas School of the Environment and Earth Sciences at Duke University invites applications for a tenure track position in earth surface processes at the assistant professor level. For the purposes of this search, earth surface processes includes marine and terrestrial geomorphology, coastal processes, hydrology, or any other area of inquiry in the physical sciences that involves the study of processes affecting the nature, form, history, evolution, and future of the surface of the Earth. We are especially interested in hearing from candidates whose research focuses on questions involving large spatial scales. Candidates will be expected to develop an active and well-supported research program in his or her specialty, should have strong computational and field skills, and should enjoy teaching and mentoring both undergraduate and graduate students. Candidates should be able and willing to articulate their view of what research directions are likely to become the most important and fruitful in earth surface processes during the early twenty-first century. With this hire we continue our efforts to make Duke University one of the nation's leading centers for the study of earth surface processes. The starting date is open but we hope to fill the position by fall 2001. All applications received by March 1, 2001, will be considered. For additional information about EOS, please see our Web site at www.eos.duke.edu. Please send your vitae and the names and addresses of three references to Chair of the Search Committee, Division of Earth and Ocean Sciences, Duke University, Box 90227, Durham NC 27708. Duke University is an equal opportunity employer.

ASSISTANT PROFESSOR IN EARTH SCIENCES WHITTIER COLLEGE

The Environmental Science Program at Whittier College invites applications for a tenure-track position at the assistant professor level in the Department of Earth Sciences. A Ph.D. in geology or a closely related field is required. Candidates with specialties in earth surface or near surface processes, or those working on geosphere-hydrosphere-atmosphere interactions will be given preference. Excellent teaching at all undergraduate levels in earth sciences and the interdisciplinary environmental sciences program is expected, as is participation in Whittier's innovative interdisciplinary liberal education and writing programs. The successful candidate will develop a research program involving Whittier undergraduates. For more detailed information see www.earthsciences.whittier.edu or contact Cheryl Swift at (562) 907-4273. Applications will be accepted until the position is filled, and review of applications will begin in January. Whittier College is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply. Whittier is a small, independent, selective liberal arts college in southeast Los Angeles County.

LAKE SUPERIOR STATE UNIVERSITY GEOLOGY FACULTY

The Department of Geology at Lake Superior State University invites applications for a tenure-track position at the assistant professor level beginning August 2001. The department currently has three full-time faculty in geology, with specialties in paleontology/stratigraphy and structure/geophysics. The department averages approximately 30 majors in geology, environmental geology, and elementary and secondary earth science teacher education. Teaching loads are 12 contract hours per 15-week semester. The department has a strong record of incorporating research into the undergraduate curriculum and a large percentage of students continue studies at the graduate level. The department is housed in a new, award-winning science facility dedicated Sept. 2000. New field and lab equipment will continue to be purchased over the next few years to support the new facilities and the new curriculum.

GEOLOGY. We are seeking an imaginative, creative, motivational instructor who is committed to excellence in teaching. The candidate must be excited about participating in a team setting to develop a new, innovative, NSF-sponsored geology curriculum based on integration of sub-disciplinary content and project-centered instruction that emphasizes group work and active learning strategies. The NSF grant abstract is available at: [HTTP://www.fastlane.nsf.gov/servelet/showaward?award=9952319](http://www.fastlane.nsf.gov/servelet/showaward?award=9952319).

Qualifications: Ph.D. required, specialty is open. The successful candidate will be expected to lead instruction of mineralogy/petrography and surface/groundwater hydrology and to participate in introductory geology and summer field courses and project-centered upper division classes based on expertise.

Location: Lake Superior State University, a four year, comprehensive, state-supported institution, is located in the Eastern Upper Peninsula of Michigan in a geologically diverse setting. Classic outcrops in the Canadian Shield and Michigan Basin, Keweenaw flows and intrusions, and a variety of glacial, lacustrine, and fluvial features are all accessible within an hour's drive of campus. The campus overlooks the St. Mary's River. Also easily accessible are Lakes Superior, Huron, and Michigan. Enrollment is approximately 3,100. Visit our Web site (<http://www.lssu.edu>) for additional information about LSSU, the local community and our benefit offerings.

Applications: Submit a letter of application, curriculum vitae, a statement of teaching philosophy and research interests with a vision of undergraduate involvement, unofficial transcripts, and a minimum of four letters of recommendation to Human Resources Office: Geology Faculty Search Committee; Lake Superior State University; 650 W. Easterday Avenue; Sault Ste. Marie, MI 49783. Application information can be e-mailed to: human-resources@gw.lssu.edu or faxed to: 906-635-2111. For additional information, contact the Human Resources Office at (906) 635-2213. Review of applications will commence immediately, and will continue until position is filled. An Equal Employment Opportunity/Affirmative Action Employer. Women and Minorities are encouraged to apply.

LABORATORY COORDINATOR DEPARTMENT OF GEOLOGY AND ENVIRONMENTAL GEOSCIENCES

The Department of Geology and Environmental Geosciences at Lafayette College, Easton, PA, is accepting applications for a full-time, nontenure-track position for a laboratory coordinator. Applicants must have at least a M.S. in geology. Responsibilities will include teaching introductory geology laboratories, assisting with upper-level geology courses, laboratory preparation and set up, and on occasion, teaching introductory geology lectures. The lab coordinator will also curate the rock and mineral and map collections used for teaching and provide field and electronic support. A strong computer background

including proficiency using both Macintosh and Windows based PCs and associated hardware/software such as a slide maker, scanner, digitizer, etc., is essential. The position begins summer/fall 2001. Please include a resume, a description of experience and capabilities, graduate and undergraduate transcripts, and reference letters from at least three references to: Dr. Dru Germanoski, Head, Department of Geology and Environmental Geosciences, Lafayette College, Easton, PA 18042; germanod@Lafayette.edu. Lafayette College is committed to equal opportunity. Women and minorities are encouraged to apply. We will begin reviewing applications March 1, 2001, and applications will be accepted until the position is filled.

GEOLOGY, WHITMAN COLLEGE

The Department of Geology at Whitman College seeks to fill a one-year sabbatical replacement position starting August 2001. The successful applicant must have a Ph.D. or ABD with ability to teach introductory courses in either geophysics or paleontology. In addition to the above, responsibilities include teaching introductory physical geology plus two other courses. Demonstrated ability to teach hydrology, GIS, or other courses outside of the department's normal offerings is desirable. The Department of Geology is a member of the Keck Geology Consortium and is strongly committed to excellence in undergraduate teaching and research. Send letter of application, statement of teaching philosophy, curriculum vitae, and names of three references to: Dr. Kevin R. Pogue, Chair of the Search Committee, Department of Geology, 345 Boyer Avenue, Whitman College, Walla Walla, WA 99362. Deadline: Feb. 28, 2001. Equal opportunity employer. Candidates must be lawfully employable in this country as a result of citizenship, visa, or resident alien status.

BIOGEOCHEMISTRY UNIVERSITY OF SASKATCHEWAN

The Department of Geological Sciences at the University of Saskatchewan invites applications for a tenure-track position in Biogeochemistry. We are interested in candidates with expertise in organic biogeochemistry, and a strong background in stable isotope analytical techniques. The successful candidate must be prepared to develop a vigorous research program, and be committed to teaching at all levels. Applicants must hold a Ph.D., and previous teaching and research experience is preferred. The position is at the assistant professor level, although outstanding candidates may be considered at a higher level.

The Department has 14 full-time faculty, including two endowed research chairs in Geochemistry, and a well-equipped Analytical Geochemistry Facility (details on our Web site: www.usask.ca/geology/). Opportunities exist on the campus for innovative collaborations with researchers from the Colleges of Agriculture, Engineering, Medicine, and Veterinary Medicine, the first Canadian synchrotron light source, and Canadian government environmental research centers.

Applicants should send a resume and three letters of reference to: Dr. James Basinger, Head, Department of Geological Sciences, University of Saskatchewan, Saskatoon, SK S7N 5E2, Canada, jim.basinger@usask.ca, fax 306-966-8593. Application deadline is Feb. 28, 2001.

The University of Saskatchewan is committed to the principle of employment equity. Applications are also invited from qualified applicants regardless of their immigration status in Canada.

HYDROGEOLOGIST/PHYSICAL GEOGRAPHER KEAN UNIVERSITY

The Department of Geology and Meteorology at Kean University invites applications for a tenure-track position at the rank of assistant professor beginning September 2001. The successful candidate should have a Ph.D. or ABD in groundwater geology, hydrology, or physical geography and is expected to teach courses in groundwater, hydrology, climatology, and geography. Additionally, the successful candidate is expected to participate in program development, student advisement, and departmental and university governance as well as maintaining an active research program.

The Department of Geology and Meteorology offers undergraduate degrees in geology, meteorology, and general earth science as well as a teaching certification degree in earth science. Additionally, the department offers a masters degree in earth science education and has a large number of undergraduate education majors taking earth science as their academic major. The department consist of eight full-time faculty and six adjuncts who cover the academic disciplines of meteorology, geology, oceanography and geography. The department Web page can be found at <http://hurri.kean.edu>.

Letters of applications and curriculum vitae should be sent to Charles H. Murphy, Chairperson, Department of Geology and Meteorology, Kean University, 1000 Morris Ave., Union, NJ 07083-0411 cmurphy@kean.edu. Kean University is an Equal Opportunity/Affirmative Action Employer and encourages applications from women and minorities.

DEPARTMENT OF EARTH SCIENCES UNIVERSITY OF NEW HAMPSHIRE GLACIAL GEOLOGY/PALEOCLIMATOLOGY

The Department of Earth Sciences at the University of New Hampshire invites applications for a tenure-track position in glacial geology/paleoclimatology at the assistant professor level, starting September 2001, or as soon as possible thereafter. This is one of four positions that we expect to fill over the next two years. The successful candidate will be expected to teach glacial geology (undergraduate/graduate level) and an introductory earth sciences course as part of the core curriculum in geology, graduate course(s) in his or her specialty, and to develop a strong research program involving graduate and undergraduate students. We seek candidates with interests in the broad area of glacial geology and paleoclimatology to carry out research complementary to current departmental and college efforts. A strong commitment to undergraduate teaching and familiarity with field methods are essential. UNH offers a B.Sc. in geology and hydrology; B.A. in earth sciences; M.Sc. in geology, hydrology, oceanography, and geochemistry; and the Ph.D. in earth sciences. The department has 12 academic faculty and 10 research faculty, and has strong ties to the Institute for the Study of Earth, Oceans, and Space and the Center for Coastal and Ocean Mapping. Starting salary will be commensurate with experience and qualifications. Candidates should have completed the Ph.D.

Review of applications begins Feb. 15, 2001. Please send complete CV (non-citizens include current visa status), statement of research and teaching interests, and names and addresses of three references to Search Committee, UNH Earth Sciences, 56 College Road, Durham NH 03824. Hiring is contingent upon eligibility to work in the U.S. UNH is committed to excellence through diversity among its faculty and strongly encourages women and minorities to apply.

UNIVERSITY OF WISCONSIN—STEVENS POINT ASSISTANT PROFESSOR/INSTRUCTOR

Tenure-track position in remote sensing/physical geography beginning August 2001. Ph.D. desirable; required for tenure. A Ph.D. is required for hiring at the assistant level, although candidates will be considered at the instructor level if they are Ph.D. candidates or the Ph.D. is pending. Successful applicant must have strong teaching and research interests in remote sensing, digital image processing, and air photo interpretation. Background in GIS highly desirable. Position requires teaching remote sensing, air photo interpretation, and introductory physical geography. Opportunities exist to teach GIS. The department has superb computing and multimedia resources. Emphasis is on quality undergraduate teaching. Scholarly activity and service required for retention and tenure. Salary and rank dependent on qualifications and experience. Interested individuals should submit a letter discussing their qualifications, a statement of teaching and research interests, plus curriculum vitae with the names and addresses of at least three references and copies of transcripts. Revised closing date for applications is February 15, 2001. UW—SP is an equal opportunity/affirmative action employer. For more information see Web site at: <http://www.uwsp.edu/geo/gp/position.html>.

Apply: Michael Ritter, Chair, Department of Geography/Geology, University of Wisconsin-Stevens Point, Stevens Point, WI 54481.

HOPE COLLEGE, ASSISTANT PROFESSOR

Hope College has a one-year, term appointment for a geologist at the assistant professor level available beginning in August 2001. Teaching responsibilities will include introductory earth science courses, surficial geology, and possibly hydrogeology. The mission of Hope College is to "offer with recognized excellence, academic programs in liberal arts, in the setting of a residential, undergraduate, coeducational college, and in the context of the Christian faith." Hope College is affiliated with the Reformed Church in America. Applicants should arrange to have a curriculum vitae, transcripts, a statement of teaching philosophy and competencies, and the names and addresses of three references forwarded to: Dr. Edward Hansen, Chair; Geological and Environmental Sciences Department; Hope College; 35 East 12th Street; Holland, MI 49422-9000. Preliminary inquiries can be sent by e-mail to hansen@hope.edu. Hope College complies with Federal and State requirements for non-discrimination in employment.

SCIENCE DIRECTOR NATIONAL GROUND WATER ASSOCIATION

The not-for-profit National Ground Water Association (NGWA) seeks a recognized ground water professional with at least 10 years of high-level experience to provide sound scientific and technical direction and support internally, as well as external visibility at scientific forums. The position requires an articulate, well-rounded ground water professional with a strong desire to lend their vision and energy to maintain the quality of NGWA programs. The preferred candidate will have an M.S. or Ph.D. in hydrogeology, civil/environmental engineering, geology or a closely related discipline, a thorough grasp of water resources issues, and scientific and engineering literature of these

areas. The position reports directly to the executive director. Relocation to Westerville, a Columbus, Ohio, suburb, is desirable. Interested individuals are urged to respond by Feb. 1 with a resume, names and addresses of four professional references, a one-page statement of professional interests and qualifications for the position (including identification of past and current NGWA involvement), and an identification of compensation expectations. The candidate should also describe how he or she could provide exemplary service to the organization without relocating to Westerville if no move is contemplated.

Applications should be sent to: Kevin McCray, Executive Director National Ground Water Association, 601 Dempsey Road Westerville, Ohio 43081 or to kmccra@ngwa.org. NGWA is an equal opportunity employer.

ASSISTANT PROFESSOR OF WATERSHED SCIENCE THE UNIVERSITY OF MONTANA

The School of Forestry at The University of Montana seeks candidates for a full-time (9-month), tenure-track position in Watershed Science at the rank of assistant professor (67% teaching, 33% research). Research activities focusing on management-related issues in forested watersheds of the northern Rocky Mountains are of particular interest. Full position description detailing qualifications sought, position responsibilities, and application procedures is available from the address below or on the Web at http://www.forestry.umd.edu/kiosk/employment/Watershed_Science_pd.htm.

Initial screening of applicants will begin Jan. 2, 2001 and will continue until a suitable candidate is identified. For further information, contact Lloyd P. Queen, Search Committee Chair, School of Forestry, The University of Montana, Missoula, MT 59812,(406) 243-2709, fax 406-243-6656, search@forestry.umd.edu.

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL COASTAL GEOLOGIST

The Department of Geological Sciences at the University of North Carolina at Chapel Hill invites applications for a tenure-track faculty position in coastal geology at the assistant professor level to begin July 1, 2001.

We seek applicants with research interests in the broad area of coastal depositional systems and processes. Areas of expertise may include, but are not limited to: coastal and estuarine geology, shelf sedimentation, response of the coastal zone to climate and sea-level change, impacts of storms on coastal evolution, and dynamics of coastal boundaries. Preference will be given to candidates who conduct field programs and are able to develop and test quantitative models of coastal evolution. We seek a versatile scientist whose research bears on environmental problems such as coastal development, water supply, and natural resource distribution. In addition, we are particularly interested in individuals who will interface with existing departmental research programs and develop cross-disciplinary ties with other units on campus including the Department of Marine Sciences and the Carolina Environmental Program, and the Institute of Marine Sciences in Morehead City, NC.

The department houses state-of-the-art sedimentological equipment and laboratories including grain size analysis, x-ray diffraction, scanning electron microscope, benzene synthesis/Carbon-14, and thermal ionization mass spectrometer labs, and high-resolution seismic acquisition, processing and interpretation hardware and software. Marine Sciences houses a gas source mass spectrometer. Faculty in the department have access to the Institute of Marine Sciences (www.marine.unc.edu/organization/IMS.html), an off-campus marine facility with in-residence faculty, staff and students. Facilities include a new 30,000 sq. ft. laboratory wing, field and laboratory instrumentation (current meters, CTDs, etc.), an off-site dormitory, a fleet of trucks and small boats, and a 48 ft research vessel. The university offers access to the NC Supercomputing Center (www.ncsc.org/).

Applicants must hold a Ph.D. at the time of appointment and postdoctoral and teaching experience is highly desirable. The successful candidate will be expected to establish a vigorous, externally funded research program and to demonstrate excellence in teaching at both the undergraduate and graduate level.

Applicants must submit a letter of application, names, addresses, e-mail and phone numbers of four references, statements of teaching and research interests, and their vitae to Search Committee for Coastal Geologist, Department of Geological Sciences, University of North Carolina, Chapel Hill, NC 27599-3315. Review of applications will begin on Jan. 31, 2001, and will continue until the position is filled. For more information on the department and the university please visit our Web page at www.geosci.unc.edu. The University of North Carolina at Chapel Hill is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply.

WITTENBERG UNIVERSITY ASSISTANT PROFESSOR OF GEOLOGY

The Department of Geology invites applications for a tenure-track appointment at the assistant professor rank beginning Aug. 20, 2001. Applicants should be broadly trained in the geosciences with expertise in sedimentary

processes and environments and stratigraphy. The primary teaching responsibilities include introductory geology and undergraduate courses in the general areas of sedimentary geology, stratigraphy, and earth history. An integral field component in both teaching and research is essential. The ability to incorporate fundamentals of invertebrate paleontology in appropriate courses would be an advantage. The successful candidate will be expected to demonstrate excellence in teaching and maintain an active research program that involves students in at least one of the areas of teaching responsibility. Current faculty expertise in the department includes mineralogy, igneous and metamorphic petrology, process geomorphology, environmental geology, and economic geology. Geology faculty members are encouraged to contribute to interdepartmental programs in environmental studies and field studies, and the college's first-year interdisciplinary course.

Wittenberg University is a small, private, residential undergraduate institution firmly committed to the liberal arts and sciences. Interested applicants are encouraged to visit our Web site (www.wittenberg.edu) for details about the college and department. Wittenberg participates in AA/EOE/ADA. We encourage women and minority applicants to apply as we are committed to creating an ethnically and culturally diverse community. Review of applications will begin Feb. 1, 2001, and continue until the position is filled.

Applications should include a curriculum vita, a brief statement about teaching in a liberal arts and sciences setting, and your thoughts on involving research and field experience in your teaching. Send these materials and a list of at least three references (with phone numbers and e-mail addresses) to Dr. Kenneth W. Bladh, Professor and Chair, Geology Department, Wittenberg University, Springfield, Ohio, 45501-0720. kbladh@wittenberg.edu.

POSTDOCTORAL FELLOWSHIPS IN EARTH SCIENCES

UNIVERSITY OF WISCONSIN—MADISON

The Department of Geology and Geophysics announces one to two postdoctoral fellowships, funded by the Albert and Alice Weeks bequest to the department. The fellowships are each for one year, with the possibility for renewal for an additional year. The positions will begin in September of 2001. Salary will be approximately \$35,000 per year. The fellowships come with a modest research fund. A Ph.D. is required at the time of appointment. Applications from all areas of Earth Science are encouraged. Applicants must contact one or more UW—Madison faculty to develop a collaborative research project for inclusion in the application.

Further information about the department and instructions on application procedures may be obtained from our Web site: www.geology.wisc.edu or by writing to the professor most closely allied with your interests. Applications should be mailed to: Dana Geary, Weeks Postdoctoral Fellowship Search Committee Chair, Department of Geology and Geophysics, University of Wisconsin—Madison, 1215 West Dayton Street, Madison, WI 53706.

Applications must be received by Jan. 22, 2001. Applicants should also ensure that three letters of recommendation reach the department by that date.

The University of Wisconsin—Madison is an equal opportunity/affirmative action employer. Women and minority candidates are encouraged to apply. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

SURFICIAL PROCESSES THE COLORADO COLLEGE

The Department of Geology seeks applicants for a one-year non-tenure track position in surficial processes beginning in August 2001. Ph.D. or ABD is required. Appointments will be at the assistant professor level for candidates with a Ph.D. Primary teaching responsibility will be in geomorphology/surficial processes. Ability to teach hydrogeology and to integrate GIS into courses is highly desirable. Additional teaching responsibilities will include introductory geology and courses in the candidate's 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 and to indicate how they might contribute.

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 three letters of recommendation by Jan. 31, 2001, to: Eric Leonard, Department of Geology,

Colorado College, Colorado Springs, CO 80903. 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.

SURFICIAL PROCESSES UNIVERSITY OF MINNESOTA

The Department of Geology and Geophysics at the University of Minnesota invites applications for a tenure-track assistant professorship in surficial processes, broadly interpreted. Appointment at a more senior rank is possible under exceptional circumstances. Applicants must have a doctoral degree or equivalent at the time of appointment and demonstrate strong potential for creative research and excellent teaching at both the undergraduate and graduate levels. The Department of Geology and Geophysics has 24 faculty members, 25 research associates and postdoctoral fellows, and about 60 graduate students encompassing a broad range of geoscience research. Existing strengths in the School of Earth Sciences include the Minnesota Geological Survey, the Limnological Research Center, and the Institute for Rock Magnetism, along with energetic research programs in isotope and low-temperature geochemistry, geodynamics, tectonics, hydrogeology, paleoclimatology, and sedimentary geology. We maintain a wide array of modern analytical, experimental, and computational facilities, and have strong ties with the St. Anthony Falls Laboratory (environmental fluid mechanics) and the Large Lakes Observatory (UM-Duluth). Interested applicants are invited to visit our web site (<http://www.geo.umn.edu>) to learn more about the School of Earth Sciences.

Applicants should send a resume, a bibliography and a statement of teaching and research interests, as well as the names and addresses of at least three referees to Search Committee (Surficial Processes), Department of Geology and Geophysics, University of Minnesota, Minneapolis, MN 55455, USA, (612) 624-1333; fax: 612-625-3819. Review of files began on Dec. 1, 2000. Applications will be accepted until the position is filled.

The University of Minnesota is an equal opportunity educator and employer.

GEOLOGICAL ENGINEERING FACULTY DEPARTMENT OF MINING AND GEOLOGICAL ENGINEERING UNIVERSITY OF ALASKA FAIRBANKS

Position # 203845: The Department of Mining and Geological Engineering at the University of Alaska Fairbanks invites application for a tenure-track assistant professor in geological engineering. The position requires a strong commitment to outstanding teaching, sponsored research, and publications in archival journals. The position is available beginning fall 2001. Candidates are required to have a Bachelor's degree in engineering or geological sciences and an earned Ph.D. degree in engineering by the time of appointment. At least one of the earned degrees must be in geological engineering. Industrial experience is desirable, and professional registration or eligibility for immediate registration as a professional engineer in the State of Alaska will be given preference. Further, the successful candidate must demonstrate or show potential for scholarly accomplishments and the ability to attract research funding. Salary will be commensurate with education and experience.

The candidate will be expected to assist in teaching one or more of the following areas: geo-materials engineering, geologic hazards, engineering design, and engineering sciences (computer techniques, mechanics, and mechanics of materials), and developing graduate courses in geological engineering.

The application deadline is March 1, 2001. The review of applications will begin on March 15, 2001.

Applicant should send curriculum vitae, a statement of current and future research interest, and the names of three professional references to: Chairman, Geological Engineering Faculty Search Committee, Department of Mining & Geological Engineering, University of Alaska Fairbanks, P.O. Box 755800, Fairbanks, AK 99775-5800, (907) 474-7388, fax 907-474-6635.

GEOLOGICAL ENGINEERING FACULTY DEPARTMENT OF MINING AND GEOLOGICAL ENGINEERING UNIVERSITY OF ALASKA FAIRBANKS

Position # 203895: The Department of Mining and Geological Engineering at the University of Alaska Fairbanks invites application for a tenure-track assistant professor in geological engineering. The position requires a strong commitment to outstanding teaching, sponsored research, and publications in archival journals. The position is available beginning fall 2001. Candidates are required to have a Bachelor's degree in engineering or geological sciences and an earned Ph.D. degree in engineering or geological sciences by the time of appointment. At least one of the earned degrees must be in geological engineering. Industrial experience is desirable, and professional registration or eligibility for immediate registration as a professional

engineer in the State of Alaska will be given preference. Further, the successful candidate must demonstrate or show potential for scholarly accomplishments and the ability to attract research funding. Salary will be commensurate with education and experience.

The candidate will be expected to assist in teaching one or more of the following areas: remote sensing, Geographical Information Systems, subsurface hydrology, engineering design, and engineering sciences (computer techniques, mechanics, and mechanics of materials), and developing graduate courses in geological engineering.

The application deadline is March 1, 2001. The review of applications will begin on March 15, 2001.

Applicant should send curriculum vitae, a statement of current and future research interest and the names of three professional references to: Chairman, Geological Engineering Faculty Search Committee, Department of Mining & Geological Engineering, University of Alaska Fairbanks, PO Box 755800, Fairbanks, AK 99775-5800, (907) 474-7388, fax 907-474-6635.

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MINERAL SPECIMENS FOR RESEARCH, EDUCATION, AND FOR COLLECTIONS. Our Web site at <http://www.mineralminers.com> is a virtual gallery displaying thousands of photographic images of unique mineral specimens from mining locations around the world. Also available are gemstones, lapidary rough, books, and a wide variety of handcrafted mineral gift items.

Opportunities for Students

Course Offering: Hydrogeology Field Camp at the University of Arkansas, Fayetteville, July 2—August 10, 2001. Field Hydrogeology is a joint effort of the University of Arkansas and the U.S. Geological Survey that provides rigorous training for students and professionals in field aspects of physical and chemical hydrogeology. The course is organized in a modular fashion comprising: Module 1—Hydrogeologic Framework and Well Completion, Module 2—Flow Assessment, and Module 3—Water Quality and includes 40-hr HAZMAT training. Participants with a focused interest may attend the module that best addresses individual needs. For information contact: Dr. Phillip D. Hays, 113 Ozark Hall, Dept. of Geosciences, University of Arkansas, Fayetteville, AR 72701, (501) 575-7343, fax 501-575-3469, pdhays@usgs.gov. Web site: www.uark.edu/depts/geology/geology.htm.

Graduate Student Fellowships, Graduate Program of Hydrologic Sciences, University of Nevada, Reno. The Graduate Program of Hydrologic Sciences at the University of Nevada, Reno invites applications for three graduate student positions beginning July 1, 2001. Each position carries an annual stipend of \$14,000 including tuition and fees. These positions require serving as a teaching assistant for one semester with the remaining time being spent on a research fellowship. One student will be selected in each of the following areas: ground water, surface water, and environmental geochemistry. Completed application packages, including expressed interest in one of the aforementioned appointments, are due Jan. 31, 2001 and should be mailed to: Graduate Program of Hydrologic Sciences, Mail Stop 175, LMR 267, Reno, Nevada 89557. Additional programmatic information can be obtained on the World Wide Web at <http://www.hydro.unr.edu> or by contacting Ms. Sam Miller, Program Manager, (775) 784-6469, miller@unr.edu.

Research Assistantships/Hydrology—New Mexico Tech. Graduate research assistantships are available for students interested in working on projects related to a NSF Science and Technology Center on Sustainability of Semi-arid Hydrology and Riparian Areas (SAHRA), in which the Hydrology Program at New Mexico Tech is a lead participant. This center was formed to address the growing problems of increasing water demand and declining water quality in the southwestern United States. The objective of the center is not only to obtain new scientific insights into the hydrological system, but also to develop and present the scientific results in such a way that they can actually be applied to the resolution of water resources problems in the near future. We encourage applications from students seeking M.S. or Ph.D. degrees who are interested in the following research topics: basin-scale water and salinity balance, influence of climate variability on water resources, Vadose zone processes and groundwater recharge. Research will be focused on the hydrology of the Rio Grande Basin. Interaction with water users and managers in the basin is an important part of the planned research.

Model simulations will be completed using the advanced computing facilities at Los Alamos National Lab. We are currently accepting applications for assistantships beginning in both spring and fall 2001. For additional information, contact Fred Phillips (phillips@nmt.edu) or Eric Small (esmall@nmt.edu), Dept. of Earth & Environmental Science, New Mexico Tech., Socorro, NM 87801, www.ees.nmt.edu/Hydro/homepage.html.

Graduate Assistantships. The Geology Department and Center for Remote Sensing and Energy Research has assistantships available for M.S. students for the spring and fall semesters. Financial aid includes a nine-month stipend for two years, full tuition waiver, and funds to support thesis research. Areas of department expertise include hydrology, remote sensing, environmental geology and geochemistry, carbonate and clastic sedimentology, petroleum geology, paleovolcanology, structure and tectonics, Precambrian geology, and computer applications in geology. Field research is carried out in Scotland, the Sierra Nevada in California, and Africa, as well as in Texas and Oklahoma. Contact Dr. R. Hanson at (817) 257-7996, hanson@gamma.is.tcu.edu. Additional information about the department can be found on our Internet Web site at <http://geowww.geo.tcu.edu>.

Jonathan O. Davis Scholarship, administered by the Division of Earth and Ecosystem Sciences, Desert Research Institute. The family and friends of Jonathan O. Davis, a prominent geologist and geoarchaeologist, have established an endowment which provides an annual scholarship of \$2,000. Jonathan was tragically killed in an automobile accident in December 1990. It is the wish of his family and friends to support graduate students working on the Quaternary geology of the Great Basin and surrounding areas. The scholarship is open to graduate students enrolled in an M.S. or Ph.D. program at any university in the United States. Quaternary geology encompasses a wide range of topics normally considered as part of the Quaternary sciences. The research, however, must have a substantial geologic component or demonstrate a strong reliance on geological techniques and must be focussed on the Great Basin and immediately adjacent areas. Applications should include: (1) a cover letter explaining how the individual qualifies for the award (please include your social security number); (2) a current résumé or vitae; (3) a two-page, single spaced description of the thesis/dissertation research, which also clearly documents the geological orientation and research significance; (4) a letter of recommendation from the thesis/dissertation supervisor, which emphasizes the student's ability and potential as a Quaternary scientist. Applications must be postmarked by Feb. 2, 2001. Applications should be addressed to: Executive Director, Division of Earth and Ecosystem Sciences, Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512. Contact: Mary Ann Moran, (775) 673-7458; mmoran@dri.edu.

Graduate Assistantships at California State University, Fullerton. The Department of Geological Sciences has at least two full calendar-year graduate assistantships (including a summer stipend) available beginning fall 2001. These two-year, combined teaching and research assistantships are available to exceptionally qualified students entering our M.S. program in fall 2001. The area of study is unrestricted. Our department has research strengths in applied geology (including engineering geology and hydrogeology), stratigraphy, Quaternary geology and neotectonics, petrology and geochemistry, geophysics, and tectonics. For more information and applications, visit <http://geology.fullerton.edu> or contact Brady Rhodes, Graduate Advisor, Department of Geological Sciences, California State University, Fullerton, Fullerton, CA 92834, brhodes@fullerton.edu. Applications must be received by March 1, 2001, in order to be considered for these assistantships.

Department of Geosciences, University of Arizona, announces the availability of Sloan Scholarships for minority graduate students in the geosciences. The Alfred P. Sloan Foundation and the Department of Geosciences are committed to increasing the number of African-American, Hispanic-American, and Native-Americans receiving Ph.D.s in the geosciences. Sloan scholars receive up to \$30,000 for stipends, tuition, fees, and research expenses, plus peer and faculty mentoring. Additional support through other fellowships, and teaching or research assistantships is also available. Masters (intending to complete a Ph.D.) and Ph.D. candidates will be considered. Inquiries and requests for applications to: Graduate Program, Department of Geosciences, The University of Arizona, Tucson, AZ 85721. Or gradapps@geo.arizona.edu and <http://geo.arizona.edu>.



Three Faculty Positions UNIVERSITY OF TEXAS AT AUSTIN

The Department of Geological Sciences at the University of Texas at Austin seeks applicants for three tenure-track positions at the level of Assistant Professor.

GLOBAL CHANGE/EARTH SYSTEM SCIENCE. This position is the first of three anticipated faculty hires in Global Change/Earth System Science in the areas of climate/paleoclimate modeling, remote sensing, climate analysis, and field experimentation. This first hire will be in climate/paleoclimate modeling, but exceptional candidates in the other areas are encouraged to apply. Areas of expertise may include, but are not limited to, climate variability and dynamics over geologic and/or human time scales, land-surface processes and biosphere-atmosphere interaction, and the global water and/or carbon cycles. Opportunities exist to interact with existing strengths on campus, including modeling and remote sensing of the land-ocean-atmosphere-ice system, and the geologic and ecological records of global change. Additional opportunities for collaboration exist through the UT Institute for Geophysics, and the newly-formed, interdisciplinary Environmental Science Institute.

IGNEOUS PETROLOGY. Two faculty positions are anticipated in the area of petrology and high-T geochemistry. For this first hire, we seek an igneous petrologist who integrates field-based investigations and modern analytical methods in the study of igneous processes and their relation to fundamental geologic problems. This person will complement existing strengths in metamorphic petrology, isotope geochemistry, and structural geology. The Department houses superb analytical facilities, including a new multicollector LA-ICP-MS; a high-resolution X-ray CT scanner; modern electron microprobe, SEM and XRD facilities; and clean labs and instrumentation for stable and radiogenic isotope geochemistry.

EXPLORATION GEOPHYSICS. This faculty position is part of our initiative to establish a premier program in exploration geophysics. Most graduates of this program enter careers in the petroleum exploration and production industry. Collaboration is expected with the UT Institute of Geophysics, the Bureau of Economic Geology, and the Texas Institute of Computational and Applied Mathematics. New facilities supporting the exploration geophysics program include the 3D Seismic Interpretation Laboratory with state-of-the-art interactive workstations and a high-speed storage area network for examining very large volumes of three-dimensional seismic data. Facilities and programs at BEG and UTIG include multi-component land seismic capabilities, multi-channel marine 3-D seismic capabilities, and extensive geological, geophysical and reservoir engineering projects all over the world.

Successful candidates will join a large, diverse and active geoscience department with superb research support and strong ties to allied organized research units at the University. They will be enthusiastic teachers of introductory courses and courses for undergraduate and graduate majors, direct the research of MS and PhD students, and conduct vigorous externally funded research programs. The anticipated starting date for all positions is August 2001; a Ph.D. is required at the time of appointment. Please see <http://www.geo.utexas.edu/facultysearches> for additional information.

To apply, please send a curriculum vitae, statements of research and teaching interests, and the names and contact information for five references to:

Faculty Searches, Department of Geological Sciences,
The University of Texas at Austin, Austin, Texas 78712.

Review of applications will begin December 1, 2000, and will continue until positions are filled. The University of Texas at Austin is an Equal Opportunity/Affirmative Action employer.

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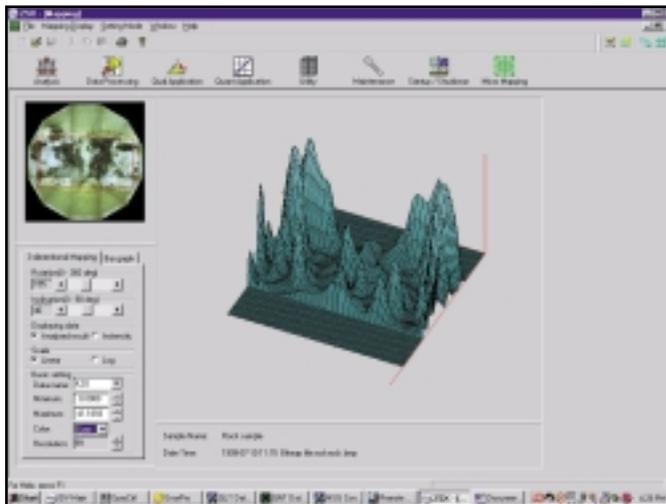
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