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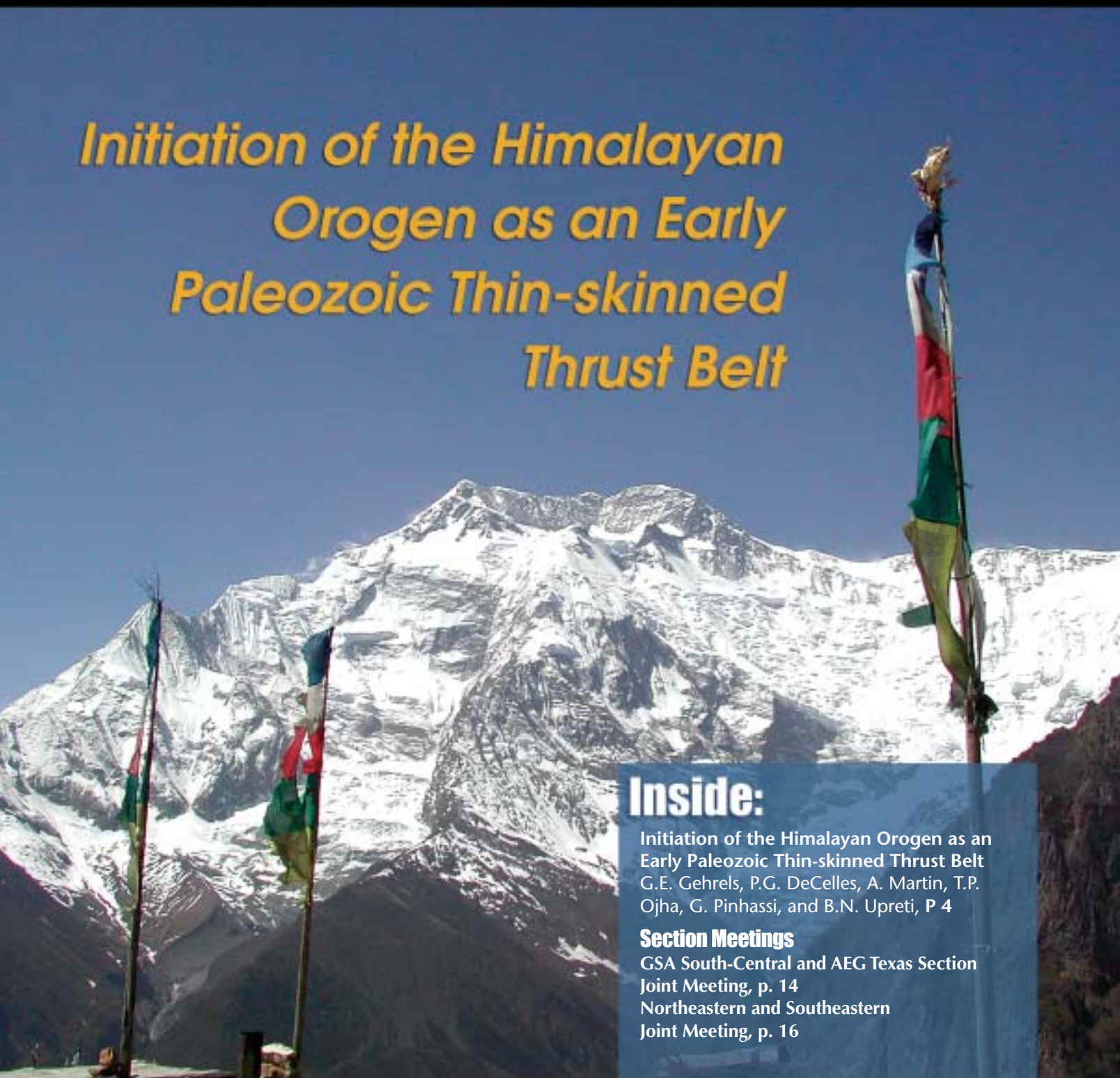
Initiation of the Himalayan Orogen as an Early Paleozoic Thin-skinned Thrust Belt



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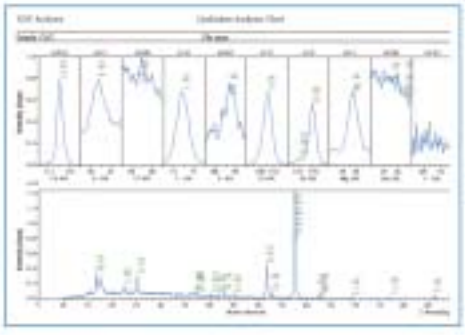

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Cover: View of the north face of Annapurna II (7939 m) and Annapurna IV (7525 m) in the Annapurna Range of central Nepal. All rocks visible are lower Paleozoic strata that belong to the Tethyan sequence, as mapped and described primarily by M. Colchen, P. LeFort, A. Pêcher, and G. Fuchs. In the foreground are prayer flags flying above the rooftops of Ghyaru. See "Initiation of the Himalayan orogen as an early Paleozoic thin-skinned thrust belt," by Gehrels et al., p. 4–9.

SCIENCE ARTICLE

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Initiation of the Himalayan Orogen as an Early Paleozoic Thin-skinned Thrust Belt

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ABSTRACT

Research by many workers in various regions of the Himalaya, combined with our recent geologic and geochronologic studies in Nepal, indicate that fundamental aspects of the Himalayan orogen originated in an early Paleozoic thrust belt and are unrelated to Tertiary India-Asia collision. Manifestations of early Paleozoic tectonism include ductile deformation, regional moderate- to high-grade metamorphism, large-scale south-vergent thrusting, crustal thickening and the generation of granitic crustal melts, uplift and erosion of garnet-grade rocks, and accumulation of thick sequences of synorogenic strata. Determining the relative contributions of early Paleozoic versus Tertiary tectonism constitutes a significant challenge in understanding the Himalayan orogen.

INTRODUCTION

The Himalayan orogen consists of five main tectonic assemblages that are juxtaposed along Tertiary faults of the Himalayan thrust belt (Fig. 1). To the south, and structurally lowest, are Tertiary foreland basin strata that record uplift and erosion of the Himalaya since India-Asia collision, approximately 55 million years ago (Hodges, 2000). These strata are overlain along the Main Boundary Thrust by strata of mainly Proterozoic age of the Lesser Himalaya, which accumulated along the northern margin of the Indian craton.

In lower elevation portions of the Himalaya, Lesser Himalayan rocks are overlain along the Mahabharat Thrust by crystalline thrust sheets. The thrust sheets consist mainly of Neoproterozoic to lower Paleozoic metamorphic rocks and Cambro-Ordovician granite bodies, which are depositionally overlain by Ordovician and younger strata.

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In higher portions of the Himalaya, Lesser Himalayan rocks are overlain along the Main Central Thrust by high-grade metamorphic rocks of the Greater Himalaya. In central Nepal this assemblage consists mainly of a lower unit of pelitic and psammitic schist (Formation I), a middle unit of calc-silicate gneiss and marble (Formation II), and an upper unit of Cambro-Ordovician augen gneiss (Formation III) (terminology from Colchen et al., 1986). Greater Himalayan assemblages are in turn overlain along the South Tibetan Detachment System by Tethyan strata of mainly Paleozoic and Mesozoic age. Tethyan units in central Nepal referred to here include Neoproterozoic-Cambrian(?) sandstone and shale of the Sanctuary Formation, Neoproterozoic, Cambrian, and perhaps Lower Ordovician carbonates of the Annapurna Yellow and Nilgiri formations, Ordovician sandstone of the North Face Quartzite, and Silurian-Devonian shale, limestone, and sandstone that belong to various units (Colchen et al., 1986).

Tertiary juxtaposition of these assemblages was accompanied by high-grade regional metamorphism, penetrative ductile deformation, crustal thickening that led to the generation of granitic crustal melts, and rapid uplift and erosion of the mountain belt (e.g., Gansser, 1964; LeFort, 1975, 1996; Harrison et al., 1997; Hodges, 2000; DeCelles et al., 2001). Although these aspects of India-Asia collision have been carefully documented by many different workers, field and geochronologic relations indicate that fundamental geological aspects of the Himalayan orogen formed initially during early Paleozoic time. The existence and significance of early Paleozoic tectonism in the Himalaya has been discussed previously by Gansser (1964), Stöcklin (1980), LeFort et al. (1983), Garzanti et al. (1986), Thakur (1992), Brookfield (1993), Valdiya (1995), and many others, and is recorded by three main lines of evidence.

EVIDENCE FOR EARLY PALEOZOIC TECTONISM

1. Within crystalline thrust sheets in the frontal part of the Himalayan thrust belt in Nepal (Fig. 1), metasedimentary rocks of Neoproterozoic and/or earliest Paleozoic age were foliated, deformed into regional ductile folds, and offset along faults prior to emplacement of Cambro-Ordovician granite bodies (Stöcklin and Bhattarai, 1977; Stöcklin, 1980). This relationship is spectacularly exposed along the eastern margin of the Palung granite in the Kathmandu thrust sheet, where non-deformed granite dikes intrude across the foliation in the adjacent schist (Fig. 2A). The minimum age of deformation at this locality is constrained by a preliminary U-Pb (zircon) age of 476.3 ± 3.4 Ma on one of the non-deformed dikes (Fig. 2B). The maximum age of at least some of the deformation is constrained by relations nearby, where a non-deformed dike with an age of 472.8 ± 6.1 Ma (Fig. 2C) intrudes across the foliation in a granite body with an age of 484.0 ± 4.9 Ma (Fig. 2D).

Our mapping in the southern part of the Kathmandu thrust sheet suggests

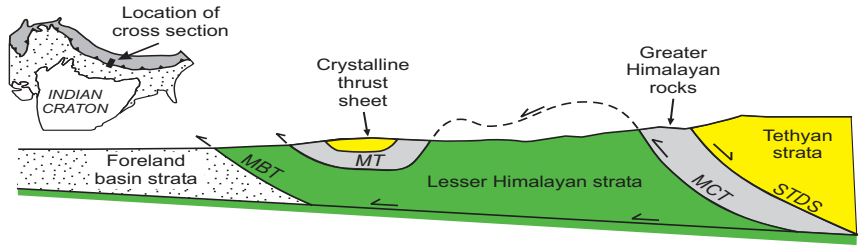

Figure 1. Schematic cross section through the Himalayan orogen at the longitude of central Nepal, showing the lithotectonic assemblages and faults referred to in the text (adapted from DeCelles et al., 2001). MBT—Main Boundary Thrust, MT—Mahabharat Thrust, MCT—Main Central Thrust, STDS—South Tibetan Detachment System. No vertical exaggeration.

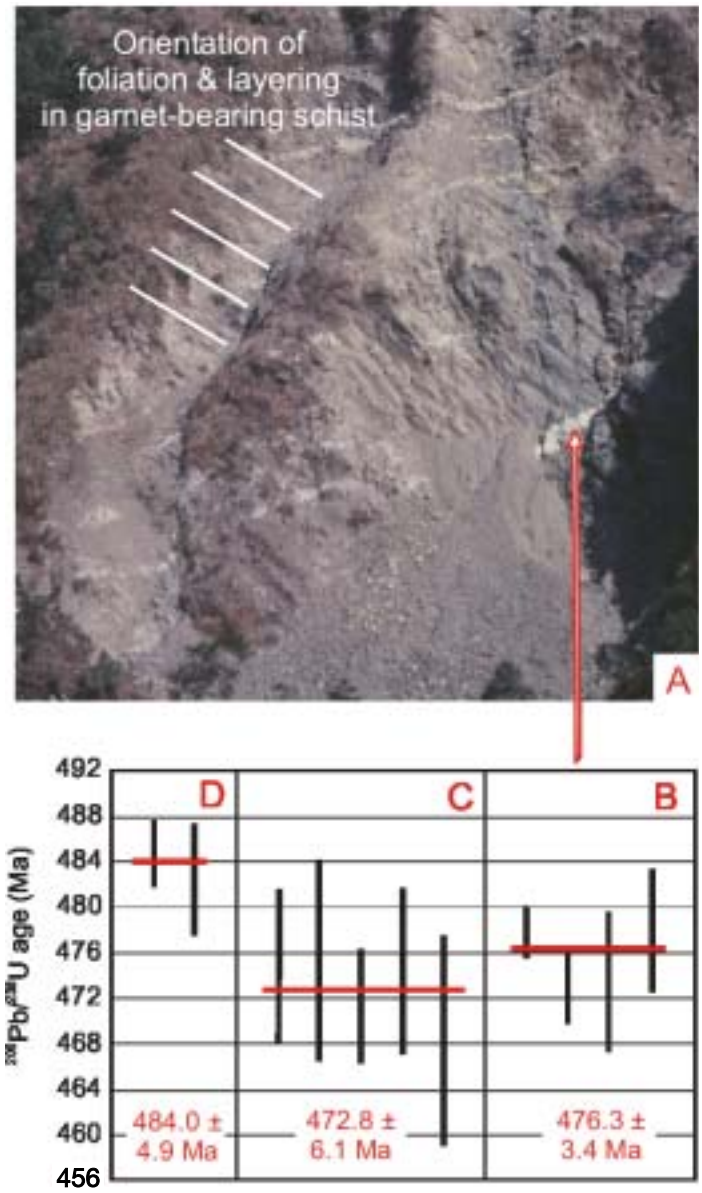

Figure 2. A: Exposure in the Kathmandu thrust sheet of non-deformed granitic dikes intruding across the foliation in garnet-bearing schist. **B:** $^{206}Pb/^{238}U$ ages of four zircon grains from a non-deformed dike shown in Figure 2A, which places a minimum constraint on the age of ductile deformation in the region. The weighted mean age is 476.3 ± 3.4 Ma. Location is near Bhimphedi (Lat 27°33.536' N, Long 85°07.766' E). **C:** $^{206}Pb/^{238}U$ ages of five zircon grains from a non-deformed dike near the locality shown in Figure 2A (Mandu Khola: Lat 27°33'14.8" N, Long 85°06'16.2" E). The weighted mean of the five analyses is 472.8 ± 6.1 Ma. **D:** $^{206}Pb/^{238}U$ ages of two zircon grains from foliated granite intruded by the non-foliated dike described in Figure 2C. The weighted mean age is 484.0 ± 4.9 Ma. The latter two samples place a maximum age on at least some of the regional metamorphism and deformation of the schist. All analyses were conducted by laser-ablation inductively coupled plasma–mass spectrometry using a 25 μm beam. Many additional analyses were conducted on zircon grains from each sample, but only the concordant analyses are shown. The error of each analysis is shown at 1σ, whereas the uncertainty of the weighted means is at 2σ. These errors include only uncertainties from the isotopic measurements; incorporation of systematic errors would add an additional 3% error (at 2σ level) to each age.

that these granite bodies occur as tabular plutons emplaced along a regionally continuous north-dipping thrust that imbricates panels of schist overlain by marble. The foliation shown in Figure 2A occurs in the footwall of this thrust and is interpreted to be related to motion along the fault. The cross-cutting relations described above accordingly indicate that at least some of the motion on this thrust fault occurred during Early Ordovician time.

2. Several lines of evidence indicate that rocks of the Greater Himalaya and the crystalline thrust sheets were regionally metamorphosed during early Paleozoic time. Stöcklin and Bhattarai (1977) and Stöcklin (1980) reported that the Palung and related Cambro-Ordovician granites in central Nepal were emplaced after regional garnet-grade metamorphism. Marquer et al. (2000) reported similar relations in the Greater Himalaya of northern India, where sillimanite- and kyanite-bearing schists were regionally folded prior to intrusion of the ca. 488 Ma Kinnaur Kailas granite. Early Paleozoic metamorphism in Greater Himalayan rocks has been dated directly in northern India at ca. 534 Ma (Sm-Nd on garnet; Argles et al., 1999), in the northwest Himalaya at ca. 467 Ma (Foster, 2000), in central Nepal at ca. 484 Ma (U-Pb on monazite and zircon; Godin et al., 2001), and in eastern Nepal at ca. 436–548 Ma (Th-Pb on monazite; Catlos et al., 2002).

We have determined $^{208}Pb/^{232}Th$ ages of monazite inclusions within garnet grains from 19 samples collected from the crystalline thrust sheets and the Greater Himalaya in Nepal. Figure 3 shows ages from a representative sample from the

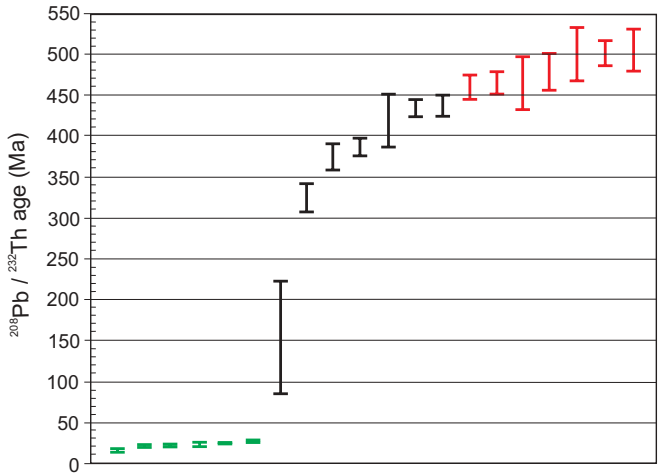

Figure 3. $^{208}Pb/^{232}Th$ ages of monazite inclusions in garnet grains from kyanite-garnet-biotite schist of the Greater Himalaya (sample location along Marsyandi River in central Nepal, Lat 28°26.470'N, Long 84°23.140' E). The garnet crystals were extracted from a 1 kg sample, mounted in epoxy and sanded down to expose the central portions of most grains, and examined by scanning electron microscope to locate the monazite inclusions. Isotopic analyses were performed by laser-ablation inductively coupled plasma–mass spectrometry using an 8 μm beam. The error bars for each analysis are at the 1σ level, and do not include an additional ~2% systematic error. Not shown is an additional age of 1283 ± 80 Ma. We interpret the cluster of ages at 450–500 Ma (red symbols) to record early Paleozoic metamorphism and the cluster of ca. 20 Ma ages (green symbols) to record Tertiary metamorphism. Analyses of intermediate age (black symbols) may be from intergrowths of early Paleozoic and Tertiary monazite, or may record Pb loss in older monazites.

Figure 4. Ordovician(?) conglomerate from the lower Damgad Formation in far west Nepal. This conglomerate occurs in a layer ~30 m in thickness along the base of the unit, and is best exposed in Korail Khola (Lat 29°17'59.8″ N, Long 80°44'14.7" E). Most clasts consist of quartzite, presumably derived from the underlying pre-Ordovician metamorphic rocks.

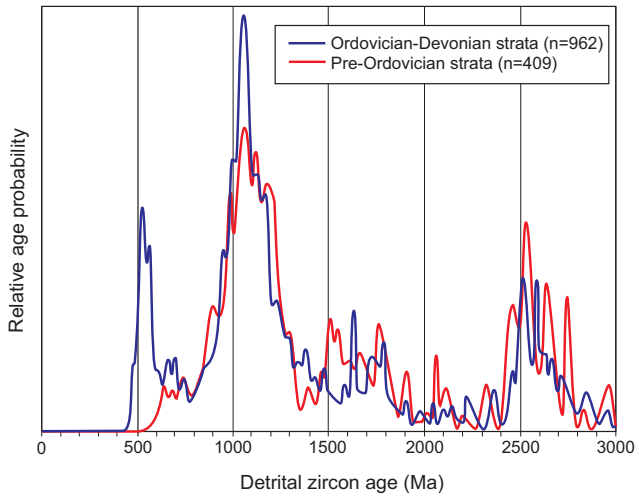

Figure 5. Pb/U ages of single detrital zircon grains extracted from metasedimentary rocks of the Greater Himalaya and the crystalline thrust sheets (red curve) and from overlying Ordovician-Devonian sandstones of the Tethyan sequence and crystalline thrust sheets (blue curve). The age patterns indicate that the Ordovician-Devonian sandstones were derived mainly from underlying metasedimentary assemblages as well as from Cambro-Ordovician granite bodies. Pre-Ordovician samples were collected from Greater Himalayan rocks in central Nepal and from the Kathmandu and Dadeldhura thrust sheets. Younger samples were collected from the Ordovician Tistung Formation and the apparently correlative Chisapani Quartzite in the Kathmandu thrust sheet, from the Ordovician(?) Damgad Formation in far west Nepal (Dadeldhura thrust sheet), and from the North Face Quartzite (Ordovician) and Tilicho Pass Formation (Devonian) in the Tethyan sequence. Age information from several of these samples was reported previously by DeCelles et al. (2000). Each curve represents the sum of the probability distributions of all grains analyzed from each set of units, with $^{206}Pb/^{238}U$ ages used for <800 Ma grains and $^{206}Pb/^{207}Pb$ ages used for >800 Ma grains. Analyses were performed by laser-ablation inductively coupled plasma–mass spectrometry, using a beam diameter ranging from 25 to 50 µm.

Greater Himalaya, with an additional age (not shown) of 1283 ± 80 Ma. The ages clearly document ca. 20 Ma metamorphism (green error bars), but also record earlier phases of garnet growth. Our preliminary interpretation is that the ca. 1283 Ma age records garnet growth in the source rock from which detritus in Greater Himalayan protoliths was shed, ages between 450 and 500 Ma (red error bars) record early Paleozoic metamorphism, and the scattered ages between 150 and 450 Ma (black error bars) are either intergrowths of Tertiary and early Paleozoic monazite in the same inclusion or a result of Pb loss in early Paleozoic monazites.

3. There is considerable stratigraphic evidence for early Paleozoic uplift and erosion in the Himalaya. In Tethyan strata of northern India (Zanskar area), a thick section of Middle Ordovician conglomerate rests on an angular unconformity and records erosion of a mountainous area dominated by sedimentary rocks (Garzanti et al., 1986). These strata are interpreted to have accumulated in the foreland basin of a thrust belt that was active during Late Cambrian(?) through Middle Ordovician time (Garzanti et al., 1986). The apparent cessation of early Paleozoic sedimentation on the northern Indian craton during Cambrian time may also record the onset of early Paleozoic tectonism (Brookfield, 1993; Valdiya, 1995).

Evidence for early Paleozoic uplift and erosion also exists in Nepal. In the crystalline thrust sheets, synorogenic sedimentation is recorded by the accumulation of conglomeratic and arkosic sandstone of Ordovician age (Stöcklin and Bhattarai, 1977; Kumar et al., 1978; Stöcklin, 1980). In the Kathmandu area, the basal conglomerate is a thin horizon that rests conformably on fine-grained marine strata in most areas (Stöcklin and Bhattarai, 1977; Stöcklin, 1980; Funakawa, 2001). In far west Nepal, however, the conglomeratic strata reach 30 m in thickness and contain clasts up to 40 cm in diameter (Fig. 4).

In the Tethyan sequence, a major change in sedimentation is recorded by a thick sequence of Neoproterozoic-Cambrian-Lower Ordovician(?) carbonates overlain by ~400 m to ~560 m of Ordovician arkosic sandstone and siltstone (North Face

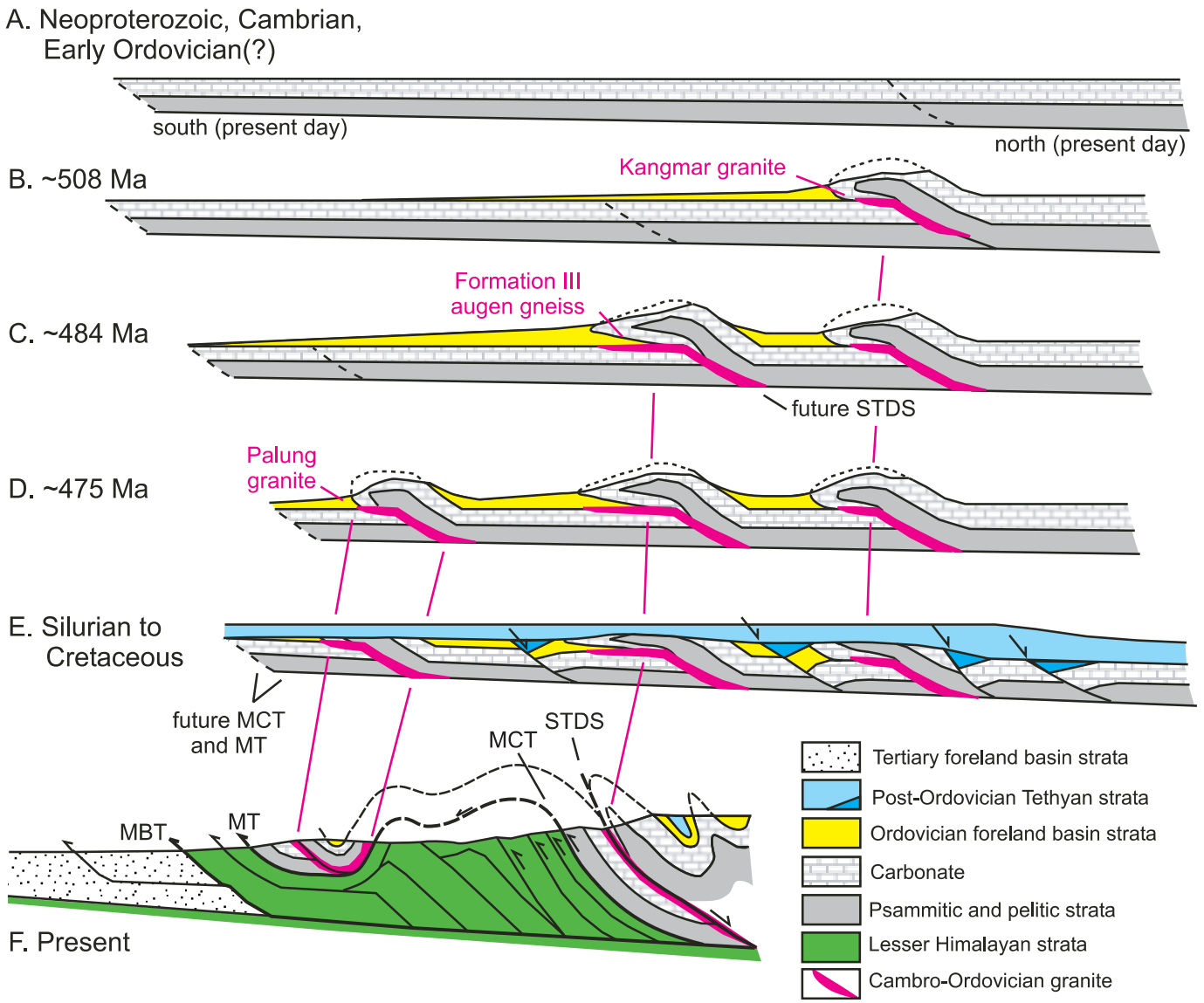

Figure 6. Proposed model for early Paleozoic tectonism in the Himalaya. Panel A shows the accumulation of Neoproterozoic, Cambrian, and possibly Lower Ordovician marine strata along or outboard of India's northern margin. Panels B–D show the interpreted progression of Late Cambrian(?) through Middle Ordovician thrusting, emplacement of granitic sills along the thrust faults, erosion of the orogen, and accumulation of synorogenic strata in a foreland basin setting. Panel E shows accumulation of Silurian to Cretaceous strata, and panel F shows the position of early Paleozoic rocks and structures in the present-day Himalaya. In F, the imbricated panels of psammitic and pelitic strata overlain by carbonate include the Raduwa Formation and Bhainsedobhan Marble overlain by the Kulikhani Formation and Markhu Marble in the Kathmandu thrust sheet, Formation I\Formation II in the Greater Himalaya, and the Sanctuary Formation\Annapurna Yellow and Nilgiri Formations in the Tethyan zone. MBT—Main Boundary Thrust, MT—Mahabharat Thrust, MCT—Main Central Thrust, STDS—South Tibetan Detachment System.

Quartzite) followed by ~1300 m of Silurian-Devonian shale, limestone, and micaceous and feldspathic sandstones (Bodenhausen et al., 1964; Bordet et al., 1971).

Detrital zircon ages indicate that the Ordovician-Devonian strata accumulated during uplift and erosion of the underlying metamorphic and plutonic rocks. Pre-Ordovician rocks in the crystalline thrust sheets and in the Greater Himalaya generally yield mainly ~1.0–1.3 Ga detrital zircons, with subordinate populations of older grains (Fig. 5). The overlying Ordovician through Devonian strata yield very similar ages but also contain a significant proportion of grains with ages of 480–530 Ma. These young grains, combined with the arkosic composition of the host sandstones, most likely record uplift and erosion of the underlying Cambro-Ordovician granite bodies soon after their emplacement.

PROPOSED MODEL

We propose a model in which the deformation, metamorphism, plutonism, uplift, and erosion described above developed within a south-vergent thrust belt that was active during Late Cambrian(?)–Middle Ordovician time (Fig. 6). The first stage (Fig. 6A), during Neoproterozoic, Cambrian, and perhaps into Early Ordovician time, involves accumulation of marine pelitic and psammitic sediments overlain by a thick succession of carbonate rocks. These units apparently thickened northward, reaching at least 15 km, and accumulated along or outboard of the northern margin of India.

Beginning during Late Cambrian(?)–Early Ordovician time, these strata were imbricated along north-dipping thrust faults, with displacements of >10 km on at least some thrusts (Fig. 6B–6D). The southernmost thrust system recognized is in the Kathmandu thrust sheet (shown in Fig. 6D), as described above. We suggest that a similar thrust system developed farther to the north (in present coordinates) and is now preserved in higher portions of the Himalaya (Fig. 6C). The footwall of this thrust system consists of psammitic and pelitic schist (Formation I) overlain by calc-silicate gneiss and marble (Formation II) of the Greater Himalaya. These rocks are interpreted to be high-grade equivalents of Tethyan strata in the hangingwall of the thrust, which include the Sanctuary Formation overlain by the Annapurna Yellow and Nilgiri formations (following from LeFort's [1975] correlation of Formation II with the Annapurna Yellow Formation). Based on analogy with the Palung and related granites in the Kathmandu thrust sheet, the sill-like Cambro-Ordovician augen gneisses of Formation III are interpreted to have been emplaced along this early Paleozoic thrust (Fig. 6C). In contrast to the crystalline thrust sheets, however, the early Paleozoic thrust in the high Himalaya is interpreted to have been reactivated by normal motion along the South Tibetan Detachment System (Burchfiel et al., 1992), thereby offsetting upper portions of the Cambro-Ordovician plutons and dropping lower grade Tethyan strata down against their higher grade Greater Himalayan equivalents. We postulate that a similar thrust system may have existed farther to the north (in present coordinates) in association with the Kangmar granite (Fig. 6B).

The interpretation that the thrust belt propagated southward (Fig. 6B–6D) is based largely on the ages of the Cambro-Ordovician granite bodies, which apparently young to the south. Available ages are ca. 508 Ma for the Kangmar Granite (Lee et al., 2000), ca. 484 Ma for Formation III in the Greater Himalaya (Godin et al., 2001), and ca. 470–485 Ma for the Palung and related granite bodies in the Kathmandu thrust sheet (Schärer and Allègre, 1983; Johnson et al., 2001; Fig. 2). These granitoids may have been generated by crustal thickening during thrusting, and their occurrence along early Paleozoic thrust faults suggests that they may have played an active role in development of the thrust belt (e.g., Hollister and Crawford, 1986).

Crustal thickening within the thrust belt was apparently sufficient to generate garnet-grade metamorphism in the crystalline thrust sheets (Stöcklin, 1980) and kyanite- and sillimanite-grade metamorphism at least locally in Greater Himalayan rocks (Marquer et al., 2000; Godin et al., 2001). This raises the possibility that some of the pressure-temperature information recovered from Himalayan metamorphic assemblages may have little to do with India-Asia collision and offers an alternative explanation for the inverted metamorphism that is one of the hallmarks of the Himalayan orogen (Gansser, 1964; LeFort, 1975, 1996; Harrison et al., 1997; Hodges, 2000). Based on existing constraints, it is plausible that Cambro-Ordovician granitoids served as a heat source for sillimanite-grade metamorphism common in higher portions of the Greater Himalaya (Godin et al., 2001), whereas burial during Tertiary tectonism would have driven the kyanite-grade metamorphism that characterizes lower portions of the Greater Himalaya.

Following Garzanti et al. (1986), the Ordovician clastic strata are interpreted to have accumulated in a foreland basin setting as the thrust belt propagated southward (Fig. 6B–6D). Erosion was apparently of sufficient depth that the Cambro-Ordovician plutons contributed a significant proportion of the detritus in synorogenic Ordovician-Devonian strata (Fig. 5).

Following this early Paleozoic orogeny, the region was blanketed by strata of Silurian through Cretaceous age, which formed in a passive margin setting along India's northern margin (Fig. 6E). This was followed during Tertiary time by the deformation, metamorphism, uplift, and erosion resulting from India-Asia collision (Fig. 6F) that has been described by many workers (e.g., Gansser, 1964; LeFort, 1975, 1996; Harrison et al., 1997; Hodges, 2000; DeCelles et al., 2001).

CONCLUSIONS

Our model for early Paleozoic tectonism in the Himalaya is built on several different lines of evidence that derive from our recent field and geochronologic studies and the research of many previous workers (e.g., Gansser, 1964; Stöcklin and Bhattarai, 1977; Kumar et al., 1978; Stöcklin, 1980; Garzanti et al., 1986; Valdiya, 1995; Argles et al., 1999; Marquer et al., 2000; Foster, 2000; Godin et al., 2001; Catlos et al., 2002). Although the model provides a coherent framework for these observations, it also raises several fundamental questions concerning the evolution of the Himalayan orogen.

1. What were the conditions and patterns of early Paleozoic versus Tertiary deformation and metamorphism in the Himalaya? At present, there is evidence for high-grade metamorphism and regional ductile deformation during both episodes, but there are few constraints on their relative proportions. Additional information is needed to constrain the nature and origin of metamorphism and deformation during each orogenic phase and to test alternative explanations for features such as the inverted metamorphism in Greater Himalayan rocks.

2. What is the fundamental nature of the Main Central Thrust and Mahabharat Thrust, which now serve as the base of rocks that clearly record early Paleozoic tectonism? If the early Paleozoic orogen was constructed along India's northern margin, then the Main Central Thrust and Mahabharat Thrust have only experienced offset related to shortening in the Himalayan thrust belt. In contrast, if the orogen formed within the paleo-Tethys, outboard of the Indian craton (DeCelles et al., 2000), then the Main Central and Mahabharat Thrusts represent an accretionary suture with potentially much greater amounts of early Paleozoic and/or Tertiary displacement.

3. What was the extent of early Paleozoic uplift and erosion? Are garnet-grade rocks present in frontal regions of the Himalayan thrust belt due to large-scale erosion during Tertiary motion on the Main Central Thrust and Mahabharat Thrust, or were these garnet-bearing schists originally brought to the surface during early Paleozoic time? Better constraints on the amounts of uplift and erosion during early Paleozoic and

Tertiary time may have an important impact on our understanding of the linkage between weathering and erosion in the Himalayan orogen, climate change, and seawater chemistry (e.g., Edmond, 1992; Ruddiman, 1997).

Because of these profound uncertainties, the recognition of early Paleozoic tectonism raises many new questions about the history of the Himalayan orogen and its relations to India-Asia collision. Our model is offered as a means of stimulating research that will address these questions.

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Dialogue

A Message to GSA Student Members

Anthony J. Naldrett, *GSA Past President*

It is no exaggeration to say that of all GSA's different types of members, you, our Student Members (graduate students) and Student Associates (undergraduates) are the most important to our Society because, above all, you are the lifeblood for our future. As of October 2002, we had 881 Student Associates and 3,010 Student Members, which accounted for over 24% of the total membership. We regard this as a healthy indicator for our future.

I came to Canada from Britain in 1957 with an undergraduate degree in geology. After a few years as a mine geologist, I entered graduate school at Queen's University in Kingston, Ontario, and joined GSA in 1962, despite the fact that my interests were primarily in Canada. I regarded GSA as a premier earth science society with a North America–wide (even worldwide) profile. My continuing involvement with the Society over the past 40 years—through its meetings, publications, and committees—gave me a breadth of outlook which membership in more focused societies has never done, a breadth which has enormously enriched both my personal and professional life.

Because of the impact GSA has had on my life, I'd like to remind you of what you are getting for your membership (and perhaps to point out to some of your friends what they are missing!).

- First, you receive the benefits of all GSA members: subscription to *GSA Today*, which keeps you abreast of what is going on and is about to occur in the earth sciences; a 20% discount on all GSA publications; member rates for certain other journals; and eligibility for our affinity programs.
- As students, you also receive free online access to *GSA Bulletin* and *Geology* and their archives (professional members must pay $130 for this), and you have the right to participate in the GSA graduate research grants competition, to compete for GeoCorps positions, to apply for travel grants and undergraduate research grants administered by the six GSA Sections, and to register for the GSA Annual meeting for $90 (which is $30 less than nonmember students must pay). In addition, if you wish to receive a print version of *GSA Bulletin* or *Geology*, you can do so for $40—half the price paid by professionals.
- You receive all of this for annual dues of $30 ($25 if you pay before January 1). And to help ease the transition to professional life, you can continue to pay the student dues rate for two years after graduation. In short, if GSA represents your field of interest, you can hardly afford not to belong!

Part of GSA's mission is to promote the geosciences in the service of humankind, and your participation is essential for achieving this. We hope that you will become involved in our Society and keep it focused and vital once you leave college and take up your professional careers.

I hope that many of you will see GSA in a way similar to how I see it, that you'll take advantage of the opportunities GSA creates that let you get to know and work with others who are specialists in areas different from your own, and that these opportunities help you in your development as a well-rounded earth scientist.

2003–2004 CONGRESSIONAL SCIENCE FELLOW APPOINTED

Michèle Koppes, a doctoral candidate at the University of Washington, has been appointed the GSA–U.S. Geological Survey Congressional Science Fellow for 2003–2004. Koppes' broad research interests are in the processes that shape our landscape and in the ways in which these processes reflect natural climate variability and anthropomorphic change. Focusing on the impact of glacial systems in landscape evolution and the glacial sedimentary record as an indicator of recent climate change, her research has taken her to the fjords of Alaska and Patagonia, the high mountain glaciers of Central Asia and the margins of the western Antarctica. She has also enjoyed sharing her research by developing and teaching courses on glaciers and geomorphology at both the high school and university level. Outside of her primary research interests, she has contributed to projects as varied as determining landslide and earthquake hazards in Puget Sound, developing environmental clean-up strategies at Hanford nuclear reservation and assessing the impact of managed forest practices on the health of New England forests. Koppes received her M.S. in geology and certificate in environmental management from the University of Washington. She received her B.A. in geology from Williams College in 1995, where she first became a member of GSA.

A Dutch citizen, Koppes has traveled to every continent and lived in countries as disparate as Switzerland and the Philippines. In so doing, she learned to appreciate the importance of communication between disciplines and cultures in the global management of climate, the ocean, the atmosphere, and natural resources. She is interested in how the findings of the geological community at large can be applied to political, societal, legal, and economic issues confronting this nation and the global public.

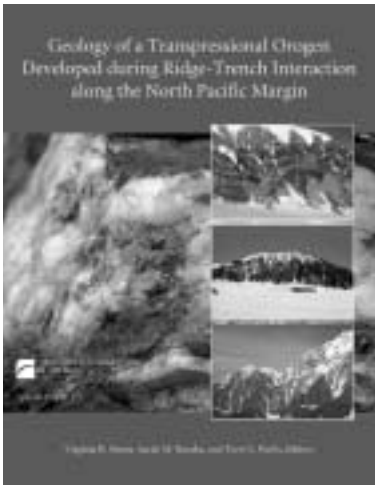
"I believe that we, as earth scientists, have a duty to lend our unique perspective on the relationships among society, the landscapes we inhabit, and the natural resources we rely on to the making of sound public policy," said Koppes. She is particularly concerned with the differences between the scientific and legislative views of risk and uncertainty in decision-making. An active advocate of using scientific literacy as a tool to bridging this communication gap, Koppes spends her summers teaching field glaciology and environmental conservation techniques to high school students in the national parks.

Koppes is honored to be the GSA–USGS Congressional Fellow and is excited to promote the role of the earth sciences to this nation's environmental and technological policy decisions. She is particularly interested in working on climate change issues, public lands management, sustainable resource use, and science education.

For Information on the 2004–2005 GSA-USGS Congressional Science Fellowship, see the Call for Applications on page 24.

THE GEOLOGICAL SOCIETY OF AMERICA

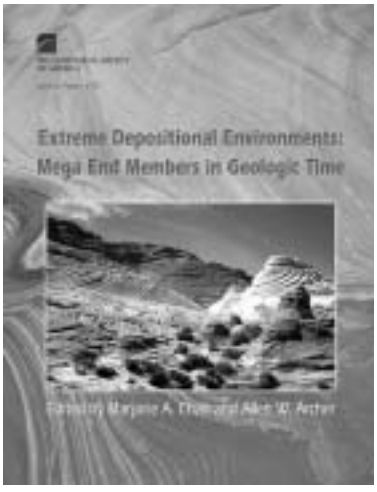
New at the GSA Bookstore



Geology of a transpressional orogen developed during ridge-trench interaction along the North Pacific margin, edited by Virginia B. Sisson, Sarah M. Roeske, and Terry L. Pavlis

SPE371, 353 p. plus index, CD-ROM,
ISBN 0-8137-2371-X
$90.00, **member price $72.00**

Many enigmatic features of convergent margins may be explained by a triple junction interaction involving subduction of a mid-ocean ridge, a common feature of plate tectonics, yet there are few documented case studies of the consequences of ridge-trench interaction. One of the best preserved ancient examples of ridge-trench interaction is exemplified by the Tertiary evolution of the northern North American Cordillera from Kodiak Island, Alaska, to Vancouver Island, British Columbia. This volume includes an overview of geologic expression of ridge subduction, and papers cover a wide range of themes: sedimentary basin evolution, structural effects, hydrothermal and metamorphic fluids, magmatic evolution of tonalite-trondhjemite suites, and time-transgressive effects, all relating to the tectonic evolution of the accretionary margin. Information in this volume will serve as an important template for future interpretations of other ancient convergent margins where this process may have occurred, but has not yet been recognized.



Extreme depositional environments: Mega end members in geologic time, edited by Marjorie A. Chan and Allen W. Archer

SPE370, 264 p. plus index,
ISBN 0-8137-2370-1
$80.00, **member price $60.00**

This compilation of papers is a synthesis of some of the largest depositional systems, designed to stretch our thinking beyond our sometimes limited uniformanitarianistic and actualistic views. The volume attempts to explore the hows and whys of sedimentary events that exceed the present norms by as much as orders of magnitude. The papers explore a range of sedimentary processes and deposits, from the present to the past, the normal to the unusual, and the rare to extreme. Recognition of extreme depositional systems allows us to better understand the range, scales, and variability of the geologic record and to better isolate what the most extreme conditions, role and magnitude of processes, or controls might be. The recognition of the extreme systems and understanding their controls provide insights that can be used to better model geologic systems whether for understanding geologic history, or for predictions and practical applications of resource exploration.

Recently Published Titles

Causes and consequences of globally warm climates in the Early Paleogene, edited by Scott L. Wing, Philip D. Gingerich, Birger Schmitz, and Ellen Thomas
SPE369, 588 p. plus index, ISBN 0-8137-2369-8
$95.00, **member price $76.00**

Arriving in October

The large-wavelength deformations of the lithosphere: Materials for a history of the evolution of thought from the earliest times to plate tectonics, by A.M.C. Şengör
MWR196, 333 p. plus index, ISBN 0-8137-1196-7, plates

Evolution and dynamics of the Australian Plate, edited by R.R. Hillis and R.D. Müller
SPE372, 430 p. plus index, ISBN 1-8137-2372-8
$90.00, **member price $72.00**

This volume is co-published simultaneously with the Geological Society of Australia as Special Publication No. 22, *Evolution and dynamics of the Australian Plate.*

Ophiolite concept and the evolution of geological thought, edited by Yildirim Dilek and Sally Newcomb
SPE373, ISBN 1-8137-2373-6

Correction: There was an error in the August ad. GSA Special Paper 370 does not include a CD-ROM.

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Visit the GSA Bookstore at the Annual Meeting in Seattle.

Integrated Solid Earth Sciences
ISES Forum I: CyberInfrastructure and Geochronology
Saturday, November 1, 2003

This year, on the day before the Annual Meeting of GSA in Seattle, the ISES Coordinating Group will hold the first Integrated Solid Earth Science Forum (ISES Forum I) with the support of the NSF. ISES is the outgrowth of the "Setting Priorities in Solid Earth Science Workshop" held last year in Denver. This forum is the next step in the change in the research and education culture of the Solid Earth Sciences (SES) through communication and integration. We invite participation in the forum from individuals in all sectors of the Solid Earth Science community. ISES Forum I will involve a series of updates and presentations, will serve as a platform for discussion of research facilities and equipment, and will identify emerging needs in cyberinfrastructure to support research and education in the SES. Community input through the Annual ISES Forums will be used to develop new ISES initiatives to better integrate and strengthen our science. Several of the NSF EAR and OCE Directorate will attend the Forum, and will contribute to the discussion of opportunities available to the ISES community.

To apply, send a single page two-paragraph application to Mike Brown at: mbrown@geol.umd.edu by Friday, September 26th, 2003. In the first paragraph, give your background, current interests and position, and summarize previous participation in recent workshops (e.g., "Setting Priorities in the Solid Earth Sciences", "New Departures in Structural Geology & Tectonics", "On the Cutting Edge", any "EarthScope" workshop), and in the second paragraph describe what you hope to contribute to ISES Forum I, including what you view as important priorities for the community and your ideas about the future direction of research and education in the Solid Earth Sciences. Please indicate the level of support you will need (generally as an add-on cost to your GSA attendance) to participate in the Forum (as a guide, we anticipated an average grant for up to 100 participants of $400 towards travel and/or hotel costs).

THE GEOLOGICAL SOCIETY OF AMERICA

JOINT MEETING

38th Annual Meeting of the South-Central Section, GSA, and Annual Spring Meeting of the Texas Section, AEG
College Station, Texas

March 15–16, 2004

HEADQUARTERS, TRAVEL, AND ACCOMMODATIONS

Preregistration deadline: February 9, 2004
Hotel Reservation deadline: February 15, 2004
Cancellation deadline: February 16, 2004
Register online at www.geosociety.org

Headquarters

Texas A&M University, the meeting host, is a land-grant, sea-grant, and space-grant institution located in College Station, Texas. It is the state's first public institution of higher education, opened October 4, 1876, as the Agricultural and Mechanical College of Texas. In 1963, the name was changed to Texas A&M University to more accurately reflect its expanding role. The initials "A&M" are a link to the university's past; they no longer represent any specific words. Today, the university's enrollment includes approximately 44,000 students studying for degrees in 10 academic colleges.

College Station is located in the Brazos River valley near the K-T boundary and along the climatic boundary between the positive and negative moisture zones of the United States. To the east, precipitation exceeds potential evaporation, and to the west, potential evapotranspiration exceeds precipitation. College Station is situated on the Eocene Yegua formation in the upper Gulf coastal plain. The major lignite deposits of the coastal plain are associated with these and related fluvial-deltaic flood plains. Preliminary plans for field trip destinations include a Gulf Coast lignite mine, power plant, aluminum smelter, and brick-manufacturing plant; the George Bush Presidential library; and the K-T boundary zone stratigraphy of the Gulf Coast.

Travel

The meeting will be held in the Rudder Tower on the campus of Texas A&M. The university is centrally located, approximately equidistant from Houston, Dallas, San Antonio, and Austin. Travel to College Station is via American Airlines (Eagle) through Dallas or Continental Airlines through Houston (Bush). Driving time from Houston (91 mi.) or Austin (98 mi.) is about 1 1/2 hours; from Dallas (170 mi.), it is about 3 hours. A free shuttle bus service will be provided to transport participants from area hotels to the Rudder Tower, thereby avoiding on-campus parking problems and costs.

Accommodations

A block of rooms has been reserved at a selection of local hotels for meeting attendees (see below); room options range from about $64 to $100 per room per night plus taxes. Meeting attendees are responsible for making their own housing arrangements. The hotel reservation deadline is February 15, 2004.

1. Best Western Inn at Cherry Hill, 901 University Drive, (979) 260-9150: from $69/night
2. Hampton Inn, 320 Texas Ave. S., (979) 846-0184: from $64/night
3. Holiday Inn Express, 1203 University Drive, (979) 846-8700: from $69/night
4. Quality Suites Hotel (14 & 15 March ONLY), 1010 University Drive, (979) 695-9500: from $76/night
5. TownePlace Suites by Marriott, 1300 University Drive, (979) 260-8500: from $89/night

The room block code is **Geological Meeting**. Each hotel provides free shuttle service to Easterwood Airport and complimentary continental breakfasts. For more information on registration, lodging, and schedules, please visit the meeting Web site, www.geosociety.org/sectdiv/southc/04mtg.htm.

ABSTRACTS

Abstract deadline: December 16, 2003

Papers are invited for symposia, theme sessions, and general sessions, in both oral and poster formats. Abstracts not included in symposia will be scheduled for theme or general sessions, as appropriate. All abstracts must be submitted online at www.geosociety.org. An abstract submission fee of $10 will be charged. Only one volunteered paper may be presented by an individual; however, a person may be a coauthor on other papers. Also, those invited for symposia may present an additional paper.

SYMPOSIA AND THEME SESSIONS

The proposed symposia and theme sessions follow. Additional symposia and theme session topics may still be accommodated. For more information, or to propose another symposium or theme session, contact the meeting chair, Chris Mathewson, (979) 845-2488, gsa.aeggeo.tamu.edu. For more details, consult www.geosociety.org/sectdiv/southc/04scmtg.htm.

Symposia

1. **Licensure of Geologists.** W. Kevin Coleman, wkc@swbglobal.net.
2. **Gulf Coast Growth Faults—New Discoveries.** Christopher J. Beal, bealc@campstanley.net.

Theme Sessions

1. **Geoscience in Human and Ecosystem Health.** Jennifer T. McGuire, mcguire@geo.tamu.edu.
2. **Global Change During the Carboniferous-Permian.** Tom Yancey, yancey@geo.tamu.edu; Anne Raymond.

3. **Near-Surface Geological Hazards.** Douglas Sassen, dsassen@geo.tamu.edu.
4. **Advances in Petroleum Geosciences.** Steve Dorobek, dorobek@geo.tamu.edu.
5. **Tertiary Climate Change.** Ethan Grossman, grossman@geo.tamu.edu.

WORKSHOPS

Workshops will be held before and after the meeting, March 14 or 17. Registration for some workshops is limited. For additional information, please check www.geosociety.org/sectdiv/southc/04scmtg.htm, or contact the workshop conveners.

1. **Ground Penetrating RADAR—New Techniques and Applications.** (Pre-meeting, 1–5 p.m.) Carl Pierce, cpierce@geo.tamu.edu.
2. **Immersive Visualization—New Tool in Geoscience Interpretation.** (TBA during the meeting.) Luc Ikelle, ikelle@geo.tamu.edu.

FIELD TRIPS

Both premeeting and postmeeting field trips are planned. Registration for some trips is limited. For more information, please visit www.geosociety.org/sectdiv/southc/04scmtg.htm.

Premeeting

1. **Paleogene of the Texas Gulf Coast.** Tom Yancey, yancey@geo.tamu.edu.

Postmeeting

2. **Lignite, Aluminum, and Bricks—Gulf Coast Mineral Resources.** Chris Mathewson, mathewson@geo.tamu.edu.

ROY J. SHLEMON MENTOR PROGRAM IN APPLIED GEOLOGY

Sponsored by GSA Foundation. Mon. and Tues., March 15–16, 11:30 a.m.–1 p.m. Karlon Blythe, kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues including professional opportunities and challenges that await students after graduation. Plan to attend both **FREE LUNCHEONS** to hear different presenters each day. Students will receive complimentary lunch tickets to attend both Shlemon Programs in their registration packet. However, **space is limited;** so first come, first served.

STUDENT TRAVEL GRANTS

Travel grants are available from the Southeastern Section, the GSA Foundation, and the Texas Section of AEG. Grants are available for GSA Student Associates or AEG Student Members who are presenting oral or poster papers. Students must be currently enrolled as GSA or AEG members to be eligible. Please visit the GSA Web site, www.geosociety.org, for details regarding application instructions for these grants. Applications must be received no later than February 15, 2004. For more information, please contact Elizabeth Y. Anthony, eanthony@geo.utep.edu.

EXHIBITS

Exhibit space will be available in an exhibit hall together with the poster sessions and all meeting coffee breaks. Exhibits will open at 8 a.m. on Mon., March 15, for morning coffee and close at 5 p.m. On Tues., March 16, the exhibit hall will open at 8 a.m. for morning coffee and close at 3:30 p.m. after afternoon coffee. For more information on exhibit space, please contact Chris Mathewson, (979) 845-2488, gsa.aeg@geo.tamu.edu.

DETAILED INFORMATION

For further details, please contact the meeting chair, Chris Mathewson, (979) 845-2488, gsa.aeg@geo.tamu.edu. Additional meeting information is also available at www.geosociety. org/sectdiv/southc/04scmtg.htm. GSA is committed to making all events at the 2004 meeting accessible to all people interested in attending. You can indicate special requirements (such as wheelchair accessibility and dietary concerns) when you register.

COLE AWARDS FOR POSTDOCTORAL RESEARCH

Gladys W. Cole and W. Storrs Cole Memorial Research Awards

GSA Foundation funded the 2003 Cole Awards at $9,500 from the Gladys W. Cole Fund for research in geomorphology of semiarid and arid terrains, and $8,700 from the W. Storrs Cole Fund for research in invertebrate micropaleontology.

The Gladys W. Cole Memorial Research Award recipient is David E. Wilkins, Boise State University, for his project "Dendrogeomorphic study of dune activity, Coral Pink Sand Dunes, Kane County, Utah."

The W. Storrs Cole Memorial Research Award recipient is Joan M. Bernhard, University of South Carolina, for her project "Benthic foraminifera of extreme deep-sea environments: Effects of oxygen depletion and sulfide enrichment with implications for the geologic record."

THE GEOLOGICAL SOCIETY OF AMERICA

JOINT MEETING

39th Annual Meeting of the Northeastern Section, GSA, and 53rd Annual Meeting of the Southeastern Section, GSA
Tysons Corner, Virginia

March 25–27, 2004

Located in suburban Washington, D.C., near the boundary between the Northeastern and Southeastern Sections, Tysons Corner, Virginia, offers a wealth of nearby historical and geological points of interest with easy access to the museums and government offices of downtown Washington. Field trip destinations include unique localities in the Coastal Plain, Piedmont, Blue Ridge, and Valley and Ridge Provinces, as well as in the Mesozoic basins of Virginia, Maryland, and Pennsylvania.

The meeting will be held at the Hilton McLean Tysons Corner, easily accessible by car, by shuttle service from Dulles Airport, and by taxi or shuttle service from the Washington, D.C., Metro. Free onsite parking is available. Meeting attendees are responsible for making their own room reservations; room options begin at $135/night. It is important that you identify yourself as a GSA attendee to receive the most favorable discounted room rate.

GSA Headquarters will handle preregistration. Registration details, as well as other details about the meeting, will be in the December 2003 issue of *GSA Today* and at www.geosociety.org. Preregister online beginning in the early part of December.

For more information on registration, scheduling, and lodging, please visit www.geosociety.org.

CALL FOR PAPERS

Abstract deadline: December 16, 2003

Papers are invited from students and professionals for oral and poster general sessions and for presentations that may fit into the symposia and theme sessions listed below. Additional general discipline sessions will be scheduled on the basis of submitted abstracts.

Abstracts must be submitted online at www.geosociety.org. An abstract submission fee of $10 will be charged. Only one volunteered paper may be presented by an individual; however, a person may be a co-author on other papers. Also, those invited for symposia may present an additional paper.

SYMPOSIA AND THEME SESSIONS

The proposed symposia and theme sessions follow. Additional symposia and theme session topics may still be accommodated. For more information, contact the technical program co-chairs: Brenda Pierce, bpierce@usgs.gov, or Leslie Ruppert, lruppert@usgs.gov.

Symposia

1. **Geology and the Civil War.** Bob Whisonant, Radford University, rwhisona@radford.edu; Drew Andrews, Kentucky Geological Survey, wandrews@kgs.mm.uky.edu; Judy Ehlen, U.S. Army Topographic Engineering Center, jehlen@tec.army.mil.
2. **Uniting Diverse Disciplines through Ecosystem Restoration: Examples from the Eastern United States.** Bill Orem, U.S. Geological Survey, borem@usgs.gov; Deb Willard, U.S. Geological Survey, dwillard@usgs.gov.
3. **Science and Public Policy.** Brenda Pierce, U.S. Geological Survey, bpierce@usgs.gov; Barbara Wainman, U.S. Geological Survey, bwainman@usgs.gov.
4. **GIS and IT Advancements in the Geosciences.** Marc Levine, U.S. Geological Survey, mlevine@usgs.gov; Jerry McFaul, U.S. Geological Survey, jmcfaul@usgs.gov.

Theme Sessions

1. **Fractured Rock Hydrology.** Bill Burton, U.S. Geological Survey, bburton@usgs.gov; Earl A. Greene, U.S. Geological Survey, eagreene@usgs.gov.
2. **New Directions in Appalachian Geomorphology.** Milan Pavich, U.S. Geological Survey, mpavich@usgs.gov; Paul Bierman, University of Vermont, Paul.Bierman@uvm.edu.
3. **Geomorphic Process Rates on the Passive Margin.** Milan Pavich, U.S. Geological Survey, mpavich@usgs.gov; Paul Bierman, University of Vermont, Paul.Bierman@uvm.edu.
4. **Nature and Timing of Grenvillian Orogenesis in Eastern North America (Pre-Cambrian).** Dick Tollo, George Washington University, rtollo@gwu.edu; Loise Corriveau, Canadian Geological Survey, lcorrive@nrcan.gc.ca
5. **Former Tidal Inlets and Breaches along Modern and Ancient Coasts: Formation, Evolution, and Geologic Record (ORAL AND POSTER).** *Sponsored by the Northern Section, SEPM (Society for Sedimentary Geology).* Randolph McBride, George Mason University, rmcbride@gmu.edu; Ilya Buynevich, U.S. Geological Survey, ibuynevich@usgs.gov.
6. **Utilization of Geologic Materials by Ancient Civilizations.** Michael Smith, University of North Carolina Wilmington, smithms@uncw.edu; E.W. Brooks, U.S. Geological Survey, ebrooks@usgs.gov.
7. **Architecture of Triassic Basins: Influence on Later Faulting and Hydrogeology.** Allen Dennis, University of South Carolina—Aiken, allend@aiken.sc.edu.
8. **Geological Carbon Sequestration: Analogs, Opportunities, and Risks.** Julio Friedmann, University of Maryland, juliof@geol.umd.edu; Bob Burruss, U.S. Geological Survey, burruss@usgs.gov.

9. **The Role of Geology in Contaminated Mine Drainage in the Eastern United States (ORAL AND POSTER).** Sue Tewalt, U.S. Geological Survey, stewalt@usgs.gov; Nora Foley, U.S. Geological Survey, nfoley@usgs.gov.
10. **Salvage Geology.** Cyril Galvin, galvincoastal@juno.com; Jim Dawson, SUNY—Plattsburgh, james.dawson@plattsburgh.edu.
11. **Geomorphology of Stream Restoration and Natural Stream Design.** Steve Kite, West Virginia University, jkite@wvu.edu; Peggy A. Johnson, Penn State University, paj6@psu.edu.
12. **Understanding the Spatial Variations in Tectonite Fabrics in Metamorphic Rocks—Grenville Tectonics.** Gary S. Solar, SUNY—Buffalo, SOLARGS@BuffaloState.edu; David Valentino, SUNY—Oswego, dvalenti@oswego.edu.
13. **Dinosaurs of Eastern North America.** Rob Weems, U.S. Geological Survey, rweems@usgs.gov; David Weishampel, John Hopkins University, dweisha1@jhem.jhmi.edu.
14. **Progress in Appalachian Basin Research: Implications for Energy and Mineral Resources.** Chris Swezey, U.S. Geological Survey, sswezey@usgs.gov; Liz Rowan, U.S. Geological Survey, erowan@usgs.gov; John Slack, U.S. Geological Survey, jslack@usgs.gov.
15. **Coalbed Gas Resources and Future Potential of Eastern North American Basins.** Peter Warwick, U.S. Geological Survey, pwarwick@usgs.gov; Robert Milici, U.S. Geological Survey, rmilici@usgs.gov.
16. **Energy Resources.** Jim Hower, Kentucky Center for Applied Energy Resources, hower@caer.uky.edu; Doug Patchen, West Virginia Economic and Geological Survey, dpatchen@wvu.edu.
17. **Recent Developments in Industrial Minerals Research: Issues and Processes.** Nora Foley, U.S. Geological Survey, nfoley@usgs.gov.
18. **Geologic Hazard Issues in the Eastern United States.** Paula Gori, U.S. Geological Survey, pgori@usgs.gov; Dawn Lavoie, U.S. Geological Survey, dlavoie@usgs.gov.
19. **Geoscience Education: Undergraduate (ORAL AND POSTER).** *Cosponsored by NAGT—Eastern Section, NAGT—Southeastern Section, and the GSA Education Committee.* P. Sethi, Radford University, psethi@radford.edu; D. Haywick, University of Southern Alabama, dhaywick@jaguar1.usouthal.edu; R. Gottfried, Frederick Community College, rgottfried@frederick.edu.
20. **Geoscience Education: K–12 (ORAL AND POSTER).** *Cosponsored by NAGT—Eastern section, NAGT—Southeastern Section, and the GSA Education Committee.* M. Passow, STANYS, mjpassow@earth2class.org; N. Huebner, Fernbank Science Center, huebnern@fc.dekalb.k12.ga.us; C. Bean, Fernbank Science Center, beanc@fc.dekalb.k12.ga.us.
21. **The Effects of Hydrology on Transport Processes in the Chesapeake Bay.** Nancy Simon, U.S. Geological Survey, nssimon@usgs.gov; Scott W. Phillips, U.S. Geological Survey, swphilli@usgs.gov.
22. **The Value of Geologic Maps for Land and Water Resource Management—Examples from National Cooperative Geologic Mapping Program (FEDMAP, STATEMAP, and EDMAP) (POSTERS).** Scott Southworth, U.S. Geological Survey, ssouthwo@usgs.gov; Randall Orndorff, U.S. Geological Survey, rorndorf@usgs.gov.
23. **Assessing Natural Climate Variability through Time.** Stacey Verardo, George Mason University, sverardo@usgs.gov.
24. **Undergraduate Research Poster Session.** *Sponsored by the Council of Undergraduate Research.* Brannon Andersen, Furman University, brannon.andersen@furman.edu.
25. **Peri-Gondwanan Terranes of the Appalachians.** Jim Hibbard, North Carolina State University, jim_hibbard@ncsu.edu; Sandra Barr, Acadia University, sandra.barr@acadiau.ca.
26. **The Paleontology of Marginal Marine Environments.** *Co-sponsored by the NE Section of SEPM (Society of Sedimentary Geology) and the Northeast Paleontological Society.* Neil Tibert, Mary Washington College, ntibert@mwc.edu, H. Allen Curran, Smith College, acurran@smith.edu.
27. **Process-based Modeling of Coastal Responses.** Michael Fenster, Randolph-Macon College, mfenster@rmc.edu, Maria Honeycutt, PBS&J.
28. **Techniques and Applications to Sea Floor Mapping.** William Schwab, U.S. Geological Survey, bschwab@usgs.gov, Page Valentine, U.S. Geological Survey, pvalentine@usgs.gov.
29. **Hydrogeologic Investigations in Carbonate Rock Aquifer/Landscape Systems.** Chris Groves, Western Kentucky University, chris.groves@wku.edu, and Art Palmer, State University College, NY, palmeran@oneonta.edu.
30. **Energy Mix for the Future.** Robert Milici, U.S. Geological Survey, rmilici@usgs.gov, and Scott Tinker, Texas Bureau of Economic Geology, scott.tinker@beg.utexas.edu.
31. **From the Mountains to the Sea: Fluvial Processes in the Eastern United States.** Brannon Andersen, Furman University, brannon.andersen@furman.edu, Gregory Hancock, College of William and Mary, gshanc@wm.edu, and Kirsten Menking, Vassar College, kimenking@vassar.edu.

FIELD TRIPS

Both premeeting and postmeeting field trips planned at this time are listed below. For more information, please contact Field Trip Committee Chair Scott Southworth, ssouthwo@usgs.gov, or the field trip leader.

Premeeting

1. **Mesoproterozoic Geology of the Blue Ridge Province in North-Central Virginia: Evidence for the Petrologic and Structural Evolution of Grenvillian Orogenesis.** Mon.–Wed., Mar. 22–24. Dick Tollo, George Washington University, rtollo@gwu.edu; Chuck Bailey, College of William and Mary.
2. **The Paleozoic Record of Changes in Global Climate and Sea Level: Central Appalachian Basin.**

Mon.–Wed., Mar. 22–24. Blaine Cecil, U.S. Geological Survey, bcecil@usgs.gov; Mitch Blake and Nick Fedorko, West Virginia Geological and Economic Survey; David Brezinski, Maryland Geological Survey; Vic Skema, Pennsylvania Geological Survey; Frank Dulong and Rob Stamm, U.S. Geological Survey.

3. **Geomorphology and Holocene Stratigraphy and Sedimentation in the Chesapeake Bay.** Wed., Mar. 24. Wayne Newell, U.S. Geological Survey, wnewell@usgs.gov.
4. **Alleghanian Strike-Slip Tectonic Assembly of the Mid-Atlantic Piedmont.** Wed., Mar. 24. Dave Valentino, State University of New York at Oswego, dvalenti@Oswego.edu; Alex Gates, Rutgers University—Newark; Gary Solar, Buffalo State College; Rick Valentino, Temple University; Jeff Chiarenzelli, State University of New York at Potsdam.
5. **Terrain and Military Geology of the Battle of Gettysburg, July 1–3, 1863.** Wed., Mar. 24. Jon Inners, Pennsylvania Geological Survey, jinners@state.pa.us; Helen Delano, Gary Fleeger, Richard Keen, John Neubaum, and Robert Smith III, Pennsylvania Geological Survey; Roger Cuffey, Pennsylvania State University; Noel Potter, Dickinson College.
6. **Geology, the Media, and Public Policy.** Wed., Mar. 24. Karen Wood, U.S. Geological Survey, kwood@usgs.gov (field trip for media personnel).

Postmeeting

7. **Middle Eocene Igneous Rocks in the Valley and Ridge of Virginia and West Virginia.** Sat.–Sun., Mar. 27–28. Lee Avary, West Virginia Geological and Economic Survey, avary@geosrv.wvnet.edu; Gerry Wilkes, Virginia Division of Mineral Resources; Jon Tso, Radford University; Ron McDowell and Dave Matchen, West Virginia Geological and Economic Survey.
8. **Fracture Flow and Compartmentalization of Crustal Fluids in Mesozoic Rift Zone Basins: The Culpeper and Barboursville Basins of Virginia and Maryland.** Sun., Mar. 28. Mike Ryan, U.S. Geological Survey, mryan@usgs.gov; Herb Pierce and Joe Smoot, U.S. Geological Survey.
9. **Transect of Fractured Rock and Hydrogeology, Northern Virginia.** Sun., Mar. 28. Bill Burton, U.S. Geological Survey, bburton@usgs.gov; Randy Orndorff, Dave Weary, George Harlow, Dave Nelms, Scott Southworth, Larry Drew, and Dave Sutphin, U.S. Geological Survey.
10. **The Incision History of a Passive Margin River, the Potomac near Great Falls.** Sun., Mar. 28. Paul Bierman, University of Vermont, paul.bierman@uvm.edu; Milan Pavich, U.S. Geological Survey; E-an Zen, University of Maryland; Luke Reusser, University of Vermont.
11. **The Goochland-Chopawamsic Terrane Boundary in the Central Virginia Piedmont.** Sun.–Mon., Mar. 28–29. David Spears, Virginia Division of Mineral Resources, dspears@geoogy.state.va.us; Brent Owens and Chuck Bailey, College of William and Mary.
12. **Effective Use of Terrain: The Battle of Fredericksburg, Virginia, December 1862.** Sun., Mar. 28. Judi Ehlen, U.S. Army Topographic Engineering Center, jehlen@tec.army.mil.
13. **Geology of Great Falls of the Potomac River.** *Cosponsored by NAGT.* Sat., Mar. 27.
14. **Geology and Paleontology of the Chesapeake Bay, Maryland.** Sat.–Sun., Mar. 27–28. Buck Ward, Virginia Museum of Natural History, lwward@vmnh.net.
15. **Geology of Calvert Cliffs, Maryland.** *Cosponsored by NAGT.* Sat., Mar. 27. Buck Ward, Virginia Museum of Natural History, lwward@vmnh.net.
16. **Geologic Evolution of Northern Virginia.** *Cosponsored by NAGT.* Sun., Mar. 28. Rich Gottfried, Frederick Community College, rgottfried@frederick.edu.

SHORT COURSES

Additional short courses may be added. For more information, contact Short Course Committee Chair Linda Gundersen, lgundersen@usgs.gov, or the leader of the short course.

Medical Geology. Joseph Bunnell, jbunnell@usgs.gov; Geoff Plumlee, U.S. Geological Survey.

Stability of Rock Slopes. Chester (Skip) Watts, Radford University, cwatts@radford.edu.

WORKSHOPS

Additional workshops may be added. For more information, contact Workshop Committee Chair Linda Gundersen, lgundersen@usgs.gov, or the workshop leader.

Girl Scout Badge Training. Terry Everett, Weinman Mineral Museum, terrye@weinmanmuseum.org.

AGI Workshop: EarthComm and CUES Curricula. *Cosponsored by NAGT—Eastern Section, NAGT—Southeastern Section, and the GSA Education Committee.* M. Smith, AGI, msmith@agiweb.org.

EXHIBITS

Exhibit space will be available in an exhibit hall adjacent to the meeting rooms. Exhibits will be open 6–8 p.m. Wed., Mar. 24, 9 a.m.–5 p.m. Thurs.–Fri., Mar. 25–26, and 9 a.m.–noon Sat., Mar. 27. For more information on exhibit space, please contact one of the meeting co-chairs. (See "Detailed Information.")

SPONSORSHIP

The local Program Committee is actively seeking sponsorship for this conference from industry and government agencies. If you are interested in sponsoring an event or coffee break or in donating to the general sponsorship of the conference, please contact one of the co-chairs.

STUDENT TRAVEL GRANTS

Travel grants are available from the Northeastern and Southeastern Sections and the GSA Foundation. Grants are available to both graduate and undergraduate students who are presenting oral or poster papers. Students must be currently enrolled as GSA members to be eligible.

Call for Geological Papers: 2004 GSA Section Meetings

South-Central Section

March 15–16, 2004

Texas A&M University, College Station, Texas

Abstract deadline: December 16, 2003

Information: Christopher Mathewson, Texas A&M University, Department of Geology & Geophysics, 3115 TAMU, College Station, TX 77843-3115, (979) 845-2488, mathewson@geo.tamu.edu

Northeastern–Southeastern Sections Joint Meeting

March 25–27, 2004

Hilton McLean Tyson's Corner, Washington, D.C.

Abstract deadline: December 16, 2003

Information: George Stephens, George Washington University, Department of Earth & Environmental Sciences, 2029 G St., NW, Washington, D.C. 20052-0001, (202) 994-6189, geoice@gwu.edu; Rick Diecchio, George Mason University, Department of Environmental Science & Policy, MS 572, 4400 University Dr., Fairfax, VA 22030-4444, (703) 993-1208, rdiecchi@gmu.edu

North-Central Section

April 1–2, 2004

Millennium Hotel, St. Louis, Missouri

Abstract deadline: January 6, 2004

Information: Joachim O. Dorsch, Saint Louis University, Department of Earth & Atmospheric Science, 3507 Laclede Ave., St. Louis, MO 63103-2010, (314) 977-3124, dorsch@eas.slu.edu

Rocky Mountain–Cordilleran Sections Joint Meeting

May 3–5, 2004

Center on the Grove, Boise, Idaho

Abstract deadline: January 27, 2004

Information: C.J. Northrup, Boise State University, Department of Geosciences, 1910 University Dr., Boise, ID 83725, (208) 426-1009, cjnorth@boisestate.edu

www.geosociety.org/sectdiv/sections.htm

Attention Students!

When you make plans to attend your Section's meeting, be sure to include the Shlemon Mentor Program in your schedule. If you have questions about your career, we have the answers. You will have opportunities to chat one-on-one with practicing geoscientists over a **FREE LUNCH.** All Sections will feature this mentor program in their proceedings. Watch this space for dates and times for the 2004 Shlemon Mentor Programs.

Student members of the Northeastern Section should contact Stephen Pollack, Secretary-Treasurer, GSA Northeastern Section, Pollack@usm.maine.edu. The application form for the Southeastern Section travel grants can be found at www.geology.ecu.edu/geology/segsa/travel.html, or through Donald Neal, Secretary-Treasurer, GSA Southeastern Section, neald@mail.ecu.edu. Deadline for travel grant applications is January 23, 2004.

ROY J. SHLEMON MENTOR PROGRAM IN APPLIED GEOSCIENCE

Sponsored by GSA Foundation. Thurs.–Fri., Mar. 25–26, 11:30 a.m.–1 p.m. Karlon Blythe, kblythe@geosociety.org. This interactive and informative program for undergraduate and graduate students, led by professional geoscientists, will cover real-life issues including professional opportunities and challenges that await students after graduation. Plan to attend both free luncheons to hear different presenters each day. Students will receive **FREE LUNCH** tickets to attend both Shlemon Programs in their registration packet. However, **space is limited;** first come, first served.

DETAILED INFORMATION

For further information, please contact the meeting co-chairs, George Stephens, geoice@gwu.edu, and Rick Diecchio, rdiecchi@gmu.edu. Additional meeting information is also available at www.geosociety.org/sectdiv/northe/04nesemtg.htm.

GSA is committed to making all events at this meeting accessible to all people interested in attending. You may indicate special requirements (such as wheelchair accessibility and dietary concerns) on the registration forms.

Congratulations!

2003 Geological Society of America
Student Research Grant Recipients

The GSA Committee on Research Grants met at GSA headquarters in Boulder, Colorado, Friday, April 4, 2003, and awarded $465,087 to 251 graduate students. As in previous years, the committee was pleased with the high quality of the research proposals submitted. The committee also selected 10 alternates in the event that any grantees return all or part of their funds due to a change in their research project or receipt of funds from another source. Congratulations and best wishes to all these young geoscientists!

Outstanding Mention

The committee has specially recognized the following 21 proposals as being of exceptionally high merit in conception and presentation.

Yarrow L. Axford, University of Colorado at Boulder
Toward Understanding Arctic Climate Change: Investigating a New Isotopic Method for Reconstructing Past Temperatures

Matthew E. Clapham, University of Southern California
The Ecological Role of the "Modern Fauna" in Late Paleozoic Communities

Nicole M. DeNovio, University of Colorado at Boulder
Colloid Mobilization and Composition in the Vadose Zone

Jennifer N. Flight, Montana State University
Sequence Stratigraphic Interpretation of the Hell Creek Formation, Northeastern Montana

Amy M. Gaffney, University of Washington
The Extent and Heterogeneity of Kimberlite Mantle Source Regions in West Greenland and the Implications for a Missing Mantle Reservoir

Allen M. Gontz, University of Maine
Organic Geochemical Tracing of Methane Sources in Maine Estuaries

Robert Scott Harris, University of Georgia
Regional Recognition and Correlation of an Upper Eocene Impact Horizon in the Southeastern United States

Austin J.W. Hendy, University of Cincinnati
The Neogene Evolutionary History of New Zealand Mollusca: Diversity Trends, Paleobiogeography, and Evolutionary Paleoecology

Gregory S. Herbert, University of California at Davis
Declining Ecosystem Health across an Extinction Boundary: New Evidence from Shifting Behavioral Strategies in Drilling Gastropod Predators

Brian Kendall, University of Alberta
Constraining the Absolute Ages of Neoproterozoic Glacial Deposits through Re-Os Dating of Associated Organic-Rich Mudrocks: Testing the Snowball Earth Theory

Johannes Koch, Simon Fraser University
Environmental Change during the Last Millennium at Snowcap Lakes, Southern Coast Mountains, British Columbia

Karen M. Layou, University of Georgia
Biotic Recovery from a Regional Extinction Event: An Example from the Late Ordovician of the Appalachian Basin of the Eastern United States

Andrew L. Leier, University of Arizona
Jurassic-Cretaceous Deposits of the Lhasa Terrane, Tibet: Implications for the Tectonic Evolution of Southern Asia Prior to the Indo-Asian Collision

Gaisheng Liu, University of Alabama at Tuscaloosa
Modeling and Experimental Study of Contaminant Transport in Aquifers Containing Connected High-Conductivity Networks

Dana L. Miller, University of Tennessee at Knoxville
Reconstructing Atlantic Tropical Cycline Activity Using $\delta^{18}O$ of a-cellulose from Slash Pine and Longleaf Pine in Southern Georgia

Carmen A. Nezat, University of Michigan at Ann Arbor
Quantification of Mineral Weathering by Ectomycorrhizal Fungi Using Scanning Electron Microscopy

Renée-Luce Simard, Dalhousie University
Geochemistry Volcanology and Tectonic Setting of Three Late Paleozoic Volcano-Sedimentary Formations in the Northern Canadian Cordillera: A Key to Understanding the Pre-Accretion Evolution of Ancient Pacific Margin of North America

Brian C. Titone, SUNY at Stony Brook
Trace Elements in Phosphatic Fossils as Indicators of Actinide and Lanthanide Mobility: A Study of Diagenesis in the Green River Formation

Alexandru M. Tomescu, Ohio University at Athens
Depositional Environments of the Earliest Megafossils in Continental Deposits—The Ashgillian (Late Ordovician) Oswego Sandstone of Pennsylvania

Claudia Velez, University of Delaware
Seismic Reflection Imaging of the Chesapeake Bay Impact Inner Crater Rim

Mindy Sue Vogel, Washington State University
Influence of Volcanogenic Sediment Delivered by the Kalama and Lewis Rivers to the Columbia River Following Holocene Eruptions of Mt. St. Helens

Recipients of Special Awards

The Gretchen Louise Blechschmidt Award Fund was established for women in the geological sciences who have an interest in achieving a Ph.D. in the fields of biostratigraphy and/or paleoceanography, sequence stratigraphy analysis, particularly in conjunction with research in deep-sea sedimentology, and a career in academic research.

Karen M. Layou, University of Georgia
Biotic Recovery from a Regional Extinction Event: An Example from the Late Ordovician of the Appalachian Basin of the Eastern United States

The John T. Dillon Alaska Research Award honors the memory of Dillon, who was particularly noted for his radiometric age-dating work in the Brooks Range, Alaska. Two areas that serve as guidelines for selection of the award are field-based studies dealing with the structural and tectonic development of Alaska, and studies which include some aspect of geochronology (either paleontologic or radiometric) to provide new age control for significant rock units in Alaska.

Brian A. Hampton, Purdue University
Stratigraphic History and Structural Evolution of the Alaska Range Suture Zone, South-Central Alaska

The Robert K. Fahnestock Award honors the memory of Fahnestock, a former member of the Research Grants Committee, who died indirectly as a result of service on the committee. The grant is awarded for the best proposal in sediment transport or related aspects of fluvial geomorphology, Fahnestock's field.

Sophie E. Baker, Dalhousie University
Plio-Quaternary Fluvial Incision and Rock Uplift along the Rio Diamante, Mendoza Province, Argentina

The Lipman Research Fund, established in 1993, is supported by gifts from the Howard and Jean Lipman Foundation. The purpose of the fund is to promote and support student research grants in volcanology and petrology. The president of the Lipman Foundation, Peter W. Lipman, was the recipient of a GSA research grant in 1965.

Renée-Luce Simard, Dalhousie University
Geochemistry Volcanology and Tectonic Setting of Three Late Paleozoic Volcano-Sedimentary Formations in the Northern Canadian Cordillera: A Key to Understanding the Pre-Accretion Evolution of Ancient Pacific Margin of North America.

The Bruce L. "Biff" Reed Scholarship Fund was established to provide research grants to graduate students pursuing studies in the tectonic and magmatic evolution of Alaska primarily, and it also can fund other geologic research.

Brian R. Jicha, University of Wisconsin at Madison
Time Scales of Crystallization and Physical Constraints on Magma Chamber Evolution beneath a Basalt-to-Rhyolite Island Arc Volcano.

The Alexander Sisson Research Award, funded in memory of Alexander Sisson by his family, promotes and supports research by students pursuing studies in Alaska and the Caribbean.

Roy Edward Price, University of South Florida
Geochemical Characterization of Shallow-Water Hydrothermal Springs in the Aleutian Archipelago

The Harold T. Stearns Fellowship Award was established by Harold T. Stearns in 1973 for student research on aspects of the geology of the Pacific Islands and the circum-pacific region.

Zachary D. Atlas, University of Miami
Comparison of Mafic and Silicic Volcanism at Masaya and Apoyo Craters, Nicaragua using Melt Inclusions: Insights into Pre-Eruptive Conditions

W. Brent Garry, University of Buffalo
Analysis of Levees on Mauna Ulu, Kilauea Volcano, Hawaii

The John Montagne Fund was established in 2000 to support one recipient's research in the field of Quaternary/geomorphology.

Yarrow L. Axford, University of Colorado at Boulder
Toward Understanding Arctic Climate Change: Investigating a New Isotopic Method for Reconstructing Past Temperatures

The Alexander and Geraldine Wanek Fund was established in 2002 to support research dealing with coal and petroleum resources, mapping and engineering geology, marine resources, petroleum economics, appraisal and evaluation, and the geology of phosphate resources.

Sam Hudson, University of Nevada at Las Vegas
Characterizing the Interaction between Migrating Hydrocarbons and Salt Weld Structures as seen in Surface Exposure of the La Popa Salt Weld, Northeastern Mexico

Jason L. Kneedy, Utah State University
The Effects of Fracture Properties on Coalbed Methane Recovery in Drunkards Wash, Utah

The Charles A. and June R.P. Ross Research Fund was established in 2002 to support research in the fields of biostratigraphy (including, but not limited to, fossil age dating and the study of evolutionary faunal successions), stratigraphy and stratigraphic correlation, paleogeography and paleobiogeography, interpreting past environments of deposition and their biological significance, and the integration of these research areas into better global understanding of (1) past plate motions (plate tectonics and sea-floor spreading), (2) past sea-level events, including their identification and ages, and/or (3) climate changes and effects of those climate changes on Earth's inhabitants through geologic time. There should be, over time, a balance of money among the awards across these various subject sub-field categories depending on the merit of the annual project proposals.

Alexandru M. Tomescu, Ohio University at Athens
Depositional Environments of the Earliest Megafossils in Continental Deposits—The Ashgillian (Late Ordovician) Oswego Sandstone of Pennsylvania

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Additional Grant Recipients

David Alexander * Brittina Argow * Tracy Arsenault * Todd Aseltyne * Muhammad Asim * Mustafa Aycenk * Matthew Badiali * Graham Baird * Miriam Barquero-Molina * Wendy Barrow * Alexander Bartholomew * Tiffany Baxter * Tiffany Becker * David Beilman * Christopher Berg * Scott Bick * Tandis Bidgoli * Sara Bier * Marron Bingle * Jessica Black * Nathan Blythe * Ninad Bondre * Nicole Bonuso * Matthew Bourke * Ronna Bowers * Brittany Brand * Carsten Braun * John Breier * Stephanie Brightwell * Justin Brooks * Katherine Bulinski * Benjamin Burke * Kurtis Burmeister * Amanda Bustin * Benjamin Bymers * Charles Carrigan * Andrew Castor * Robinson Cecil * Ramananda Chakrabarti * Cory Clechenko * Brian Cook * Alan Coulson * Samuel Coyner * Brent Dalzell * Nicole Davis * Fionnuala Devine * Mimi Diaz * Dalphania Dickerson * Pamela Dickinson * Aaron Diefendorf * Mirela Dumitrescu * Matt Dupee * Sedelia Durand * Mason Dykstra * Kristin Ebert * Joseph English * Juraj Farkas * Noah Fay * Seth Finnegan * Kayse Fisher * Stephen Flora * Eric Fossett * Kurt Frankel * Stephanie Furgal * Terence Garner * Christopher Gerbi * John Gillaspy * Alison Gillespie * Robert Gillis * Heather Gingerich * Scott Giorgis * Katherine Glover * Leonel Gomez * Beverly Goodman * Rashmi Grace * Gerald Grellet-Tinner * Guilherme Gualda * Adel Haj * Lisa Harrell * Caroline Harris * Michael Hayes * Jeremy Haynes * Chad Heinzel * Jonathan Hendricks * Kristin Hepper * Melissa Hicks * Joann Hochstein * Erik Hoffmann * Michael Hofmann * John Hora * Jacob Horner * Michael Hsieh * Steve Israel * Margarete Jadamec * Scott Johnston * Walter Joyce * James Kalbas * George Kamenov * Gabe Kassos * Katy Keller * Eric Kelly * Landon Kelly * Melissa Klinger * Jeremiah Kobor * Fawna Korhonen * Patrick Kormos * Jesse Korus * Greta Kristjansdottir * Pranav Kumar * Vesna Kundic * Benjamin Laabs * Kira Lawrence * Stephen Lehner * Lucinda Leonard * Jerome-Etienne Lesemann * Janna Levin * Jamie Levine * Jih-Pai Lin * Mark List * Robert Locklair * Michael Loso * Nancy Mahlen * Michelle Malone * Russell Mapes * Nicholas Mariita * Kevin Martin * James Mataragio * Chris Mattinson * David Mauel * James Mayer * Kevin McCarthy * Siobhan McConnell * Olivia McCormick * Jeremy McHugh * James Metcalf * Xiaodong Miao * Joseph Michalski * Heather Michaud * Matthew Mihlbachler * Ian Miller * Shahnewaz Mohammad * Briana Mordick * Naila

Where Are They Now? *Past Recipients of …*

Naomi Oreskes

Associate Professor, History, and Director, Graduate Program in Science Studies, University of California at San Diego Affiliate, Scripps Institution of Oceanography

While earning a Ph.D. in geological research and history of science at Stanford University, Naomi received a grant in 1986 for "An Investigation into the Origin of Rare Earth Element Enriched Iron-Oxide Rocks at Olympic Dam, South Australia, and Related Deposits."

Today, Naomi's work focuses on the processes of scientific inquiry and breakthroughs. In 1999, she published *The Rejection of Continental Drift: Theory and Method in American Earth Science* (Oxford University Press). In 2001, she edited *Plate Tectonics: An Insider's History of the Modern Theory of the Earth* (Westview Press), and her current book in progress is *Science on a Mission: American Oceanography 1939–1989.*

Douglas H. Erwin

Curator of Paleobiology, National Museum of Natural History, Smithsonian Institution

Doug received a grant in 1983 for work on Permian and Triassic gastropods at the Smithsonian's National Museum of Natural History. He's now curator of these collections, "to the occasional horror of those who remember me as a graduate student," he said.

According to Doug, "The Penrose grant from GSA—the first grant I ever received—opened a host of new opportunities for me in ways I never could have imagined."

Doug's dissertation work introduced him to the end-Permian mass extinction. As a research paleobiologist, his work now focuses on the causes and consequences of that extinction and on developmental and ecological aspects of the Cambrian Metazoan radiation. As Curator, Doug has developed a traveling exhibit on the Burgess Shale (one of the Smithsonian's premier collections) and is now helping plan a new oceans hall. Doug also recently completed 10 months service as the interim director of the museum.

Moreira * Christopher Moy * Sean Mulcahy * Nicole Nastanski * Whitney Nelson * Philip Novack-Gottshall * Krishna Pallavi * Petra Pancoskova * Stephanie Park * Frederick Partey * Kim Pearce * Michael Petronis * Erik Pollock * Sara Pruss * Michele Punke * Kendra Pyke * Rhonda Quinn * Robyn Raftis * Dustin Rainey * Doug Raszewski * Timothy Raub * Alberto Reyes * Dave Risk * Julie Roberge * Amanda Rowe * Michael Rowe * Hernando Rueda * Tyler Ruks * Brian Ruskin * Andrew Schroth * Lea Anne Scott * Jennifer Seabaugh * Patrick Shamberger * Timothy Shanahan * Essam Sharaf * Timothy Sheehan * Kyle Shipley * Heather Short * Timothy Sickbert * Janelle Sikorski * Benjamin Siwiec * Philip Skemer * Stephen Slaughter * Shane Smith * Cameron Snow * Erin Sommers * Scott Soricelli * Nathan Stansell * Akinori Takeuchi * Benjamin Tanner * Evgueni Tcherepanov * Jennifer Teerlink * Joya Tetreault * Kathryn Thomas * Lisa Thompson * Ekaterina Tumakova * Elizabeth Valaas * John Vanden Brooks * Jennifer Wagner * Yiming Wang * Dylan Ward * Elizabeth Watson * Andrew Webb * Ralf Weger * Lars Weiershaeuser * Stephen Welch * Tristin Wellman * Scott Werts * Jeffrey Wilcox * Christine Witkowski * Ewan Wolff * Kristina Yelinek * Seth Young * Grant Zazula * Cathleen Zeleski * Gengxin Zhang * Ruixuan Zhao * Yong Zhou * Francesca Zucco *

2003 GSA Committee on Research Grants

. . . GSA Student Research Grants Advance the Geosciences

Peter Vrojlik

Senior Research Specialist, ExxonMobil Upstream Research Company, Houston, Texas

Peter received a GSA grant in 1983 while working on a Ph.D. at the University of California at Santa Cruz. His subsequent dissertation was titled "Vein Systematics: Paleohydrology of the Kodiak Accretionary Complex." Today, Peter leads and conducts fundamental and applied research projects related to problems of oil and gas development and production. More specifically, he works on how the geometric and gouge components of faults affect subsurface fluid flow.

"The value of a GSA research grant far outweighs its size," says Peter. "I used the money to conduct field work that helped form and focus the ideas for my dissertation research. I learned that there is support to take intellectual risks, to stumble forward with only a vague notion of where I was going. Such risk taking is a critical part of the intellectual process, and GSA research grants are an important source of funds for such efforts."

2003 Student Research Grant Statistics

Total proposals received	571
Total proposals funded	251
Total dollars awarded	$465,087
Average request	$2,438
Average award	$1,853

2003 Partial List of Funding Sources

Penrose Endowment and Pardee Memorial	$221,050
National Science Foundation	$154,500
GSA Foundation (GSAF)	$73,450
GSAF-GEOSTAR and Unrestricted Funds	$38,800
GSAF-Research Fund	$8,000
GSAF-Lipman Research Fund	$3,500
GSAF-Hydrogeology Division	$2,400
Harold T. Stearns Award Fund	$3,000
Geophysics Division	$1,300
Sedimentary Geology Division	$1,000
Structural Geology & Tectonics Division	$2,000

Students: LOOK Here!

Offset your meeting costs by becoming a Student Volunteer.

- ☞ No up-front meeting registration fee required!
- ☞ **FREE** registration if you volunteer just 12 hours.
- ☞ **FREE** *Abstracts with Programs* volume in addition to the FREE registration if you volunteer for 15 or more hours.
- ☞ **PLUS,** GSA will pay volunteers a stipend of $20 per each half-day (4 hours) volunteered at the meeting. (Stipends can only be issued to students who have a U.S. government–issued Social Security Number, Green Card, or Student Work Visa.)

For more information, contact Kevin Ricker, kricker@geosociety.org, or visit www.geosociety.org/meetings/2003/students.htm.

Call for Applications:

Apply for the GSA–USGS Congressional Science Fellowship for 2004–2005

Opportunities to serve as a Congressional Science Fellow are rare, unique experiences. This position may be a good fit for you. It will enable you to work directly with national leaders and put your expertise and experience to work helping shape science and technology policy on Capitol Hill.

The Congressional Science Fellow will be selected from top competitors early in 2004. Successful candidates are GSA members who possess either a:

- Ph.D. in the earth sciences (or a related field); or a
- Master's degree and at least five years of professional experience in the earth sciences or related field.

If you possess this professional background, have experience in applying scientific knowledge to societal challenges, and share a passion for helping shape the future of the geoscience profession, GSA invites your application. The fellowship is open to U.S. citizens or permanent residents of the U.S.

Deadline to apply: January 23, 2004.

For application information, visit www.geosociety.org/science/csf/, or contact Ginger Williams, GSA Headquarters, (303) 357-1040, gwilliams@geosociety.org.

Halbouty Distinguished Lectureship to be Presented during the GSA Annual Meeting in Seattle

Tuesday, November 4
1:30–2:30 p.m.
Rm. 607, Washington State Convention and Trade Center

The Michel T. Halbouty Distinguished Lecturer will be selected from abstracts submitted in the Engineering Geology discipline for the 2003 GSA Annual Meeting in Seattle. The lecturer will be announced on the GSA Web site in September and in the official Annual Meeting Program on-site.

Come support the winner of this lectureship by adding this special presentation to your personal schedule.

You won't want to miss it!

GSA Foundation Update

Donna L. Russell, *Director of Operations*

Education & Outreach Reaches Out

GSA Education & Outreach programs are going from strength to strength through the generous support of donors over the past few months. While significant progress is being made, we hope that through continued support, these programs will grow to have a major impact on our school teachers, faculty, students, and the wider geoscience community.

GSA Faculty Resources Program (GeoInq)

One major program Education & Outreach staff members are working on is the development of new introductory geoscience course modules to assist college faculty, especially those new to the teaching profession. The GeoInq modules will use inquiry-based learning and will be made available for all faculty members to use to enhance their teaching. Members who have been identified as the very best geoscience teachers will develop the modules that will cover all the major introductory topics.

GeoInq is a three-year program, and we are seeking funding to secure the development of the first six modules that will be completed during 2004. We very much need and would appreciate your support and donations for this effort.

GSA Teacher Advocate Program

Through the generous support of the donors listed below, five teacher resources on CD-ROM have been developed. The "Explore Geoscience" series covers the topics of plate tectonics, volcanoes, geologic time, silicate minerals, and cross sections. Under development are resources on climate change and earthquakes. These resources will be advertised to every high school in the nation in September this year—that's around 30,000 schools.

Also, teacher experience trips have been planned for summer 2004. Teachers will be able to visit volcanoes in Hawaii, volcanoes and glaciers in Iceland, coral reefs in Australia, and a number of fascinating sites within continental America.

Shlemon Mentor Program

This year was the program's most successful year to date, with 57 mentors talking to more than 300 students during the 2003 GSA Section meetings. This valuable program only exists because of the generous donations of Roy Shlemon and John F. Mann funds.

GeoCorps America Program

This summer, 39 participants have been or are currently involved in projects in which they are providing geoscience knowledge and skills. Many of these participants are involved in further outreach tasks to the general public, making the impact of this program dramatic. Many thanks need to go to those donors who have helped to make another successful summer, and to those Foundation Trustees who are helping us to secure funding for well into the future.

Got an Item for Our Auction?

The Foundation is looking for items for the Silent Auction that will be held during GSA's Seattle meeting in November. Our past three auctions have been successful and fun, and if you have something you would like to donate to this exciting event, it will directly help a number of GSA programs.

Here's how it works:

You can donate items for the auction such as rare books, pictures, fossils, mineral samples, gift certificates from bookstores or restaurants, wine, field supplies, and antiques, just to name a few. Your donation is tax deductible based on the retail value of the donated item. If you don't have an item, we'd be happy to accept a cash contribution. Your name will be listed as the donor on the auction item displayed in the Foundation's booth. Proceeds from the auction will be designated for GSA's Greatest Needs.

For further information, please contact George Sharp, geosharp@comcast.net, (253) 581-2603.

Teacher Advocate Program Donors

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ANNOUNCEMENTS

MEETINGS CALENDAR

2003

October 29–30	Getting It Done: The Role of TMDL Implementation in Watershed Restoration, Stevenson, Washington. Information: www.swwrc.wsu.edu/conference2003.

2004

January 5–8	Conference on Sustainable Range Management, New Orleans, Louisiana. Information: The Conference Group, 1580 Fishinger Road, Columbus, OH 43221, USA, 1-800-783-6338 (USA and Canada), (614) 488-2030, fax 614-488-5747, info@confgroupinc.com, www.battelle.org/rangecon.
January 11–15	84th Annual Meeting of the American Meteorological Society, Seattle, Washington. Information: AMS Meetings, (617) 227-2426, www.ametsoc.org. *(Cosponsored by GSA.)*
April 11–17	Fifth International Conference on Case Histories in Geotechnical Engineering, New York, New York. Information: Shamsher Prakash, (573) 341-4489, fax 573-341-4729, prakash@umr.edu, www.umr.edu/~eqconf/5thCHConf.
August 21–28	Global and Continental-Scale Mineral Resource Assessments, at the 32nd International Geological Congress, Florence, Italy. Information: www.32igc.org. *(Abstract deadline: January 10, 2004.)*
September 8–10	International Symposium of Earth System Science Istanbul, Turkey. Information: www.earthsystem2004.org. *(Abstract deadline: October 15, 2003.)*
November 22–24	XII Latin American Geological Congress, Quito, Ecuador. Information: Guillermo Rosero, Juan León Mera y Orellana, Ed. MOP 3er Piso, (593-2) 2550041/550018 Fax (593-2) 2550041, ext. 3313, dinage@menergia.gov.ec, www.xiicongresolatinoamericanodegeologia.edu.ec.

Visit www.geosociety.org/calendar/ for a complete list of upcoming geoscience meetings.

About People

GSA member **Paul G. Marinos** delivered the 2002 Glossop Lecture ("Ongoing challenges in engineering geology for tunneling in difficult ground"), the sixth in the prestigious series of the Geological Society of London. More than 350 people attended the lecture, considered a flagship event for engineering geology in the UK.

AGC Call for Papers Deadline is September 26, 2003

GSA is a cosponsor of the 17th Australian Geological Convention in Hobart, Tasmania, February 8–13, 2004. The convention theme is "Dynamic Earth: Past, Present, and Future." GSA and the Geological Society of Australia encourage you to submit abstracts and attend the meeting in support of enhanced scientific dialog and collaboration between scientists in Australia and North America. **Information: www.17thagc.gsa.org.au.**

ICDD Scholarship Announced

To encourage promising graduate students to pursue crystallography-oriented research, the International Centre for Diffraction Data (ICDD) has established the Ludo Frevel Crystallography Scholarship Fund. Multiple recipients are selected on a competitive basis, each receiving an award of $2,250. Applications must be received by the ICDD by 31 October 2003. Complete details are posted at **www.icdd.com.**

State Geologists Announce New Leadership

At its annual meeting in Lincoln, Nebraska, the Association of American State Geologists (AASG) elected new leaders, who will serve through June 2004. John Steinmetz, state geologist and director of the Indiana Geologic Survey, will serve as president. President-elect is Robert Marvinney, state geologist and director of the Maine Geological Survey, and vice president is S. Cragin Knox, state geologist and director of the Mississippi Office of Geology. Peter Scholle, state geologist and director of the New Mexico Bureau of Geology and Mineral Resources will serve as treasurer, and Edmond Deal, state geologist and director of the Montana Bureau of Mines and Geology is the new secretary. Completing his years of service on the AASG Executive Committee as past president is Emery Cleaves, state geologist and director of the Maryland Geological Survey.

Information about the AASG is posted at www.stategeologists.org.

Ads (or cancellations) must reach the GSA Advertising office one month prior. Contact Advertising Department, (303) 357-1053, 1-800-472-1988, ext. 1053, fax 303-357-1073, acrawford@geosociety.org. Please include address, phone number, and e-mail address with all correspondence.

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

Situations Wanted

My Yankee wife wants to go home! British PhD hydrogeologist seeks interesting employment in USA or Canada. Details on www.propubs.com/resume.

Positions Open

FACULTY POSITION: SEDIMENTOLOGY/ STRATIGRAPHY

San Diego State University invites applications for a tenure-track faculty position in Sedimentology/ Stratigraphy in the Department of Geological Sciences. We anticipate an appointment, starting fall 2004, at the Assistant Professor level. A Ph.D. is required at the time of appointment.

We seek applicants who will establish a vigorous, externally funded research program involving BS and MS students within the realm of terrestrial and/or marine environments using carbonate and/or siliciclastic materials. Research areas of special interest include, but are not limited to, field-oriented sequence stratigraphy and genetic stratigraphy. The successful candidate may have more than one opportunity to join the faculty of a Ph.D.-offering program at SDSU depending on their specialization. Teaching responsibilities will include both undergraduate and graduate courses in the individual's field of expertise. Starting salary range will depend upon experience. Additional information about analytical equipment and other aspects of the Department is available at http://www.geology.sdsu.edu.

Please send a letter of application describing teaching and research interests, curriculum vitae, and the names, addresses, and telephone numbers of three references to Patrick L. Abbott, Search Committee Chair, Department of Geological Sciences, San Diego State University, San Diego, CA 92182-1020. Closing date for applications is 12 November 2003. Applicants should also request that their references send letters of recommendation directly to the search committee chair at the above address. Inquiries may be e-mailed to pabbott@geology.sdsu.edu. SDSU is a Title IX, equal opportunity employer and does not discriminate against individuals on the basis of race, religion, national origin, sexual orientation, gender, marital status, age, disability or veteran status, including veterans of the Vietnam era. Learn more about the University at http://www.sdsu.edu.

UNIVERSITY OF WESTERN ONTARIO
DEPARTMENT OF EARTH SCIENCES
TWO FACULTY POSITIONS IN EARTH SCIENCES

The Department of Earth Sciences, The University of Western Ontario, invites applications for two tenure-track appointments at the rank of Assistant or Associate Professor (effective July 1, 2004); one in Structures, Tectonics and Deformation of Earth Materials, and a second in Physics of Earth and Planetary Interiors. Rank and salary will be commensurate with qualifications and experience. Applicants must hold a PhD degree or equivalent from a recognized university. It is anticipated that the two appointees will develop vigorous, cooperative research programs, with one focused primarily on the crust and the other on the mantle and core. The research programs are expected to complement Departmental strengths in petrology, planetary science, physics and chemistry of materials, basin analysis, seismology and geodesy. Successful candidates are expected to teach courses at the undergraduate and graduate level within our broadly based academic programs. Information about the Department and its programs can be found at **http://www.uwo.ca/earth.**

Applicants for the position in Structures, Tectonics and Deformation of Earth Materials should have a strong research background in one or more of the following areas: macro-scale tectonic processes and their relationship to metamorphism; meso-scale structural analysis in field studies; or micro-scale fabric analysis in Earth materials science. Teaching responsibilities may include undergraduate courses in Structural Geology and Metamorphic Petrology.

Applicants for the position in Physics of Earth and Planetary Interiors should have a strong experimental and/or theoretical background in research focused on one or more of the following areas of investigation: physics of Earth materials, dynamics of planetary interiors, and the physical properties of minerals, rocks and melts under mantle or core conditions.

The successful candidates will have access to a wide variety of analytical, imaging and computational and specialized research facilities. These include electron microprobe and stable isotope analysis, several large-volume high-pressure/temperature devices, micro-XRD, micro-FTIR, XRF, ICP-OES, XPS, SIMS and STM/AFM equipment. There is ready access to a high-performance parallel computer cluster (refer to **http://www.sharcnet.ca/**) and several large volume high pressure-temperature devices.

A complete application should include a covering letter, a full curriculum vitae, the names, phone/fax numbers, mail and email addresses of at least three referees. A statement (not to exceed 500 words) of background, experience and research accomplishments should be included with the covering letter. Submit applications to **Professor H.W. Nesbitt,** Chair, Department of Earth Sciences, The University of Western Ontario, London, Ontario, CANADA, N6A 5B7. Deadline for receipt of applications is **October 31, 2003.**

The position is subject to budgetary approval. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. The University of Western Ontario is committed to employment equity and welcomes applications from all qualified women and men, including visible minorities, aboriginal people, and persons with disabilities.

EDUCATION
COASTAL SEDIMENTARY PROCESSES OPEN RANK
UNIVERSITY OF DELAWARE

The Department of Geology at the University of Delaware seeks applicants for a tenure track position in coastal and near-shore marine sedimentary processes. Appointment may be at any rank commensurate with the applicant¹s qualifications and experience. Essential qualifications include a Ph.D. in a relevant scientific discipline (Geology, Engineering, Oceanography, Geography, etc.), significant publications, demonstrated ability to secure external funding, and significant teaching experience at the expertise in field studies, numerical and physical modeling, GIS and remote sensing, and other areas. The successful applicant will be expected to develop a vigorous externally funded program resulting in significant scholarly research and publication, and to teach graduate and undergraduate courses. The successful applicant will interact with faculty in and outside of the Geology Department and will have research expertise that complements available expertise at the University of Delaware. Current departmental research programs (described at www.geology.udel.edu) are focused on near surface processes of coastal and marine geoscience, including shallow geophysics, micropaleontology of marginal-marine environments, fluvial geomorphology, and Quaternary Atlantic Coastal Plain stratigraphy. In addition to members of the Geology Department, scientists in the College of Marine Studies (www.ocean.udel.edu), the Delaware Geological Survey (www.udel.edu/dgs/), and the Center of Applied Coastal Research (housed in the Department of Civil and Environmental Engineering, www.coastal.udel.edu) offer important opportunities for collaboration. Furthermore, the successful applicant can anticipate helping to reshape the Department as a significant number of current faculty members retire in the next several years. Applicants should send a curriculum vitae, statement of research and teaching interest, and names of three references by January 5, 2004 to Coastal Geology Search Committee, Department of Geology, University of Delaware, Newark, DE 19716. The curriculum vitae and letters of reference shall be shared with departmental faculty. The University of Delaware is an Equal Opportunity Employer which encourages applications from Minority Group Members and Women.

CARBONATE SEDIMENTOLOGY/STRATIGRAPHY
FACULTY POSITION
UNIVERSITY OF TEXAS AT AUSTIN

The Department of Geological Sciences, Jackson School of Geosciences, at The University of Texas at Austin seeks a carbonate geologist who uses field relationships and petrology as primary research methods. Fundamental is the ability to establish a vigorous research program and teach at both the undergraduate and graduate levels, and the desire and ability to interact with the already strong carbonate program as well as other programs in sedimentary geology, petroleum and mineral resources geology, paleontology, geochemistry, hydrogeology, exploration geophysics and tectonics within the Jackson School of Geosciences. A Ph.D. is required. Preference will be given to Assistant Professor level applicants but outstanding individuals at all levels will be considered. Please visit our web site at www.geo.utexas.edu. Please send statement of research and teaching interests, resume, reprints, names and addresses of at least four references, plus any supplemental information to: Chair, Carbonate Search Committee, Department of Geological Sciences, Jackson School of Geosciences, 1 University Station C1100, The University of Texas at Austin, Austin, TX 78712-0254. The Search Committee will begin reviewing applications on November 1, 2003 and continue until the position is filled. The University of Texas at Austin is an equal opportunity/affirmative action employer.

VISITING FELLOWS AND STUDENTS
INSTITUTE FOR ROCK MAGNETISM

Applications are invited for visiting fellowships (regular and student) lasting for up to 10 days during the period from January 1, 2004, through June 30, 2004. Topics for research are open to any field of study involving fine particle magnetism, but preference will be given to projects relating magnetism to geological or environmental studies, or to fundamental physical studies relevant to the magnetism of Earth materials.

A limited number of travel grants of up to $750 are available to cover actual travel costs. No funds are available for per diem expenses. Application forms and information necessary for proposal preparation may be obtained from IRM manager Mike Jackson at the address below, or online at http://www.geo.umn.edu/orgs/irm/irm.html.

Short proposals (two pages, single-spaced text plus two forms and necessary figures and tables) are due by October 30, 2003 for consideration by the IRMs Review and Advisory Committee. Successful applicants will be notified in early December, 2003. Proposals should be sent by e-mail to irm@umn.edu, or by post to: Facilities Manager, Institute for Rock Magnetism, University of Minnesota, 291 Shepherd Laboratories, 100 Union St. SE, Minneapolis, MN 55455-0128.

QUATERNARY PROCESSES POSITION
AT THE UNIVERSITY OF CINCINNATI

The Department of Geology at the University of Cincinnati invites applications for a tenure-track faculty position at the assistant professor level in the area of Quaternary Processes with an emphasis on glacial processes beginning in spring 2003. This hire is intended especially to enhance research and graduate student training in the surface process group, which currently has strengths in Quaternary stratigraphy, slope processes, earth surface and geochemical processes. The Department of Geology seeks to maintain and strengthen its traditional research approach to problems of global interest from field-based observation and laboratory analysis.

Areas of expertise for this position might include: geochronology, fluvial and lacustrine sedimentation in the glacial environment, entrainment, transport, or deposition of glacial debris, glacial erosion, glaciology and global climate change.

The successful applicant will be expected to supervise graduate research, participate in graduate and undergraduate teaching, and establish an externally funded research program. Candidates must demonstrate active research activity as exemplified by peer-reviewed publication and grants and show potential for interacting with existing programs in the Department (e.g. sedimentology, ground water hydrology) and in related disciplines (e.g. Geography, Biology, Engineering, Environmental Studies).

Interested candidates should send current vita, statement of research and teaching interests and three letters of recommendation to address below. Review of applications will begin on 10 October 2003. The successful candidate must have a Ph.D. degree at the time of appointment. The Department of Geology especially encourages the application of qualified women and

minorities. The University of Cincinnati is an affirmative action/equal opportunity institution.

For more information please contact: Chair, Quaternary Processes Search, Committee, Department of Geology, 500 Geology/ Physics Building, University of Cincinnati, Cincinnati, OH 45221, 513-556-3732.

RESEARCH FACULTY POSITIONS
EARTH AND SPACE SCIENCES
UNIVERSITY OF WASHINGTON

The Department of Earth & Space Sciences, University of Washington, Seattle, seeks to fill two non-tenure track full-time research faculty positions in terrestrial/planetary remote sensing. Both positions will be located in the W.M. Keck Remote Sensing Laboratory. Although some initial support is available, the successful candidates will be expected to successfully compete for external research funding. Participation in the teaching program will be primarily through seminars, occasional classroom lectures, and supervision of undergraduate and graduate students. Applicants must hold a Ph.D. in Geology or closely related field at the time of appointment. The first position is for a **terrestrial/planetary geologist** with a background in spectral and radiative transfer theory and experimental spectroscopy. The applicant should have experience in the acquisition, calibration, and analysis of laboratory and field thermal infrared emission and reflection spectra and an interest in applied remote sensing. This appointment is expected to be filled at the Research Assistant Professor level. However, candidates with exceptional qualifications and an established research program may be considered for appointment at the Research Associate Professor or Research Professor level.

The second position is for a **remote-sensing specialist** with expertise in spatial and time-series analysis, and a demonstrated interest in applications of remote sensing to land and water environments. A theoretical background in both spectral techniques and geographical information science is beneficial, with an emphasis on issues of scale. This position addresses the increasing need to integrate spectral analysis from remote sensing with spatial and temporal analysis techniques and large GIS databases. This appointment is expected to be filled at the Research Assistant Professor level.

Applicants should send a curriculum vita, bibliography, description of research interests, and include the names of four references. All materials should be sent to: Keck Search Committee, c/o D. Ellen McDannald, Department of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310. Preference will be given to applications received prior to October 1, 2003.

The University of Washington is an affirmative action, equal opportunity employer. The University is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities and covered veterans.

POMONA COLLEGE FACULTY POSITION
PALEO/SEDIMENTOLOGY

The Geology Department at Pomona College, the founding member of the Claremont Colleges, invites applications for a tenure-track position at the level of Assistant Professor beginning July 1, 2004. Candidates with significant teaching experience are encouraged to apply. The candidate must have a strong commitment to quality undergraduate teaching in a liberal arts environment and to establishing an active research program involving undergraduates in field and laboratory components. Teaching responsibilities will include historical geology, sedimentology, introductory and specialty courses. The ideal candidate will have a research direction which complements those already in the department - such research areas might include paleoclimatology, paleobiology, paleoecology, sedimentology, or coastal studies. Applicants should send a letter of interest, curriculum vitae, undergraduate and graduate transcripts, a statement of teaching philosophy, a summary of research plans and three letters of reference to **Professor Linda Reinen, Geology Department, Pomona College, Claremont, CA 91711.** Web address: http://www.geology.pomona.edu; email: lreinen@pomona.edu. Review of completed applications will begin November 21, 2003. Pomona College is an equal opportunity employer, and it especially invites applications from women and members of under-represented groups.

STATE GEOLOGIST
STATE OF IOWA

The Iowa Department of Natural Resources is seeking a State Geologist for the Iowa Geological Survey (IGS) in Iowa City, Iowa. The State Geologist will serve as the State's lead geological scientist, and will manage the IGS worksite. Applications must be submitted by September 30, 2003. For more information, including duties, salary range, and instructions for applying, go to: www.igsb.uiowa.edu.

FACULTY POSITION IN GEOMICROBIOLOGY
UNIVERSITY OF WISCONSIN—MADISON

The Department of Geology and Geophysics solicits applications for a faculty position in Geomicrobiology. We seek applications from scientists across a broad range of disciplines who are interested in microbial interactions with fluids and minerals in modern and/or ancient environments. The position will include major new facilities dedicated to geomicrobiological research. Opportunities exist for collaborative research with members in the Department who are interested in paleobiology, low-temperature geochemistry (including mineral-fluid interface chemistry), hydrogeology, and isotope geochemistry. An additional new position in mineralogy, as well as a new ion microprobe facility, provide further opportunities for collaborative research. Beyond the Department, outstanding resources in microbiology, genomics, molecular biology, materials science, soil science, environmental engineering, and chemistry are available on the Madison campus.

Appointment level will be contingent upon qualifications. Screening of applicants will begin November 1, 2003, and the position will remain open until filled. Interested applicants should send a full vitae, including a statement of research and teaching interests, several reprints/preprints, and contact information for 3–5 letters of reference to Prof. Clark M. Johnson, Geomicrobiology Search Committee Chair, Department of Geology and Geophysics, 1215 W. Dayton Street, University of Wisconsin, Madison, WI 53706, U.S.A.

Further information about the search and the department may be found at www.geology.wisc.edu or by contacting Prof. Johnson at clarkj@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.

FACULTY POSITION IN MINERALOGY
UNIVERSITY OF WISCONSIN—MADISON

The Department of Geology and Geophysics solicits applications for a faculty position in Mineralogy at the Assistant Professor level. Applicants should have demonstrated research interests in any broadly defined area of Mineral Physics, Mineral Chemistry, or Biomineralization. Opportunities exist for collaborative research with a wide variety of areas in the department, including geochemistry, petrology, geophysics, sedimentary geology, and hydrogeology. An additional new position in geomicrobiology, as well as a new ion microprobe facility, provide further opportunities for collaborative research.

Screening of applicants will begin November 1, 2003, and the position will remain open until filled. Interested applicants should send a full vitae, including a statement of research and teaching interests, several reprints/preprints, and contact information for 3–5 letters of reference to Prof. John W. Valley, Mineralogy Search Committee Chair, Department of Geology and Geophysics, 1215 W. Dayton Street, University of Wisconsin, Madison, WI 53706, U.S.A.

Further information about the search and the department may be found at www.geology.wisc.edu or by contacting Prof. Valley at valley@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.

SEISMOLOGY/GEOPHYSICS
UNIVERSITY OF ARIZONA

The Department of Geosciences at the University of Arizona invites applicants for a tenure-track Assistant Professor position in the field of Solid Earth Geophysics. We seek outstanding applicants interested in carrying out innovative teaching and research on the processes and structures of the solid Earth utilizing geophysical techniques such as seismology and satellite-based geodesy. We are especially interested in individuals who employ multidisciplinary approaches to tackle significant problems. A Ph.D. or equivalent degree in Geosciences is required. The Department of Geosciences is committed to sustained excellence in geophysics/tectonics research, to innovation in the geosciences curriculum both at the undergraduate and graduate levels, and to leadership in graduate student training. The selection process will begin October 1, 2003, and will continue until the position is filled. Information about the Department of Geosciences is available at http://www.geo.arizona.edu. Interested applicants should submit a curriculum vitae, a statement of research and teaching interests, and a list of at least three references (with addresses, e-mail, phone, and fax num-

bers) to: Susan Beck, Head, Department of Geosciences, The University of Arizona, Tucson, AZ 85721 (520-621-6024, 520-621-2672 (fax), chair@geo.arizona.edu). Please reference job number 26669. The University of Arizona is an EEO/AA Employer - M/W/D/V.

CALIFORNIA STATE UNIVERSITY, SACRAMENTO
DEPARTMENT OF GEOLOGY
TENURE TRACK FACULTY POSITION
NEOTECTONICS/SEISMOLOGY

The Department of Geology at CSUS seeks to fill a tenure-track faculty position with emphasis in neotectonics or seismology at the Assistant Professor level, effective August 22, 2004. Field-based skills and experience are essential and candidates with strengths and experience in GPS, GIS and field mapping are highly desirable. Enthusiasm and a strong commitment to teaching and mentoring are essential. CSUS has a vibrant and growing program in undergraduate and graduate geology. This is one of two open positions.

Review of applications begins October 15, 2003. Submit resume, letter of application, statement of teaching interests, statement of research interests, transcripts (unofficial OK), three letters of reference and corresponding phone numbers to: Chair of Search Committee, Department of Geology, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6043. AA/EO.

Please see further details at: http://www.csus.edu/fas/vacancies/nsmvac.htm or http://www.asn.csus.edu/geol/.

CALIFORNIA STATE UNIVERSITY, SACRAMENTO
DEPARTMENT OF GEOLOGY
TENURE TRACK FACULTY POSITION
LOW TEMPERATURE GEOCHEMISTRY

The Department of Geology at CSUS seeks to fill a tenure-track faculty position with emphasis in low temp geochemistry at the Assistant Professor level, effective August 22, 2004. Applicants must hold a Ph.D. in Geology by the time of appointment. Enthusiasm and a strong commitment to teaching and mentoring are essential. Prior teaching experience at the college level is desired. Preference will be given to applicants who have demonstrated the ability to work well with students from diverse backgrounds and with abilities and willingness to teach marine geology. Applicants must be able to teach upper division / graduate courses in their discipline, as well as introductory general and physical geology lecture and laboratory courses. Other duties will include advising students, committee assignments, community service, writing external grant proposals, and developing a research program involving undergraduate and graduate students. The position is tenure-track at the rank of Assistant Professor. Salary range: $43,632–$55,008 commensurate with experience.

Applicants must submit a one to two page letter of application addressing their fitness for the position described above, a statement of teaching interests and experience, a statement of scholarly interests and experience (particularly in the context of doing research with undergraduate students), official transcripts of all college work (unofficial copies accepted until invited for interview), a curriculum vitae, three letters of recommendation sent directly to the department search committee, and the telephone numbers of at least three references who will speak to the professional qualifications of the applicant. Deadline for the application is **October 15, 2003.** Reply to: Chair of Search Committee, Department of Geology, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6043. AA/EO.

Please see further details at: http://www.csus.edu/fas/vacancies/nsmvac.htm or http://www.asn.csus.edu/geol/.

NORTHERN ILLINOIS UNIVERSITY
EARTH SCIENCE EDUCATION

The Department of Geology and Environmental Geosciences anticipates filling a tenure-track position in earth science teacher education to begin in August 2004. A teaching certificate and teaching experience at the 6–12 grade level are highly desirable, although not required. A Ph.D. in the geosciences is required at the time of appointment, and evidence of scholarship in an area of the geosciences will be expected. Appointment will be at the assistant professor level, or at the associate professor level for a candidate with established external funding and appropriate experience.

In addition to scholarship, primary responsibilities will include administering the earth science education program to prepare secondary earth science teachers. NIU has a teacher preparation structure that places full responsibility for the program with the department. Therefore, responsibilities might include teaching science education classes, coordinating clinicals, supervising student teachers, etc. Some of these activities are shared with other science departments, and the candidate will be expected to coordinate with faculty in these departments. The successful applicant will be expected to establish and maintain a vigorous externally-funded research program in science education and/or other areas of the geosciences, supervise graduate students, and have a commitment to excellence in teaching at both the undergraduate and graduate levels. Research expertise that integrates with one or more of our existing program strengths in biogeochemistry, environmental geochemistry/geophysics, hydrogeology, global change, volcanology, experimental mineralogy, structure/geodynamics, paleontology, or Antarctic geoscience would be welcomed but is not required.

The department offers programs leading to the B.S., M.S., and Ph.D. degrees, and currently has 14 faculty members, whose research and teaching interests are described on our web-site at http://jove.geol.niu.edu. Applicants must submit a letter of application, curriculum vitae, and statement of teaching and research interests. Applicants must also have at least three letters of reference sent by the deadline to: Dr. Mark Fischer, Search Committee Chair, Department of Geology and Environmental Geosciences, Northern Illinois University, DeKalb, IL 60115. For consideration, all application materials must be received by October 15, 2003. Women and minorities are especially encouraged to apply. NIU is an equal employment opportunity/affirmative action institution.

EARTH SURFACE PROCESSES
STANFORD UNIVERSITY

The Department of Geological and Environmental Sciences at Stanford University is seeking applications for a tenure-track faculty appointment at the Assistant Professor level in the area of Earth Surface Processes starting in fall 2004. We are looking for a person with a demonstrated record of excellence in research, who is committed to quality undergraduate and graduate teaching. Candidates should take a physical, process-oriented, quantitative approach to complement existing faculty who emphasize chemical or biological approaches to surface processes. The disciplinary focus is broadly defined and includes hydrology, geomorphology, environmental geology, sedimentary geology, and active tectonics. Interdisciplinary approaches are of special interest. We are seeking an individual who applies fundamental physical principles, quantitative data, and field-based studies to characterize and model mechanical behavior to develop insights into physical processes operating at or near the Earth's surface.

Applications, including curriculum vitae, a statement outlining research and teaching experience and interests that would materially contribute to related programs in the School of Earth Sciences (http://pangea.stanford.edu/), and the names and addresses of three referees should be sent in either paper or electronic (.pdf only) format to arrive by October 15, 2003. Send paper applications to: Chair, Surface Process Search Committee, Department of Geological and Environmental Sciences, Stanford University, Stanford, CA 94305-2115, USA.

Send electronic applications to: surface@pangea.stanford.edu.

Stanford University has a strong institutional commitment to the principle of diversity. In that spirit, we particularly encourage applications from women, members of ethnic minorities, and individuals with disabilities.

FACULTY POSITION
QUANTITATIVE GEOMORPHOLOGY/SURFICIAL PROCESSES/QUATERNARY GEOLOGY
UNIVERSITY AT BUFFALO
THE STATE UNIVERSITY OF NEW YORK

The Department of Geology, University at Buffalo (http://www.geology.buffalo.edu) is accepting applications for a tenure-track Assistant Professor position, to begin in August 2004. The successful candidate will demonstrate a potential for research and teaching that will complement and integrate with our existing programs in Environmental Geology and Volcanology. We seek a person with primary interest in quantitative sedimentology and landform development, Quaternary geochronology, or surficial geostatistics. Preference will be given to candidates who use techniques applicable to the understanding of the age, disposition and development of geological materials in the shallow subsurface. Teaching duties will involve undergraduate introductory courses and graduate level courses in the candidate's specialties, including advanced geomorphology or Quaternary geochronology. Minimum qualifications include: Ph.D. degree at the time of appointment, demonstrated potential to start and maintain an active research program through the securing of external grants, demonstrated potential to publish and otherwise disseminate results of research, and demonstrated potential to perform teaching duties. To apply, please submit a letter explaining research and teaching interests, a curriculum vitae, and names and contact information for at least three references to: Professor Marcus Bursik Department of Geology, University at Buffalo, 876 Natural Sciences Complex, Buffalo, NY 14260. Review of the material will begin on October 1, 2003, and will continue until the position is filled. The University at Buffalo is an Equal Opportunity Employer/Recruiter.

GEOCHEMISTRY; UNIVERSITY OF OREGON

The Department of Geological Sciences invites applications for a tenure track faculty position at the assistant professor level to begin in fall 2004. We seek an individual who applies geochemical measurements to the solution of fundamental problems in the Earth's crust or surficial environment. The ideal applicant will complement existing departmental strengths in hydrothermal geochemistry, paleopedology, volcanology, neotectonics, and/or geomorphology. Applicants with expertise in light stable, or cosmogenic isotope geochemistry are particularly encouraged to apply.

The successful candidate will be expected to establish a laboratory appropriate for her or his research focus, develop an externally funded, academically-oriented research program, and contribute to teaching at both the undergraduate and graduate levels.

Completion of the Ph.D. is required and postdoctoral research experience is desirable. Applicants should send a curriculum vitae, statements of teaching and research interests, and the names, postal and email addresses, and telephone numbers of three referees to Geochemistry Search Committee, Department of Geological Sciences, 1272 University of Oregon, Eugene, OR 97403-1272. We will begin reviewing completed applications October 20, 2003, and will continue until the position is filled.

The University of Oregon is an equal opportunity/affirmative action institution committed to cultural diversity and compliance with the Americans with Disabilities Act.

GEOPHYSICS/FLUID DYNAMICS
UNIVERSITY OF OREGON

The Department of Geological Sciences invites applications for a tenure track faculty position at the assistant professor level to begin in fall 2004. We seek an individual working in the general field of continuum mechanics, including fluid dynamics, who integrates data of diverse type and scale with the use of computer-based models. Specific applications may include geohydrologic processes, earthquake and fault physics, and/or viscoelastic problems related to magma transport, tectonics, or the earthquake cycle.

The successful candidate will be expected to develop an externally funded, academically-oriented research program and contribute to teaching undergraduates, graduate-level fluid dynamics, and other courses in his or her specialty.

Completion of the Ph.D. is required and postdoctoral experience is desirable. Applicants should send a curriculum vitae, statements of teaching and research interests, and the names, postal and email addresses, and telephone numbers of three referees to Geophysics Search Committee, Department of Geological Sciences, 1272 University of Oregon, Eugene, OR 97403. We will begin reviewing completed applications October 20, 2003, and will continue until the position is filled.

The University of Oregon is an equal opportunity/affirmative action institution committed to cultural diversity and compliance with the Americans with Disabilities Act.

GEOPHYSICS: LITHOSPHERIC DEFORMATION
UNIVERSITY OF CALIFORNIA AT SANTA BARBARA

The Department of Geological Sciences at the University of California at Santa Barbara seeks a broadly educated geophysicist who conducts creative research in quantitative analysis of deformation processes within the lithosphere. Individuals who utilize recent advances in geodesy, numerical modeling, inversion methods, or geoinformatics are particularly encouraged to apply. This tenure-track appointment will be as an Assistant Professor to begin July 1, 2004. The appointee is expected to develop a vigorous, externally funded research program (for example, by participating in EarthScope) and will teach both undergraduate and graduate courses in geophysics and tectonics.

A Ph.D. is required at the time of appointment. Review of applications will begin October 15, 2003. Applicants should request that three referees send letters of evaluation directly to the search committee by October 15. Applicants should submit a letter of application, curriculum vita, a description of teaching and research objectives and accomplishments, and provide the names, email addresses and contact information of the three referees. All materials should be sent to: Doug Burbank, Chairperson, Geophysics Search Committee,

Department of Geological Sciences, University of California, Santa Barbara, CA 93106-9630.

The department is especially interested in candidates who can contribute to the diversity and excellence of the academic community through research, teaching and service. UCSB is an Equal Opportunity/Affirmative Action employer.

CARBONATE RESERVOIR GEOLOGIST and WELL-LOG PETROPHYSICIST
THE PETROLEUM INSTITUTE, ABU DHABI

The Petroleum Geosciences Program of The Petroleum Institute, Abu Dhabi, is seeking a carbonate reservoir sedimentologist-stratigrapher and a well-logging petrophysicist, although other specializations will be considered.

Applicants should possess a Ph.D. in Geology or Geophysics and experience in the petroleum industry is desirable. Appointments probably will be at the Assistant Professor rank, although senior appointments will be considered for strong candidates. Faculty in Petroleum Geosciences will teach undergraduate and graduate courses, develop an active research program that impacts the UAE petroleum industry, and engage in service work. Opportunities exist to work with PI industry stakeholders in research.

The Petroleum Institute is a small, highly focused, new teaching and research institute that offers educational programs that will lead to B.Sc., M.Sc., and Ph.D. degrees in engineering and petroleum geosciences. Staff will have the resources to equip laboratories with up-to-date analytical equipment and computer software and hardware to support teaching and research. The Colorado School of Mines is the PI's academic advisor.

The compensation package for staff includes a 12-month salary and benefits that include housing, utilities, home furnishings, an automobile purchase loan, health insurance, and annual leave travel.

This is an unusual opportunity for self-motivated geoscientists to help build a world-class teaching and research institution. Additional information is at www.pi.ac.ae/. Interested candidates should send an application letter and their résumé by 31 September 2003, although late applications may be considered, to: Human Relations, Geoscience positions, Petroleum Institute, P.O. Box 2533, Abu Dhabi, United Arab Emirates; with an email copy to: Dr. Robert Winn, Petroleum Geosciences, rwinn@pi.ac.ae.

GEOLOGY INSTRUCTOR/ASSISTANT PROFESSOR FULL-TIME
ST. LOUIS COMMUNITY COLLEGE AT MERAMEC

Masters degree in subject field or Masters with 30 approved graduate hours in the field; prefer college teaching experience. Ability to teach Physical Geology, Earth Science, Environmental Geology and/or Physical Geography. Ability to teach regional geography courses a plus. Begins January 2004. Cover letter, resume, and copy of graduate transcripts must be received by Oct 15, 2003. Mail: SLCC, HR Dept, 300 S. Broadway, St. Louis, MO 63102. Fax: 314/539-5493. E-mail: hremp@stlcc.edu. Web: www.stlcc.edu. AA/EOE

ASSISTANT PROFESSORS
UNIVERSITY OF CHICAGO

The Department of the Geophysical Sciences at The University of Chicago is seeking to make several new appointments in areas that complement our current strengths in Paleobiology, Solid Earth, and Atmosphere and Ocean Sciences. Information about the Department can be found at http://geosci.uchicago.edu. The appointments will be at the Assistant Professor-level, except in exceptional cases. Strong preference will be given to candidates whose research has a substantial, lab- or field-based observational or experimental component. Candidates must have completed the Ph.D. prior to appointment. Please send a curriculum vitae, statement of research interests, and contact information for three or more referees to: David B. Rowley, Chair; Department of the Geophysical Sciences; The University of Chicago; 5734 South Ellis Avenue; Chicago, IL 60637, USA, or via email to facjobs@geosci.uchicago.edu. Consideration of applications will begin September 30, 2003. The University of Chicago is an Affirmative Action/Equal Opportunity Employer.

Opportunities for Students

Visiting Fellows and Students, Institute for Rock Magnetism. Applications are invited for visiting fellowships (regular and student) lasting for up to 10 days during the period from January 1, 2004 through June 30, 2004. Topics for research are open to any field of study involving fine particle magnetism, but preference will be given to projects relating magnetism to geological or environmental studies, or to fundamental physical studies relevant to the magnetism of Earth materials. A limited number of travel grants of up to $750 are available to cover actual travel costs. No funds are available for per diem expenses. Application forms and information necessary for proposal preparation may be obtained from IRM manager Mike Jackson at the address below, or online at http://www.geo.umn.edu/orgs/irm/irm.html. Short proposals (two pages, single-spaced text plus two forms and necessary figures and tables) are due by October 30, 2003, for consideration by the IRMs Review and Advisory Committee. Successful applicants will be notified in early December, 2003. Proposals should be sent by e-mail to irm@umn.edu, or by post to: Facilities Manager, Institute for Rock Magnetism, University of Minnesota, 291 Shepherd Laboratories, 100 Union St. SE, Minneapolis, MN 55455-0128.

Research Faculty Positions, Earth and Space Sciences, University of Washington. The Department of Earth & Space Sciences, University of Washington, Seattle, seeks to fill two non-tenure track full-time research faculty positions in terrestrial/planetary remote sensing. Both positions will be located in the W.M. Keck Remote Sensing Laboratory. Although some initial support is available, the successful candidates will be expected to successfully compete for external research funding. Participation in the teaching program will be primarily through seminars, occasional classroom lectures, and supervision of undergraduate and graduate students. Applicants must hold a Ph.D. in Geology or closely related field at the time of appointment. The first position is for a **terrestrial/planetary geologist** with a background in spectral and radiative transfer theory and experimental spectroscopy. The applicant should have experience in the acquisition, calibration, and analysis of laboratory and field thermal infrared emission and reflection spectra and an interest in applied remote sensing. This appointment is expected to be filled at the Research Assistant Professor level. However, candidates with exceptional qualifications and an established research program may be considered for appointment at the Research Associate Professor or Research Professor level. The second position is for a **remote-sensing specialist** with expertise in spatial and time-series analysis, and a demonstrated interest in applications of remote sensing to land and water environments. A theoretical background in both spectral techniques and geographical information science is beneficial, with an emphasis on issues of scale. This position addresses the increasing need to integrate spectral analysis from remote sensing with spatial and temporal analysis techniques and large GIS databases. This appointment is expected to be filled at the Research Assistant Professor level. Applicants should send a curriculum vita, bibliography, description of research interests, and include the names of four references. All materials should be sent to: Keck Search Committee, c/o D. Ellen McDannald, Department of Earth and Space Sciences, University of Washington, Box 351310, Seattle, WA 98195-1310. Preference will be given to applications received prior to October 1, 2003. The University of Washington is an affirmative action, equal opportunity employer. The University is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities and covered veterans.

Structural geology Assistantship at the University of Kentucky. It is anticipated an M.S. or Ph.D. degree assistantship in the field of structural geology/organic petrology will be available for spring or fall of 2004. The appointment involves a flexible combination of Research and Teaching Assistantships. The Research Assistantship stipend will be $15,000/year for 2 years, plus health insurance and tuition, and can be supplemented by an additional $3,000/year for students with the requisite academic qualifications. The project involves a combination of field and laboratory work, using frictional heating of coals on faults in the southern Appalachians, as a paleo-stress indicator on ancient seismic faults. This project is topical and is a newly emerging field in structural geology. The candidate will be encouraged to collaborate with the Center of Applied Energy Research at the Univ. of KY. Candidates may take courses in a wide range of graduate disciplines, including structural geology, seismology, and organic petrology. For further information contact Kieran O'Hara at geokoh@uky.edu, or see our web page at http://www.uky.edu/AS/Geology/.

Graduate Assistantships in Groundwater Biogeochemistry/Hydrogeology. M.S. and Ph.D. assistantships are available for projects in biogeochemical and hydrological interactions related to N transport in karst. Assistantships are available January 2004 in Biological Sciences, Geosciences, or the Environmental Dynamics programs at the University of Arkansas in Fayetteville. One project will define hydrological flow paths and hydrologic budget in karst systems using stable isotopic tracers. A complementary study element will focus on biogeochemical cycling of N; dissolved organic matter, NO_3^- concentration, and stable isotopic compositions will be assessed to link immobilization and denitrification to hydrologic controls. Results will be applied to field-scale experiments testing impact of common agricultural practices on hydrology and biogeochemistry in karst. Students will gain experience in hydrology and stable isotope techniques, including direct training in the U of A Stable Isotope Lab. Ideal candidates will have analytical and field skills and at least a BS in some field of biology or geology. Contact Dr. Phil Hays (Geosciences: pdhays@usgs.gov; 479-575-7342) or Dr. Sue Ziegler (Biological Sciences; susanz@uark.edu; 479-575-6944) for information. Applications (http://biology.uark.edu/bisc.html or http://www.uark.edu/depts/geology/) due October 1, 2003.

ATTENTION, STUDENTS! Looking for a full-time job or an internship? Then join us in Houston for the 6th Annual National AAPG/SEG Student Expo on October 5–6, 2003! The Expo is a great opportunity for students to meet representatives from oil/gas and environmental companies, some of which recruit only at the Expo. Students will have the chance to showcase their research in a poster session and network with potential employers. Successful job searches result from the Expo every year! And use this occasion to explore Houston, a vibrant city, an oil capital, and home to the largest geoscientist population in the world! The deadline for abstract and resume submissions is September 5, 2003. For more information, check out our website at www.studentexpo.info.

Calling All Shipmates

Deep Sea Drilling Project participants are invited to a reunion celebrating the 20th anniversary of the last cruise of the D/V Glomar Challenger and the 100th anniversary of Scripps Institution of Oceanography (SIO). The gathering will be Saturday, September 27, 2003, noon to 7 p.m. at the Munk Conference Room at IGPP, Scripps Institution of Oceanography, La Jolla, California—a beautiful setting overlooking the ocean, with plenty of room to mingle and catch up with some of the favorite people of your life! On the evening of Friday September 26, the Ancient Mariners—a group that includes SIO alums, employees, former employees, and families—are sponsoring a party with live music, food and drink, time capsules, and fireworks from the end of the pier. See www.scripps100.ucsd.edu and http://ancientmariners.ucsd.edu. For the Saturday party, contributions of chips, dips, finger-foods and drinks will be welcome. Information about the $3 campus parking sticker and parking locations will be provided later.

For more information or to get on the mailing list, contact Jeannie Smith, JeanSmith@msn.com (Global Marine folks) or Trudy Wood, twood@cts.com (all others).

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Books—Used & Rare

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Oct. 13-15, 2003	Introduction to ArcGIS with an Environmental Focus	Boulder, CO
Nov. 1-2, 2003	The Geochemist's Workbench® Workshop	Seattle, WA
Feb. 19-20, 2004	RockWorks2002 Workshop with Intro to LogPlot	Colorado
March 3-5, 2004	Introduction to ArcGIS with a Petroleum Focus	Boulder, CO

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