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1999 Izmit, Turkey Earthquake Was No Surprise

Robert Reilinger, Nafi Toksoz, Simon McClusky, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139, reilinge@erl.mit.edu
Aykut Barka, Istanbul Technical University, Eurasian Earth Science Institute, Ayazaga, Istanbul, Turkey

ABSTRACT

The magnitude (M) 7.4 Izmit earthquake was the largest and most deadly earthquake in Turkey in the past 60 years, and the most destructive in terms of property damage in Turkey's recorded history. It struck on a segment of the North Anatolian fault ~100 km east of Istanbul, one of the most heavily populated and industrially developed regions of the country. The earthquake caused a 120 km surface rupture (with an unmapped extension beneath Izmit Bay) with right-lateral offsets of 1.5–5 m. Apart from the loss of life and property, the Izmit earthquake is remarkable in being the latest in a series of 11 major (M >6.7) earthquakes this century that have broken more than a 1000 km length of the North Anatolian fault from near the Karliova triple junction in eastern Turkey to the Aegean Sea. The detailed record of surface offsets for these earthquakes, the tight geodetic constraints on present-day North Anatolian fault slip rates, and geologic evidence for total offset and age provide a rich data set for placing the historic earthquakes in the broader context of regional tectonic processes, and for determining the role of static stress transfer in triggering sequential earthquakes. The quantitative information on pre-, co-, and post-seismic deformation being developed for the Izmit event is providing important information for evaluating the likelihood and mitigating the impact of future earthquakes in the vulnerable Istanbul region.

INTRODUCTION

The Izmit earthquake caused more than 30,000 deaths and up to \$6.5 billion in direct property losses (September 14, 1999, World Bank report). The economic impact will be higher, likely exceeding \$10 billion, and possibly \$20 billion, including indirect and secondary losses. The psychological impact on the people of Turkey has been immense, if difficult to measure in purely economic terms.

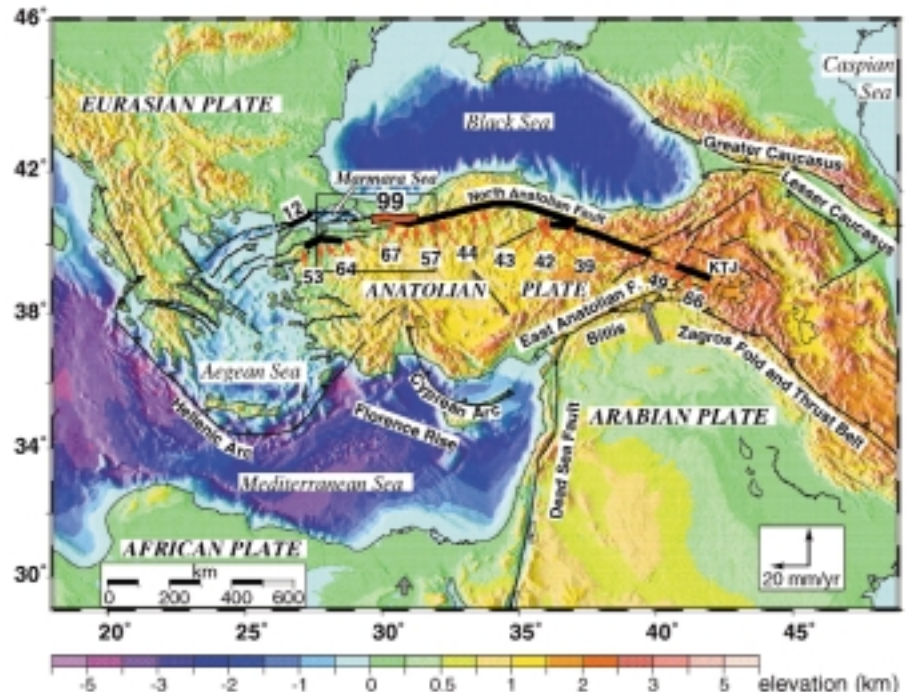


Figure 1. Simplified tectonic map of eastern Mediterranean superimposed on topography and bathymetry. Solid lines—strike-slip faults; lines with tick marks—normal faults, ticks on down-thrown block; lines with triangles—thrust faults, triangles on overriding block. Large gray arrows show NUVEL-1A estimates for Africa and Arabia motion relative to Eurasia (DeMet et al., 1994). Heavy dark lines indicate segments of North Anatolian fault zone that showed coseismic surface breaks; red arrows indicate approximate limit of breaks for each event in year indicated (i.e., 44 = 1944). Heavy red line shows location of the 1999 Izmit and Duzce earthquake surface breaks (November 12, 1999, Duzce event, M = 7.1, ruptured easternmost 30–40 km segment shown in red). Area enclosed by rectangle is shown in Figure 4. KTJ—Karliova triple junction.

The Izmit earthquake represents the latest in a series of major (M >6.7) earthquakes this century that collectively resulted in surface breaks along a 1000 km section of the North Anatolian fault (Ambraseys, 1970; Toksoz et al., 1979; Barka, 1996; Fig. 1 here). Because many of these earthquakes occurred after the deployment of a substantial global seismic network, significant seismic information is available. In addition, fault offsets accompanying each of these major earthquakes have been mapped in detail (Barka, 1996), providing a basis for evaluating the role of static stress transfer in triggering sequential earthquakes (Stein et al., 1997).

On the basis of the history of major earthquakes along the North Anatolian fault, Toksoz et al. (1979) identified the Marmara segment as a seismic gap. Consequently, substantial efforts have been underway to monitor seismicity and tectonic deformation in this area. Most recently, a program was begun to install

Earthquake *continued on p. 2*

The Second 1999 Turkey Earthquake

The November 12, 1999, M = 7.1, Duzce earthquake appears to be a second event extending the Izmit break approximately 30–40 km to the east (Fig. 4). The focal mechanism and surface faulting indicate predominately right-lateral slip of 1.5–4 m on a steeply dipping fault. There is some evidence for a small component of dip-slip with the north side moving down. This earthquake highlights the importance of static stress changes from one earthquake triggering subsequent events, and further demonstrates the current increased seismic hazards in the greater Istanbul region.

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In Memoriam

Robert B. Erwin Fairmont, Wisconsin October 12, 1999	Ernest E. Glick North Little Rock, Arkansas December 30, 1998	Richard W. Lounsbury Knoxville, Tennessee September 3, 1999
Olcott Gates Wiscasset, Maine July 27, 1999	Melvin L. Hill Lakewood, Colorado April 8, 1999	Troy L. Péwé Tempe, Arizona October 1999
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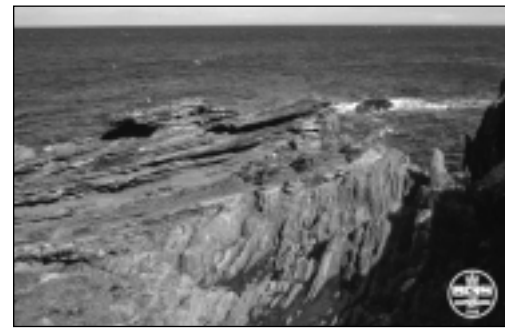
continuously recording Global Positioning System (GPS) stations and a relatively dense network of GPS survey sites to monitor strain accumulation on the various branches of the fault in the Marmara region. This effort is providing information on the various phases of the earthquake cycle for the Izmit event, including pre-earthquake strain accumulation, coseismic deformation, and postseismic relaxation. Furthermore, regional GPS studies undertaken over the past 10 years provide quantitative constraints on slip rates along the North Anatolian fault and place the motions along the fault in the context of regional tectonic processes associated with the interaction of the Arabian, African, and Eurasian plates (Straub et al., 1997; Reilinger et al., 1997a; McClusky et

al., 2000). As a result, rather complete seismic, geologic, and deformational records are available for the fault that produced the Izmit event. These records hold the promise of improving our understanding of the fundamental nature of earthquake processes on this and similar faults. Here, we describe the Izmit earthquake and place it in the context of prior earthquakes on the North Anatolian fault and the regional tectonic framework of the eastern Mediterranean zone of active plate interactions.

ACTIVE TECTONICS OF THE EASTERN MEDITERRANEAN REGION

The tectonic framework of the eastern Mediterranean and Middle East region is dominated by the collision of the Arabian

Earthquake *continued on p. 3*



Hutton's unconformity, Siccar Point, Scotland. © NERC. Courtesy of British Geological Society.

Geology As An Art Form

You may laugh or even guffaw, feel emotionally moved, or seriously disagree with me when I state that geology is as much an art form as a science. But let's think about what we do. We are attempting to quantify an experiment that has been going on for more than 4.55 billion years. In this experiment, we don't know the input parameters or the experimental design. We don't know the beginning point or the expected end. Yet we classify, attempt to quantify, and define from observations, the natural system around us. We cannot identify all of the independent variables or their feedback loops in this grand experiment, so we rely on analogy, estimation, and, ultimately, interpretation.

In his book *Guns, Germs, and Steel*, Jared Diamond provides an interesting illustration of the problem of defining natural systems. He writes, "One can provide *a posteriori* explanations (e.g., why an asteroid impact on Earth 66 million years ago may have driven dinosaurs but not many other species to extinction), but *a priori* predictions are more difficult (we would be uncertain which species would be driven to extinction if we did not have the actual past event to guide us)."

The Role of Observation. Recall that the word "science" means "knowledge." It is derived from the Latin *scire*, "to know," and *scientia*, "knowledge." The ways of obtaining this knowledge are to use whatever methods are most appropriate to a particular field of study. In geology, one's interpretation is based in observational experimentation. It is only as good as the breadth of experience one brings to bear on the problem, or the breadth of experiences a team brings to bear. The result seems to be that one who's seen the most rocks wins, or at least may have a better interpretation.

"The result of this physical inquiry [into the age of Earth] is that we find no vestige of a beginning, no prospect of an end."

—James Hutton, 1795

The first geologists were naturalists, true observers of the world around them. Their observations form the foundation of modern geological thought and theory. James Hutton recognized that the vertical Llandoverly shales beneath the gently dipping Old Red Sandstone strata at the "Great Unconformity" were formed at different times and by different processes.

Experimentation and Geologic Time. Today, we augment our observations with experimental results from other physical sciences including chemistry, physics, and biology. This allows us to better refine our interpretations of Earth and other planetary bodies. But geoscience differs from the other physical sciences because of an added dimension within the natural system—geological time. The addition of this temporal dimension, extending over billions of years, alters the scale of the problem at hand—be it relative time as in Hutton's day, or absolute time as determined with today's geochronological techniques.

Geoscientists continually balance the broad definition of Earth and her systems with quantifiable experiments on specific pieces and parts. In support of this work, GSA provides its members with various venues to share their ideas, interpretations, and experimental results. Next month, we'll look at some of the ways GSA assists members and students in their quest to quantify the art of geology. ■

Earthquake *continued from p. 2*

and African plates with Eurasia (e.g., McKenzie, 1970; Jackson and McKenzie, 1988). Plate tectonic models (e.g., NUVEL-1A; DeMets et al., 1994) suggest that the Arabian plate is moving in a north-northwest direction relative to Eurasia at a rate of about 18–25 mm/yr, averaged over about 3 m.y. These models also suggest that the African plate is moving in a northward direction relative to Eurasia at a rate of about 10 mm/yr. Differential motion between Africa and Arabia (~10–15 mm/yr) is thought to be taken up predominantly by left-lateral motion along the Dead Sea transform fault. The northward motion of Arabia results in continental collision along the Bitlis-Zagros fold and thrust belt, intense earthquake activity (Fig. 2), and high topography in eastern Turkey and the Caucasus Mountains. The northward motion of Arabia is also thought to contribute to westward extrusion of the Anatolian plate, which is accommodated by right-lateral slip on the North Anatolian fault and left-lateral slip on the East Anatolian fault (McKenzie, 1970). The leading edge of the African plate is being subducted along the

Hellenic trench at a higher rate than the relative northward motion of the African plate, requiring that the trench moves southward relative to Eurasia proper (e.g., Sonder and England, 1989; Royden, 1993). This qualitative picture of present-day kinematics is well illustrated by the distribution and focal mechanisms of earthquakes in Figure 2. The lack of events within the Anatolian plate attests to the low level of internal deformation in this area, and the nature of strike-slip faulting along the North Anatolian (right-lateral) and East Anatolian (left-lateral) faults are consistent with westward motion and counterclockwise rotation of Anatolia relative to Eurasia. Although this qualitative description of eastern Mediterranean tectonics has proven robust and useful, quantitative estimates of plate motions, intraplate deformation, and fault slip rates, now being provided by GPS observations, help to better constrain models for dynamic processes and lithospheric rheology (e.g., Thatcher, 1995) and provide a physical basis for effectively illuminating earthquake generation processes.

GPS results (Fig. 3) provide direct estimates of Arabia-Africa-Eurasia motion, the counterclockwise rotation and associated

westward motion of the Anatolian (Turkish) plate, and the rapid (>30 mm/yr) southward motion of the southern Aegean region (block?) relative to Eurasia. These results also quantify strain partitioning and crustal shortening in eastern Turkey and the Caucasus, fault-slip rates on the main, active faults, and partitioning between seismic and aseismic deformation. The kinematic results in turn provide constraints on dynamic processes and the rheological character of the lithosphere in this region. For example, the increase in velocities from eastern Turkey toward the Hellenic trench requires forces other than pushing from Arabia to account for Anatolian motion. The apparently coherent motion of much of Anatolia (i.e., little internal deformation) is consistent with relatively strong continental lithosphere (e.g., Reilinger et al., 1997; Barka and Reilinger, 1997; Lundgren et al., 1998; McClusky et al., 2000).

NORTH ANATOLIAN FAULT ZONE

The North Anatolian fault is a major, right-lateral, continental strike-slip fault that accommodates the westward motion

Earthquake *continued on p. 4*

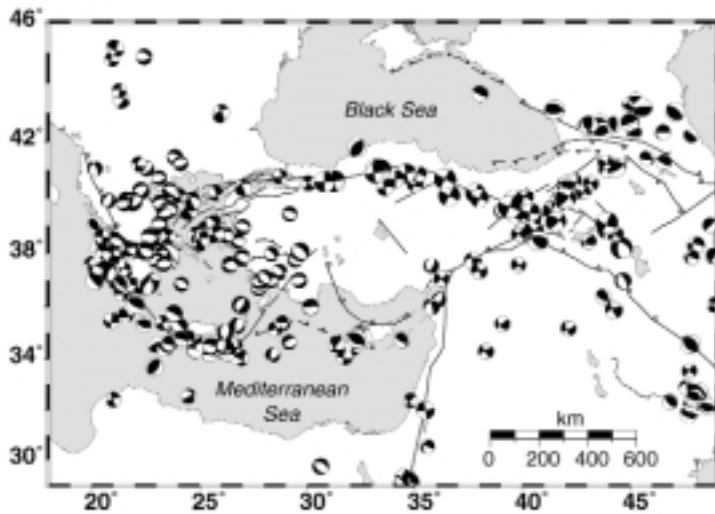


Figure 2. Focal mechanisms (lower hemisphere projection) for shallow (<100 km), major earthquakes ($M > 5.0$) (Dziewonski et al., 1981; Jackson and McKenzie, 1988), indicating nature of fault slip during an earthquake. Mechanisms along North Anatolian fault indicate right-lateral, strike-slip faulting along strike of mapped surface fault; those in western Turkey indicate normal faulting (i.e., white center and dark around the edges); those in Caucasus indicate thrust faulting (dark center and light edges).

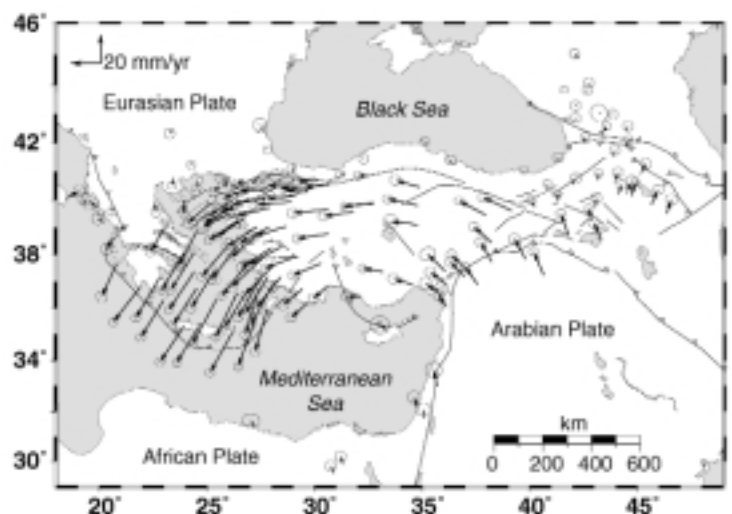


Figure 3. GPS horizontal velocities and 95% confidence ellipses in Eurasia-fixed reference frame for period 1988–1998 (McClusky et al., 1999). To avoid clutter, not all sites are plotted in Marmara region (see Fig. 4).

Earthquake *continued from p. 3*

and counterclockwise rotation of Anatolia and extends approximately 1200 km from the Karliova triple junction to the Aegean Sea (Fig. 1). Right-lateral deformation continues east of the triple junction, but the fault has a more complex character and is not easily identified as a single surface trace (e.g., Toksoz et al., 1977; Westaway, 1994; Reilinger et al., 1997b). In the Marmara region, the fault becomes more complex, bifurcating into two or three separate branches. Right-lateral deformation extends west of the Marmara Sea into the Aegean and is thought to connect with the east-west-striking normal faults bounding the Gulf of Corinth (Armijo et al., 1996; McClusky et al., 2000).

On the basis of the regional GPS velocity field, McClusky et al. (2000) estimated an upper bound on North Anatolian fault slip rate of 24 ± 1 mm/yr. This estimate is made by assuming that all motion of Anatolia is accommodated by slip on the North Anatolian fault, which serves as the primary boundary between Anatolia and Eurasia. Independent GPS estimates of Anatolia-Eurasia relative motion in the Marmara area by Straub et al. (1997) indicate a rate of 22 ± 3 mm/yr for Anatolia relative to a station in Istanbul (and hence a lower bound). These present-day fault slip rates are in reasonable agreement with geologic slip rates based on total fault offset and the estimated age of faulting (e.g., Şengör, 1979; Westaway, 1994; Armijo et al., 1999). This agreement suggests that Anatolia-Eurasia motion has continued in its present configuration and at approximately the same rate for the past 4–5 m.y. Such a first-order kinematic model (i.e., Anatolia moving as a coherent

unit, the motion being accommodated within a narrow fault zone relative to the size of the plates) provides a physical basis for relating fault slip for specific events to the overall motion of the plates, for identifying seismic gaps (i.e., slip deficient segments), and, to the extent that the characteristic earthquake model is applicable, for estimating average earthquake repeat times (Reilinger and Barka, 1997).

A series of 11 large ($M > 6.7$) earthquakes on the North Anatolian fault this century resulted in continuous surface breaks along more than 1000 km of the surface trace (Fig. 1). Surface offsets for many of these events have been mapped in detail (e.g., Barka, 1996), providing a basis for investigating the relationship between earthquakes and regional tectonics, as well as the interaction between successive events (e.g., Barka and Reilinger, 1997; Stein et al., 1997). Subsequent to the 1912, $M = 7.4$ Ganos earthquake, which broke the western segment of the northern fault branch (Fig. 1), and beginning with the 1939, $M = 7.8$ Erzincan rupture, four successive earthquakes (1939, 1942, 1943, 1944) migrated to the west (Dewey, 1976; Toksoz et al., 1979). Westward migration continued with the 1957 and 1967 earthquakes. Most other large earthquakes on the North Anatolian fault (1949, 1951, 1966, 1992) occurred on fault segments with low coseismic slip in prior earthquakes, or extended the break to the east (e.g., Stein et al., 1997; Fig. 1). The 1999 Izmit earthquake, on a fault segment specifically identified as a seismic gap (Toksoz et al., 1979; Stein et al., 1997), appears to be a continuation of the westward migrating historic earthquake sequence.

As indicated in Figure 4, the North Anatolian fault bifurcates into several active strands in the Marmara region. While faults beneath the Marmara Sea are known to generate earthquakes (e.g., Barka, 1997), the geometry and nature of these active faults remain unclear, and the distribution of slip on specific faults within the Marmara is unknown. However, the large increase in westward velocities for GPS stations located south of the northern branch of the North Anatolian fault indicates that the majority of strain occurs on the northernmost fault segments (Straub et al., 1997; McClusky et al., 2000). In fact, preliminary modeling indicates that the pre-earthquake GPS velocity gradient across the eastern Marmara can be explained by strain accumulation along a single, approximately east-west-striking fault, including the segment that broke in the Izmit earthquake (R. Bergmann, 1999, personal communication).

1999 IZMIT EARTHQUAKE

The 1999, $M = 7.4$ Izmit earthquake epicenter was near the town of Izmit at the east end of Izmit Bay. The quake involved predominantly right-lateral, strike-slip motion on a vertical fault plane (Harvard CMT) (Fig. 4). Observed surface offsets ranged from 1.5 to 5 m along a 120 km fault break (Barka, 1999). The largest offsets were observed along the western end of the fault where it entered the Bay of Izmit. Offsets decrease to the east where the Izmit break lies north of the 1967 Mudurnu Valley earthquake fault break. The extent of faulting beneath Izmit Bay is unknown. Although significant aftershock activity reached as far west as 28.7°E , there is no evidence for right-

lateral offsets in the Hersek delta (29.5°E, 40.7°N; Fig. 4). In addition, data from continuously recording GPS stations located north and south of Izmit Bay prior to the earthquake show a substantial component of north-south coseismic motion, consistent with a fault that ends (or slip decreases sharply) near or east of 29.5°E.

Because the Marmara region is home to about 25% of Turkey's population and a large part of Turkey's industrial activity, and the area had been identified as a seismic gap, substantial seismic and geodetic work was underway prior to the earthquake. Part of this effort included using continuous GPS (CGPS) and survey-mode GPS (S-MGPS) to monitor the distribution of Anatolia-Eurasia motion on the various faults that compose the North Anatolian fault zone. Figure 4 shows the locations of those CGPS stations in operation prior to the earthquake (all continue to operate), and S-MGPS sites that had been observed less than two years before the main shock. In addition, the Marmara Research Center in Gebze, Turkey, installed four CGPS stations along the highest coseismic slip segment of the fault within 48 hours of the main shock (Fig. 4). The S-MGPS stations are now being reobserved and together with the CGPS stations, INSAR, seismic estimates of fault slip, and surface offsets should provide fairly detailed estimates of coseismic slip distribution on the Izmit fault. This is of more than academic interest, because the details of coseismic slip distribution are critical for estimating future earthquake hazards in the Marmara region (i.e., the extent to which the Izmit earthquake filled the seismic gap and advanced or retarded future earthquakes on other fault segments). Furthermore, some of the S-MGPS stations are being observed multiple times after the earth-

quake to monitor continuing postseismic motions. The resulting data, together with the data from CGPS stations, will help constrain models of postseismic after-slip and viscoelastic relaxation. Such postseismic processes can substantially increase the overall earthquake moment and can result in rapid, postseismic strain accumulation, which could affect estimates of future earthquake occurrences.

SUMMARY

Quantitative information on pre-, co-, and postseismic deformation for the Izmit earthquake provides an important opportunity to further our understanding of basic earthquake processes, with implications for forecasting and mitigating the effects of future events on the North Anatolian fault and similar faults like the San Andreas fault in California. The remarkable series of earthquakes along virtually the entire length of the North Anatolian fault this century (excluding the Marmara Sea segments) provides an ideal data set to investigate the relationship between successive earthquakes on a major continental strike-slip fault, as well as the relationship among earthquakes, regional tectonics, and geologic deformation. Most critically, understanding the Izmit event and the nature of active faulting in the Marmara Sea is prerequisite to determining the probability and nature (location, magnitude) of future earthquakes west of the Izmit event. The vulnerability of the greater Istanbul region, as well as other large population centers in earthquake-prone areas, demands that we do our utmost to extract information from this tragic event, with the expectation that this knowledge will lead to an improved ability to mitigate future earthquake losses.

ACKNOWLEDGMENTS

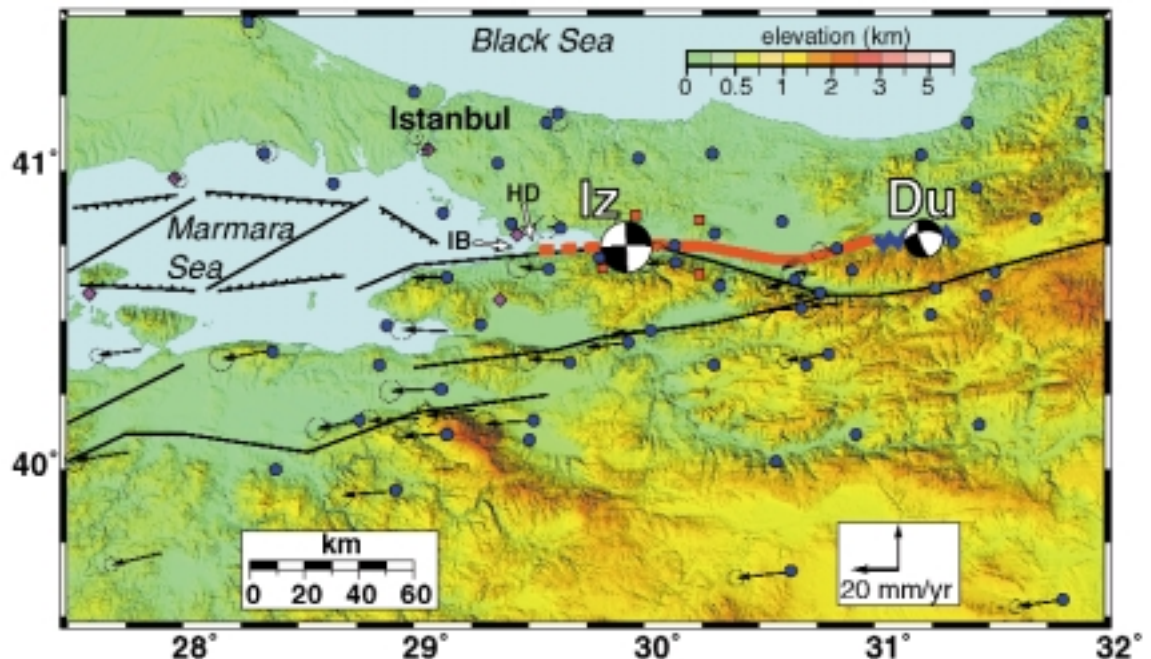
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Earthquake *continued on p. 6*

Figure 4. Topographic and simplified tectonic map (symbols as in Fig. 1) of Izmit-Duzce earthquake area showing epicenters and focal mechanisms (lower hemisphere "beachball" projections from Harvard CMT; larger is Izmit break, smaller is Duzce break), surface faulting (Izmit: heavy red line, dashed where inferred; Duzce: heavy blue line), pre-earthquake GPS-velocity field and 95% confidence ellipses, and GPS sites. Purple diamonds—continuous GPS stations operating prior to earthquakes; red squares—continuous GPS stations installed within two days of Izmit main shock; blue dots—survey-mode GPS sites observed less than two years prior to earthquakes and currently being reobserved to estimate coseismic motion. IB—Izmit Bay, HD—Hersek delta.



Allen W. Hatheway Named GSA Engineering Geology Division/AEG Richard H. Jahns Distinguished Lecturer

Allen W. Hatheway, past chair of the GSA Engineering Geology Division (1980) and past president of the Association of Engineering Geologists (AEG) (1985), will be available throughout 2000 as the Richard H. Jahns Distinguished Lecturer. His theme will be "Site Characterization."

Interested university departments, as well as AEG, GSA, and American Society of Civil Engineers (ASCE) sections can contact Hatheway directly to set up visits. He says he will attempt to spread his travel budget to the limit and is willing to give multiple lectures or strings of lectures in the same or regional cities. Hosts are asked to stretch the budget by providing a night of local housing and meals. For same-city lectures, Hatheway will offer additional talks: "Characterizing Former Manufactured Gas Plants: Facing SVOCs First Hand"; "Geotechnical and Geoenvironmental Case Histories with Twists"; and "Urban Geology: Carrying on a Grand Tradition."

Hatheway has announced his early retirement from the Department of Geological Engineering at the University of Missouri—Rolla, which will allow great flexibility in his lecture travel. He will practice in troubleshooting, forensics and expert

testimony, mitigation of geologic constraints, hazardous waste cleanup, gas works and coal tar sites, rock jobs and railroad incidents, and other areas.

Hatheway holds degrees from the University of California, Los Angeles (geology) and the University of Arizona (geological engineering) and is registered as a geologist, engineering geologist, and geological and civil engineer in several states. He has received the Burwell Award of GSA, the Johnston Award of AEG, and the Mead Prize of ASCE. He is a GSA Fellow, Life Member of AEG, and Fellow of ASCE and the Geological Society of London. He has practiced for 39 years, in every state and most provinces, and in Latin and South America, Singapore, South Korea, eastern Europe, Scandinavia, and South Africa. He retired from the U.S. Army and Army Reserve as Colonel of Engineers in 1991.

Hatheway is an emeritus professor of geology and emeritus professor of environmental engineering at the University of Missouri—Rolla. He can be reached at: Department of Geology & Geophysics, University of Missouri—Rolla, Rolla, MO 65409, hatheway@umr.edu, (573) 364-0818 or (573) 341-4777, fax 573-341-2071. ■

Earthquake *continued from p. 5*

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Manuscript received October 25, 1999; accepted November 11, 1999. ■

Submitting Science Articles

Each month, *GSA Today* features a short science article on current topics of general interest. For guidelines on submitting an article, contact either *GSA Today* Science Editor:

Karl E. Karlstrom
Department of Earth and Planetary Science
University of New Mexico
Albuquerque, NM 87131-1116
kek1@unm.edu

M. F. Miller
Department of Geology
Box 117-B
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millermf@ctrvax.vanderbilt.edu

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GSA PENROSE CONFERENCE

The Iapetus Ocean—Its Birth, Life, and Death: The Wilson Cycle

September 16–21, 2000

Edinburgh, Scotland

Application Due Date: February 28, 2000

Co-conveners:

Ian Dalziel, Institute for Geophysics, University of Texas, 4412 Spicewood Springs Rd., Bldg. 600, Austin, TX 78759-8500, (512) 471-0431, ian@utig.utexas.edu

Douglas J. Fettes, British Geological Survey, Murchison House, West Mains Rd., Edinburgh, Scotland EH9 3LA, UK, DJF@wpo.nerc.ac.uk

Anthony L. Harris, Department of Earth Sciences, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, UK, sr45@liverpool.ac.uk

Ricardo Astini, Universidad Nacional de Córdoba, Facultad Ciencias Exactas Físicas y Naturales, Av. Vélez Sársfield 299, C.C. 395, Córdoba 5000, Argentina, rastini@satlink.com

Cosponsor: The Geological Society, London

Additional supporters: International Geological Correlation Project #440 and the Tectonics Special Research Centre, University of Western Australia

See www.geosociety.org, or December 1999 issue of *Geoscientist* for details, or contact Ian Dalziel.

Recent hypotheses regarding the possible existence of the Neoproterozoic supercontinents Rodinia and Pannotia have cast the classic concept of a “proto-Atlantic” or Iapetus Ocean in a new and important light. Global paleogeography and paleoenvironment at the time of the Cambrian “explosion” of metazoan life and the rapid radiation of modern phyla center on understanding this ocean that all earth scientists believe existed between Laurentia and Gondwanaland, the major continental entities of the time interval. Yet much controversy surrounds its history, geography, and environment.

The topic of the meeting therefore embraces specifically the early Paleozoic Ocean off the Caledonian and Appalachian margin of Laurentia and their conjugate margins in Baltica and the newly amalgamated Gondwanaland. The conference will focus mainly on the problem issues of identifying the conjugate margins at the time of the rift-drift transition; the timing of that transition; the paleo-oceanography and environment of the ocean; and the closure of the ocean basin. In other words, it will focus on modern ideas concerning the classic “Wilson cycle” of ocean opening and closure to form a mountain range.

The meeting, September 16–21, 2000, will be at Our Dynamic Earth, a new exhibition and conference center in Edinburgh, Scotland. Accommodation has been arranged in the Pollock Halls of the University of Edinburgh, a 15-minute walk through Queen Park from Our Dynamic Earth—skirting the Carboniferous Arthurs Seat volcano and Salisbury Craigs sill. Our Dynamic Earth is located near the Palace of Holyrood House in the Old Town of Edinburgh and is adjacent to the building being constructed to house the new Scottish Parliament.

The principal reason for selecting Scotland as the site for the meeting is the significance of the “Scottish Promontory” of Laurentia—between the Greenland and Newfoundland-Labrador parts of the Iapetus margin—for understanding of the questions to be addressed. There is also considerable historical significance in the venue beneath Salisbury Craigs where James Hutton made observations of fundamental importance in the history of geologic thought.

Optional field trips will be arranged to study localities in the Scottish Highlands and Southern Uplands critical to the main issues to be addressed at the conference. These will include visits requested by individuals or groups of participants to localities of particular interest.

Anticipated number of participants: 75. Persons interested in participating should contact Ian Dalziel, preferably by e-mail (ian@utig.utexas.edu) before *February 28, 2000*.

A brief paragraph concerning interests in the topic of the conference should be provided. Notification regarding acceptance of applications will be sent out before mid-April 2000. Limited funding will be available for graduate students. ■

Coal Geology Division Seeks Nominations for Cady Award

The Coal Geology Division of the Geological Society of America seeks nominations for the Gilbert H. Cady Award for the year 2000. The Cady Award is made for outstanding contributions in the field of coal geology. As defined in the bylaws of the Coal Geology Division of the Society, “coal geology refers to a field of knowledge concerning the origin, occurrence, relationships, and geologic characteristics of the many varieties of coal and associated rocks, including economic implications.” The award will be made for contributions considered to advance the field of coal geology within and outside North America. It consists of a certificate and an engraved silver tray. Presentation of this award will be

made at the Coal Geology Division Business Meeting and Mixer at the 2000 GSA Annual Meeting in Reno.

Nominations for the Cady Award will be evaluated by the Gilbert H. Cady Award Panel.

Nominations should include: name, office or title, and affiliation of the nominee; date and place of birth, education, degree, honors and awards; major events in the professional career including a brief bibliography; and outstanding achievements and accomplishments that warrant the nomination. Three copies of the nomination are required. For a list of past recipients, see www.mysite.com/coalgeology/page8.html.

Send nominations to: Thomas D. Demchuk, Conoco Inc., Permian 3048, P.O. Box 2197, Houston, TX 77252-2197, (281) 293-3189; thomas.d.demchuk@usa.conoco.com.

Deadline for submission of nominations is February 28, 2000.

The Coal Geology Division established the award in honor of Gilbert H. Cady; the first award was presented in 1973. Monies for this award are derived from the annual interest income from the Gilbert H. Cady Memorial Fund, which is administered by the GSA Foundation.



Loper Chair in Environmental Geology The University of Alabama

The Department of Geological Sciences invites applications and nominations for the Loper Chair in Environmental Geology. The successful candidate will have a distinguished record of scientific publication and externally supported research, and will be expected to develop a nationally recognized graduate program in their specialty area at the University of Alabama. Appointment will be made at the rank of full professor. Qualified scientists are encouraged to apply who have expertise in any area of Environmental Geology which would enhance our existing graduate programs in aqueous environmental geochemistry, hydrogeology, and surficial processes.

Applications/nominations should be sent to: **Dr. Rona J. Donahoe, Chair, Loper Chair Search Committee, Department of Geological Sciences, The University of Alabama, Tuscaloosa, Alabama 35487-0338.** The search committee will begin to review applications on February 1, 2000, but applications will be received and considered until the position is filled. Prospective candidates are encouraged to review the Department's web site at <http://www.geo.ua.edu>. The University of Alabama is an equal opportunity, affirmative action employer.

Toward a Stewardship of the Global Commons

Engaging "My Neighbor" in the Issue of Sustainability Part I: What Do We Mean by the Global Commons?

A. R. Palmer, Institute for Cambrian Studies, Boulder, Colorado

Sustaining human civilization on Earth at acceptable levels requires recognition of the place of human beings in the "web of life" and the role human beings play in modifying the world in which we live and the natural systems that maintain the biosphere of which human beings are just a part. We must take individual personal responsibility for the atmosphere, hydrosphere, lithosphere, and biosphere—the Global Commons—that we all share.

Throughout human history, we let the noxious gases and particles from our cooking, heating, industrial activities, and, more recently, our various modes of transportation and delivery of goods drift away on the wind, without really considering what happened to these materials downwind from us. How much responsibility do we bear for acid rain, persistent smog, increasing atmospheric carbon dioxide, and disturbances of the stratospheric ozone layer?

We have mined water from underground as if the supply were inexhaustible. We have discharged our industrial effluents and our sewage into streams or lakes, or into the ground, with little thought to the consequences. Some results are dramatic drops in the level of the water table under many key agricultural areas and cities, groundwater and surface water no longer safe to drink by humans, and diminished or destroyed fisheries. Even as we deplete our potable water, the population in the areas of depletion continues to in-

crease, further straining an exhaustible supply.

We have plowed the ground and heavily fertilized and/or irrigated our crops, realizing short-term gain, but not readily recognizing the long-term losses. Some results are soil erosion with accompanying loss of soil depth, nitrification of lakes and streams adjacent to farmland, and loss of formerly productive agricultural land by salinization of soils.

We have cut forests for fuel and timber, and to create pastures or cropland. We have further altered the landscape by expanding cities and industries, or by building dams to augment our water needs, supply power for our homes and factories, or control floods that might wash away our structures. We have overfished our rivers, lakes, and oceans, and overhunted many of our game animals. We have introduced foreign animals or plants into new areas where they have no natural controls on their spread. We have, as human beings, disrupted ecological systems that have existed in balance with their surroundings for millennia.

We must constantly remind ourselves that we are an interdependent component of those ecosystems that form the complex web of life on this planet. We each have a responsibility to be aware of our dependence on the successful function of all components of the Global Commons for the future well-being of humanity.

Next month, Part II: The Concept of Deep Time and the Context of Humanity. ■

GSA ON THE WEB



Visit the GSA Web Site at www.geosociety.org. From our home page you can link to many information resources.

New for 2000—full-text PDF files for *Bulletin and Geology*, as well as the science article from *GSA Today*. Also watch for a new look on the GSA Web site in early 2000 as we strive for more user-friendliness.

Nominate your colleagues for GSA Awards and Medals. Look for a link from the "What's Hot" area on the home page. The forms can be found in the "About Us" section of the Web site.

Planning to attend the 2000 International Geological Congress? GSA has travel grants. Find more information in the Professional Development area of the Web site.



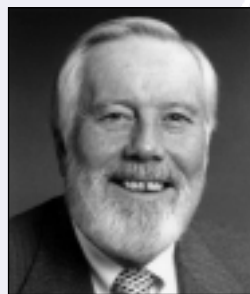
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Don J. Easterbrook Distinguished Scientist Award

The Quaternary Geology and Geomorphology Division of the Geological Society of America seeks nominations for the Don J. Easterbrook Distinguished Scientist Award. This award will be given to an individual who has shown unusual excellence in published research, as demonstrated by a single paper of exceptional merit or a series of papers that have substantially increased knowledge in Quaternary geology or geomorphology.

The intent of the Easterbrook Distinguished Scientist Award is to recognize an individual whose research has constituted significant advancements in Quaternary geology and geomorphology. No particular time limitations apply to the recognized research. It may have been done recently or many years ago. The recognition is normally extended to a single person, but in the event of particularly significant research by more than one person, the award may be shared by not more than two persons.

Although recognition of extraordinary prior research excellence is the principal goal of this award, the award carries with it an opportunity for funding additional research. The Easterbrook Distinguished Scientist is eligible to draw funds for research from the Geological Society of America Easterbrook Fund in an amount to be determined by the availability of funds. This opportunity for funding additional research by the winner is a secondary consideration of the award.

Nominations

Nominations for the Easterbrook Award will be evaluated by members of the Quaternary Geology and Geomorphology

Division Award Panel. Because the award primarily recognizes research excellence, self-nomination is not allowed. Nominees need not be members of the division. Nominations are not automatically carried forward to subsequent years, but the same individuals may be renominated in subsequent years.

Nominations are to be accompanied by supporting documentation, including a statement of the significance of the research of the nominee, a resume, letters of support, and any other documents deemed appropriate by the Nominating Committee.

Funding Continued Research

Following his or her selection for the award, the Easterbrook Distinguished Scientist is invited to submit a research proposal to the Easterbrook Fund within one year of the date of the presentation of the award at the Business Meeting and Awards Ceremony at the GSA Annual Meeting. The award winner may submit a proposal for funding of research up to the amount available from distributable funds in the Easterbrook Fund at the time of the award. The proposal shall be evaluated by the Division Panel, which shall also determine the amount to be made available from the Easterbrook Fund. Such funds are not intended for the personal use of the winner, but to fund new research. Items normally included in research proposals to agencies such as the U.S. National Science Foundation are appropriate, including summer salaries and various research costs. Although funding may be requested for graduate assistants, the award winner is expected to conduct the bulk of the research. Proposals for

research to be done largely by graduate students are inappropriate. No overhead costs to universities or other agencies are to be included in the funds withdrawn from the Easterbrook Fund, but the Geological Society of America Foundation may charge overhead costs as specified in the Easterbrook Fund agreement.

Research proposals should follow the same general format as those for a U.S. National Science Foundation proposal, including, but not limited to (1) an abstract of the proposed research, (2) a statement of the objectives and significance of the research, (3) a description of the research problem and the methodology used to investigate it, (4) a budget for each year of the research and a summary budget, (5) a list of references related to the project, and (6) any additional information that may be requested by the panel.

Once a proposal from the Easterbrook Distinguished Scientist has been accepted by the panel, withdrawal of funds may begin immediately according to the accounting practices employed by the Geological Society of America Foundation. Payment of funds will be made upon presentation of appropriate documents as required by accounting procedures of the Foundation. All of the allocated funds for the award winner's research must be committed within three years of the date of approval of the award by the panel. At the end of the three-year period, the winner shall submit a written report of the results of the research to the Division Secretary. Publications resulting from the research may be submitted in lieu of the written report.

Deadline for nominations: April 1, 2000. Send nominations to Alan Nelson, U.S. Geological Survey, Box 25046, MS 966, Denver Federal Center, Denver, CO 80225, (303) 273-8592, anelson@usgs.gov. ■

Call for Nominations

PENROSE MEDAL

To be awarded for outstanding original contributions or achievements that mark a major advance in the science of geology. Scientific contributions should be considered rather than contributions in teaching, administration, or service. Mid-career scientists who have already made exceptional contributions should be given full consideration for this award. Nominations are due by February 1, 2000.

DAY MEDAL

To be awarded for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. The intent is to recognize outstanding achievement and inspire further effort, rather than reward a distinguished career. Scientific achievements should be considered rather than contributions in teaching, administration, and service. Nominations are due by February 1, 2000.

HONORARY FELLOWS

To be awarded to non-North Americans who live and work outside of North America and have distinguished themselves in geological investigations or in notable service to the Society. Under excep-

tional circumstances, North Americans have been named Honorary Fellows. Nominations are due by February 1, 2000.

YOUNG SCIENTIST AWARD (DONATH MEDAL)

To be awarded to a young scientist (35 or younger during the year in which the award is to be presented) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. Nominations are due by February 1, 2000.

GSA PUBLIC SERVICE AWARD

To be awarded for contributions that have materially enhanced the public's understanding of the earth sciences or significantly served decision-makers in the application of scientific and technical information in public affairs and public policy related to the earth sciences. Nominations are due by February 1, 2000.

DISTINGUISHED SERVICE AWARD

To be awarded for exceptional service to the Society. GSA Members, Fellows, and Associates are eligible. Nominations are due by March 1, 2000.

Albert W. Bally Spring 2000 Symposium and Fest Slated

A symposium in honor of former GSA president Bert Bally, professor emeritus at Rice University, will be held in Houston on Thursday and Friday, April 13 and 14, 2000. The Albert W. Bally Symposium will bring together an international group of world-renowned geoscientists to honor Bally's great insight in combining geology and reflection seismology—a hallmark of all his research and teaching. Bruno d'Argenio, Daniel Bernoulli, Sierd Cloetingh, Carlos Cramez, John Dewey, Carlo Doglione, Robert Ginsburg, Chris Harrison, Martin Jackson, Art Sylvester, Bruce Trudgill, Paul Weimer, and Martha Withjack will give technical presentations that focus on regions of the world, such as the Apennines, the Canadian Cordilleras, and the Gulf of Mexico, where Bally has conducted research for almost five decades. Jorge Carnevali, Marlan W. Downey, Jean Michel Fonck, and Alfredo Guzman will offer unique insights on the future of oil and gas exploration at the beginning of the third millennium.

"Bert Fest" will also present an opportunity for participants to celebrate Bally's achievements and dedication to the advancement of geology and geophysics. Bert Fest will consist of a late-afternoon reception and evening banquet on Thursday, April 13, and an evening festival to conclude the symposium on Friday, April 14.

Those interested in attending should contact the Department of Geology and Geophysics at Rice University (geol@rice.edu). ■

[Call for Nominations](#)

Laurence L. Sloss Award for Sedimentary Geology

The Sedimentary Geology Division of GSA solicits nominations for the Laurence L. Sloss Award for Sedimentary Geology. The award is given annually to a sedimentary geologist whose lifetime career achievements best exemplify those of Larry Sloss—by contributing widely to the field of sedimentary geology and through service to GSA. We are now actively soliciting nominations from the

membership of the Sedimentary Geology Division to be considered for the year 2000. The deadline is *March 1, 2000*. Nominations should include a cover letter describing the nominee's accomplishments in the field of sedimentary geology, contributions to GSA, and a curriculum vitae. The nominations committee will forward two names to the management board of the Sedimentary Geology Divi-

sion, and the board will choose the recipient. The Sloss Award will be presented at the GSA Annual Meeting in Reno in November.

Please send nominations to: Christopher M. Fedo, Chair, Sedimentary Geology Division, Dept. of Geology, George Washington University, Washington, DC 20052. ■

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JOHN C. FRYE ENVIRONMENTAL GEOLOGY AWARD

In cooperation with the Association of American State Geologists (AASG), GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. The award is a \$1000 cash prize from the endowment income of the GSA Foundation's John C. Frye Memorial Fund. The paper must be selected from GSA or state geological survey publications; it must be selected from those published during the preceding three full calendar years; and the nomination must include a paragraph stating the pertinence of the paper. Nominated papers must establish an environmental problem or need, provide substantive information on the basic geology or geologic process pertinent to the problem, relate the geology to the problem or need, suggest solutions or provide appropriate land-use recommendations based on the geology, present the information in a manner that is understandable and directly usable by geologists, and address the environmental need or resolve the problem. It is preferred that the paper be directly applicable by informed laypersons (e.g., planners, engineers). Deadline for nominations for 1999 is March 31, 2000.

OFFICERS AND COUNCILORS

The GSA Committee on Nominations requests your help in compiling a list of GSA members qualified for service as officers and councilors of the Society. The committee requests that each nomination be accompanied by basic data and a description of the qualifications of the individual for the position recommended (vice-president, treasurer, and councilor). Nominations are due by February 15, 2000.

NATIONAL AWARDS

The deadline for the William T. Pecora Award, the National Medal of Science, the Vannevar Bush Award, and the Alan T. Waterman Award is April 30, 2000.

Materials and supporting information for any of the nominations may be sent to GSA Administrative Offices, Geological Society of America, P.O. Box 9140, Boulder, CO 80301-9140. For more detailed information about the nomination procedures, refer to the October 1999 issue of *GSA Today*, or call headquarters at (303) 447-2020, ext. 188.

NORTH-CENTRAL SECTION, GSA 34th Annual Meeting

Indianapolis, Indiana

April 6–7, 2000

www.geosociety.org/profdev/sectdiv/northc/00ncmtg.htm
or www.state.in.us/idem/olq/ncgsa

The Indiana University–Purdue University at Indianapolis (IUPUI) Department of Geology and the Center for Earth and Environmental Science (CEES) along with the Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR), U.S. Geological Survey (USGS), Indiana Geological Survey, Professional Geologists of Indiana (PGI), and Natural Resource and Conservation Service (NRCS) invite you to participate in the 34th Annual Meeting of the North-Central Section of the Geological Society of America. The meeting will be held at the Indiana Government Center and the Marriott Courtyard in downtown Indianapolis.

REGISTRATION, ACCESSIBILITY, AND ABSTRACTS BOOK

Pre-registration Deadline:

February 25, 2000

Cancellation Deadline:

March 3, 2000

Preregister to qualify for lower registration fees. Field trip participants must preregister for the meeting. Use the preregistration form in this announcement or on the GSA Web page. Full payment MUST accompany the preregistration form.

Guest registration is required for those attending guest activities, technical sessions, or the exhibit hall. Guest registrants (nongeologist spouse or friend) must be accompanied by either a registered professional or student. Students and

K–12 teachers must show a current ID in order to obtain reduced rates. All registrations received after February 25 will be held for on-site processing and charged the on-site rates.

All requests for registration additions, changes, and cancellations must be made in writing and received by March 3, 2000. There will be no refund for cancellations received after this date.

Members pay less! Join GSA now or at the meeting. Contact Membership Services for further information.

GSA's North-Central Section is committed to making all events at the 2000 meeting accessible to all people interested in attending. You can indicate special requirements, such as an interpreter or

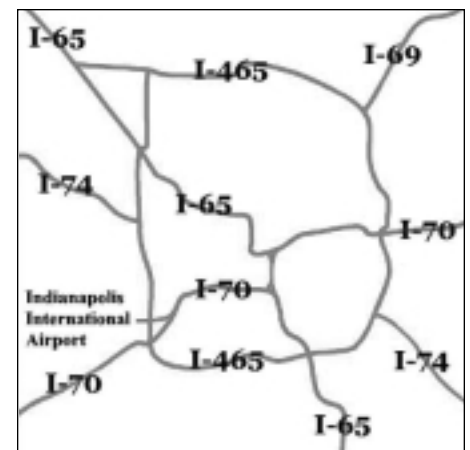
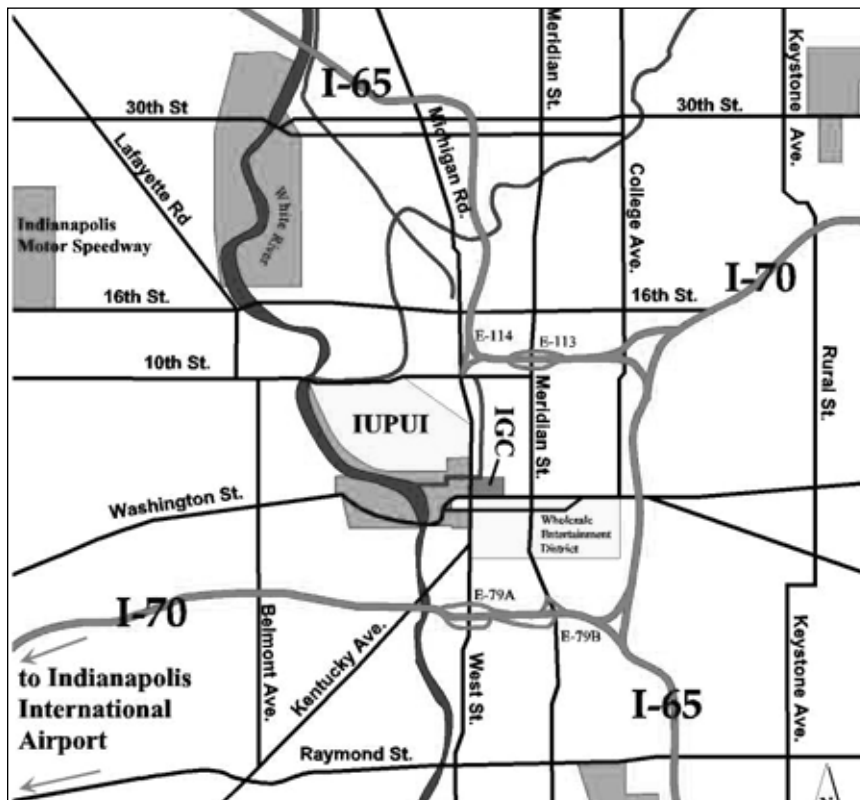
wheel chair accessibility, on the registration form.

The *Abstracts with Programs* book may be purchased with your GSA membership renewal, or on site in the registration area.

SYMPOSIA

The mailing address for all at the IUPUI (Indiana University–Purdue University at Indianapolis) Department of Geology and Center for Earth and Environmental Science, is 723 W. Michigan St., SL 118, Indianapolis, IN 46202-5132, fax 317-274-7966; for all at the Indiana Geological Survey, it is 611 N. Walnut Grove, Bloomington, IN 47405, fax 812-855-2862.

1. Glacial, Hydrological, Engineering, and Other Perspectives in Urban Settings. Robert T. Duncan, ATC Inc., Indianapolis, (317) 849-4990 x1309, fax 317-849-4278, duncan86@atc-enviro.com.
2. Dynamic Shallow Ground-Water Systems. Paul K. Doss, University of Southern Indiana, Evansville, (812) 465-7132, fax 812-465-1052, pkdoss@deepcnet.usi.edu.
3. Records of Post-Glacial Processes. Todd Thompson, Indiana Geological Survey, (812) 855-5412, tthomps@indiana.edu.
4. Recent Advances in the Geology of Indiana. John Steinmetz, Indiana Geological Survey, (812) 855-5067, jsteinm@indiana.edu.
5. Sedimentology, Geochemistry, and Biology of Tidal Deposits—Modern and Ancient. (*Sponsored by the Great Lakes Section of SEPM.*) Erik Kvale, Indiana Geological Survey, (812) 855-1324, kvalee@indiana.edu.
6. Evolutionary Biology of Cincinnatian Invertebrates. Joseph Pachut, IUPUI, (317) 274-7785, jpachut@iupui.edu; Robert Anstey, Michigan State University, East Lansing, (517) 355-9009, fax 517-353-8787, anstey@msu.edu.
7. Biogeochemistry. Christopher Maples, Indiana University, Bloomington, (812) 855-5581, fax 812-855-7899, cmaples@indiana.edu.



8. Impacts of the Geosciences on Society. Arthur Mirsky, IUPUI, (317) 274-7154, amirsky@iupui.edu.
9. Assessing Contaminants in the Hydrologic Environment. Eliot Atekwan, IUPUI, (317) 274-7969, eatekwan@iupui.edu; John Mundell, Mundell and Associates, Inc., Indianapolis, (317) 630-9060, fax 317-630-9065, mundell@indy.net.
10. Lake Records of Biogeochemical Cycling and Climate. Gabriel Filippelli, IUPUI, (317) 274-3795, gfilippe@iupui.edu; James McManus, Large Lakes Observatory, University of Minnesota, Duluth, jmcmanus@d.umn.edu.
11. Understanding, Restoring, and Managing Wetland Ecosystems. Lenore Tedesco, IUPUI, (317) 274-8383, ltedesco@iupui.edu.
12. Soil Science and Quaternary Geology: Past and Future Partners? Robert Hall, IUPUI, (317) 274-7154, rhall@iupui.edu; Bill Hofstetter.
13. Applications of Environmental Soil Chemistry. William R. Roy, Illinois State Geological Survey, Urbana, (217) 333-1197 or (217) 244-8389, roy@isgs.uiuc.edu.
14. Special Poster Session on Undergraduate Research. (*Sponsored by the Council on Undergraduate Research.*) Robert D. Shuster, University of Nebraska at Omaha, (402) 554-2457, fax 402-554-3518, bshuster@unomaha.edu; David J. Matty, Central Michigan University, Mount Pleasant, (517) 774-3179, fax 517-774-3537, dmatty@cmich.edu.
15. From Hands-On to High Tech. (*Sponsored By NAGT.*) Pat DeCapraris, IUPUI, (317) 274-7732, pdecaprr@iupui.edu.
16. Data Technology: Managing Environmental Change. Roger Koelpin, Indiana Department of Environmental Management, Indianapolis, (317) 232-8726, fax 317-232-3403, rkoelpin@dem.state.in.us.
17. Trilobite History and Paleobiology. (*Sponsored By North-Central Section, Paleontological Society.*) Don Mikulic, Illinois State Geological Survey, Champaign, (217) 244-2518, mikulic@geoserv.isgs.uiuc.edu.

POSTER SESSIONS

Poster sessions will be in the same area as exhibits and will be available for viewing for four hours during each session.

ABSTRACTS

The deadline for receiving abstracts was December 20, 1999.

WORKSHOPS

1. Determination of Water-Soluble Metals in Contaminated Soil by Inductively Coupled Plasma (ICP)

- Spectroscopy. April 5, 8 a.m.–2 p.m. William R. Roy, Illinois State Geological Survey, Champaign, (217) 244-8389 or 333-1197, roy@isgs.uiuc.edu. Cost: \$75, includes lab supplies, lunch, and break service.
2. Fundamentals of GIS. April 5, 8:30 a.m.–12 noon. Pam Hogue, CEES, (317) 274-7104, fax 317-274-7966, phogue@iupui.edu. Cost: \$30, includes lunch and break service.
3. Experiences with the Use of Digital Orthophotos for Data Collection of Planimetric Features. April 5, 1:30–5 p.m. Pam Hogue, CEES, (317) 274-7104, fax 317-274-7966, phogue@iupui.edu. Cost: \$30, includes break service.
4. Roy J. Shlemon Mentor Program in Applied Geology. April 6, 7:30 a.m.–1:30 p.m. Gabriel Filippelli, gfilippe@iupui.edu. Cost: No charge to students. Preregistration required. Breakfast and lunch provided.

FIELD TRIPS

Field trip coordinators are Robert Hall, IUPUI, (317) 274-0225, rhall@iupui.edu, fax 317-274-7966; and Pam Hogue, IUPUI CEES, (317) 274-7104, phogue@iupui.edu, fax 317-274-7966. Direct all inquiries about field trip arrangements to Pam Hogue. Trip charge includes transportation, lunch, snacks, drinks, any associated entry fees, and guidebook, unless otherwise noted. All trips will begin and end from the Marriott Courtyard Downtown Hotel lobby. Detailed information is available at www.geosociety.org/profdev/sectdiv/northc/00ncmtg.htm.

Premeeting

1. Furthering the Understanding of the St. Louis Limestone: Stratigraphy and Commercial Quality. April 4, 12–5 p.m. Jim Nowacki, Applied Geology Associates, (317) 888-7437, jamesnowacki@email.msn.com; Carl Rexroad, Indiana Geological Survey, (812) 855-7428, crexroad@indiana.edu. Cost: \$30, snacks and drinks will be provided.
2. Pennsylvanian Incised Valley Fills. April 5, 8 a.m.–5 p.m. Erik Kvale, Indiana Geological Survey, (812) 855-1324, kvalee@indiana.edu. Cost: \$40.
3. Building Stone Walking Tour of Downtown Indianapolis. April 5, 1–4 p.m. Art Mirsky, IUPUI, (317) 278-0229, amirsky@iupui.edu. Cost: \$20, includes guide book and soft drinks and water.

Postmeeting

4. A Vertical Tour Through the Classic Cincinnati Focusing on Bryozoa-Rich Intervals. April 8, 7 a.m.–6 p.m. Joseph F. Pachut, IUPUI, (317) 274-7785, fax 317-274-7966, jpachut@iupui.edu; Robert L. Anstey, Michigan State University, (517) 388-9009,

- anstey@pilot.msu.edu; Roger J. Cuffey, Penn State University; (814) 865-1293; cuffey@ems.psu.edu. Cost: \$45.
5. Glacial, Hydrological, Engineering, and Other Environmental Perspectives in the Indianapolis Area. April 8, 8:30 a.m.–5:30 p.m. Roger U. Koelpin, Indiana Dept. of Environmental Management, (317) 232-8726 or (317) 232-3403, rkoelpin@dem.state.in.us. Cost: \$56.
6. Glacial and Nonglacial Quaternary Stratigraphy of Eastern Indiana and Western Ohio: See What Didn't Wash Away in 1994. Robert D. Hall, IUPUI, (317) 274-0225, fax 317-274-7966. Day 1—April 8, 8 a.m.–5 p.m. Cost: \$50. Day 1, 2—April 8, 9, 8 a.m.–5 p.m. Cost: \$120. Lunch will be on your own.
7. Geology, Hydrology, and Water Quality of Karst Areas of Southern Indiana. April 8, 8 a.m.–5 p.m. Nancy Hasenmueller, (812) 855-7428, hasenmue@indiana.edu; Carl Rexroad, (812) 855-7428, crexroad@indiana.edu; John Bassett, (812) 855-7428; Richard L. Powell, (812) 855-7428, all at Indiana Geological Survey. Cost: \$40.

STUDENT PAPER AWARDS AND TRAVEL ASSISTANCE GRANTS

The North-Central Section of GSA will award \$100 each for up to eight papers judged best in their respective technical session. The principal author and presenter must be a graduate or undergraduate student.

The North-Central Section of GSA, in cooperation with the GSA Foundation, offers grants for travel assistance of up to \$200 (exclusive of field trip fees) available to student members and associates of GSA. Assistance will be offered on a first-come, first-served basis, with priority given to students presenting oral or poster papers. To be eligible for travel assistance grants, students must be currently enrolled in an academic department and certify their student membership in GSA. Applications for travel assistance grants may be obtained from Robert D. Hall, Department of Geology, IUPUI, 723 W. Michigan Street, SL 118, Indianapolis, IN 46202, (317) 274-0225; fax 317-274-7966; rhall@iupui.edu.

Applications for travel assistance must be received no later than February 25, 2000.

PROJECTION EQUIPMENT

Two standard 35 mm carousel projectors for 2" x 2" slides and two viewing screens will be provided in each meeting room. An overhead projector for transparencies will be available for each room as well. A speaker-ready room equipped with projectors will be available for review

North-Central *continued on p. 14*

North-Central *continued from p. 13*

of slides and overheads and for speaker preparation. Each carousel to be used in an oral presentation should be clearly identified with the speaker's name, session number, and speaker number. Carousels must be turned in to the projectionists at the beginning of the appropriate technical session. If any special audio or visual equipment is required, contact Gabriel Filipelli for associated fees and arrangements.

BUSINESS MEETINGS AND SOCIAL EVENTS

The special events and business meetings will be held at the Indiana Government Center or the Marriott Courtyard. A Welcome Reception will be held on Wednesday evening, April 5, 5-7 p.m., at the Marriott Courtyard Downtown in the lobby area and adjoining rooms.

The Association for Women Geoscientists (AWG) will hold an informal reception on Wednesday evening, April 5, 6:30-8 p.m., at the Marriott Courtyard Downtown.

The GSA North-Central Section Management Board will hold its business meeting with breakfast on Thursday morning, April 6, 7-8 a.m., at the Marriott Courtyard Downtown.

The North-Central Section of the Paleontological Society/SEPM will have its annual luncheon on Thursday,

April 6, 11:30 a.m.-12:30 p.m., at the Marriott Courtyard Downtown. \$18.

The North-Central Annual Business Meeting will be held 12:30-1 p.m., on Thursday, April 6, in the Government Center.

An All-Convention Presentation will be held Thursday, April 6, 1-2 p.m. at the Government Center. Our guest speaker will be Evan Bayh, a former Governor of Indiana and current U.S. Senator; he will discuss the current environmental agenda.

The GSA North-Central Campus Repts breakfast will be held on Friday, April 7, 7-8 a.m. at the Marriott Courtyard Downtown.

Special Event

The first GSA North-Central Section meeting of the new millennium brings an alternative evening of entertainment from the previously held banquets. On April 6, 5:30-10 p.m., a very special evening is being planned for everyone! As part of your registration fee, you will receive your official INDY PASS, your ticket to a night of fun, where the food will be plentiful, the atmosphere festive, the entertainment lively, and the drinks cold. With your INDY PASS, you will have entry to several of Indianapolis's exciting attractions. You won't want to miss this! Look for your INDY PASS and don't forget to be wearing it by 5:30 p.m. on Thursday evening!

Guest Tour

Historic downtown Indianapolis, Thursday, April 6. Will begin from the Marriott Courtyard lobby at 9 a.m. \$25 (includes lunch).

HOUSING

Blocks of rooms have been reserved at:

Marriott Courtyard Downtown (Host Hotel), 501 W. Washington Street, Indianapolis, IN 46204, 1-800-321-2211, \$85 single or double.

The Marriott Courtyard at the Capital, 320 N. Senate Ave., Indianapolis, IN 46204, 1-800-321-2211, \$75 single or double, www.courtyard.com.

The Hampton Inn Downtown, 105 S. Meridian Street, Indianapolis, IN

46225, 1-800-HAMPTON, \$85 single or double.

Days Inn Downtown, 401 E. Washington Street, Indianapolis, IN 46204, room rate \$65 single.

All reservations must be made by March 10, 2000. Registrants are responsible for making their own lodging arrangements and are encouraged to stay at the designated hotels, which are all close to the Indiana Government Center where most of the activities related to the meeting will be held.

GETTING TO INDIANAPOLIS

The Indiana Government Center and Marriott Courtyard Downtown are located in Downtown Indianapolis and just three blocks from the Indiana University-Purdue University at Indianapolis campus. Indianapolis can be reached by major highways including I-65, I-69, I-70, and I-74. Only I-65 and I-70 come into the downtown area. Indianapolis is served by several airlines via the Indianapolis International Airport.

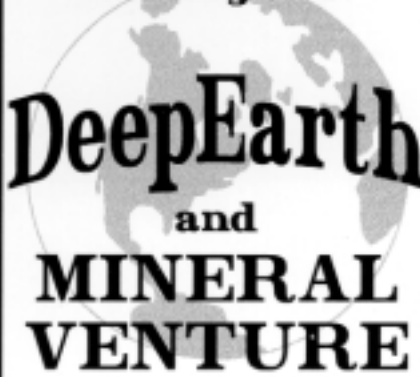
EXHIBITS

Exhibit space must be reserved by March 19, 1999. For further information, contact Pamela H. Hogue, (317) 274-7104, fax 317-274-7966, phogue@iupui.edu; IUPUI Center for Earth and Environmental Science, 723 W. Michigan St., SL 118, Indianapolis, IN 46202-5132.

DETAILED INFORMATION

Detailed information concerning registration, hotel accommodations, alternative opportunities in Indianapolis, technical sessions, symposia, field trips, and workshops is available through the GSA Web site, www.geosociety.org/profdev/sectdiv/northc/00ncmtg.htm, and at www.state.in.us/idem/olq/ncgsa. Inquiries, requests, or suggestions should be directed to Robert D. Hall, General Chair, GSA North-Central Section, Department of Geology, IUPUI, 723 W. Michigan St., SL 118, Indianapolis, IN 46202, (317) 274-7154, rhall@iupui.edu; or Joe Pachut, Co-chair, same address, (317) 274-7154, jpachut@iupui.edu. ■

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STUDENTS!! Don't Miss a Free Meal

And an opportunity to explore the world of applied geoscience! Attend the Roy J. Shlemon Mentor Program in Applied Geology at your Section's meeting; have some munchies and get down to business, talking with the "movers and shakers." This is your chance to find out from those who know what it takes to get a job—beyond graduation. Preregistration required.

Hurry! Maximum attendance is 30.

PREREGISTRATION FORM

Indianapolis, Indiana
April 6-7, 2000

GSA North-Central Section

Preregistration Deadline: February 25, 2000
Cancellation Deadline: March 3, 2000

Register one professional or student per form.
Copy form for your records.


Please print clearly • THIS AREA IS FOR YOUR BADGE

First Name _____ Last Name _____
 Employer/University Affiliation _____
 City _____ State or Country _____

Mailing Address (use two lines if necessary) _____

 City _____ State _____
 ZIP Code _____ Country (if other than USA) _____
 Male Female

Business Phone _____
 Fax _____
 Home Phone _____
 E-mail _____

 Please inform us by February 25 of any special considerations that you or your guest require.
 I will need special considerations.

GUEST INFORMATION • Please print clearly • This area is for badge

First Name _____ Last Name _____ Male Female
 City _____ State or Country _____

MAIL TO:
GSA NORTH-CENTRAL SECTION MEETING, P.O. BOX 9140, BOULDER, CO 80301
OR
FAX TO: 303-447-1133 or 303-443-1510
Remit in U.S. funds payable to: 2000 GSA North-Central Section Meeting
(All preregistrations must be prepaid. Purchase Orders not accepted.)

Payment by (check one): Check # _____ Discover Diners Club
 American Express VISA MasterCard

Card Number _____ Expires _____
 Signature _____

ADVANCE REGISTRATION FEES

	Full Meeting	One Day	Qty.	Amount
Professional Member*	(10) \$75 <input type="checkbox"/>	(11) \$40 <input type="checkbox"/>	_____	\$ _____
Professional Member (70 & older)*	(12) \$25 <input type="checkbox"/>	(13) \$20 <input type="checkbox"/>	_____	\$ _____
Professional Nonmember	(14) \$80 <input type="checkbox"/>	(15) \$45 <input type="checkbox"/>	_____	\$ _____
Student Member*	(30) \$30 <input type="checkbox"/>	(31) \$20 <input type="checkbox"/>	_____	\$ _____
Student Nonmember	(32) \$35 <input type="checkbox"/>	(33) \$25 <input type="checkbox"/>	_____	\$ _____
K-12 Professional	(60) \$25 <input type="checkbox"/>	_____	_____	\$ _____
Guest or Spouse	(90) \$10 <input type="checkbox"/>	_____	_____	\$ _____
Field Trip Only	(95) \$ 5 <input type="checkbox"/>	_____	_____	\$ _____

*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed below.

Discount does not apply to guest registrants. Check member affiliation (to qualify for member registration discount):

(1) GSA Member # _____ (2) AWG (3) NAGT (4) PS (5) SEPM

WORKSHOPS

- Determination of Water-Soluble Metals in Contaminated Soil April 5 (601) \$75 _____ \$ _____
- Fundamentals of GIS April 5 (602) \$30 _____ \$ _____
- Experience with Digital Orthophotos April 5 (604) \$30 _____ \$ _____
- Roy J. Shlerson Mentor Program April 6 (603) Free _____ \$ _____

FIELD TRIPS (Separate registration forms required for each field trip participant.)

- Furthering the Understanding of the St. Louis Limestone April 4 (401) \$30 _____ \$ _____
- Pennsylvanian Incised Valley Fills April 5 (402) \$40 _____ \$ _____
- Building Stone Walking Tour of Downtown. April 5 (403) \$20 _____ \$ _____
- A Vertical Tour through the Classic Cincinnati April 8 (404) \$45 _____ \$ _____
- Glacial, Hydrological, Engineering & Other Perspectives April 8 (405) \$56 _____ \$ _____
- Glacial and Nonglacial Quaternary Stratigraphy One-day April 8 (406) \$50 _____ \$ _____
- Two-day April 8-9 (407) \$120 _____ \$ _____
- Geology, Hydrology, and Water Quality April 8 (408) \$40 _____ \$ _____

TICKETED EVENTS

- AWG Informal Reception April 5 (301) Free _____ \$ _____
- GSA North-Central Section Management Board Breakfast April 6 (302) Free _____ \$ _____
- Paleontological Society/SEPM Luncheon April 6 (303) \$18 _____ \$ _____
- North-Central Annual Business Meeting April 6 (304) Free _____ \$ _____
- All-Convention Presentation April 6 (305) Free _____ \$ _____
- GSA North-Central Campus Reps Breakfast April 7 (306) Free _____ \$ _____

GUEST TOUR

- Historic Downtown April 6 (101) \$25 _____ \$ _____
- TOTAL FEES \$ _____**

ROCKY MOUNTAIN SECTION, GSA 52nd Annual Meeting

Missoula, Montana

April 17–18, 2000

www.geosociety.org/profdev/sectdiv/rockymtn/00rmmtg.htm
or www.cs.umt.edu/GEOLOGY

The University of Montana Department of Geology will host the 2000 Rocky Mountain Section meeting of the Geological Society of America in Missoula, Montana. The meeting will be held in the new Missoula Community Theater (MCT), which is within three blocks of the Holiday Inn headquarters hotel, many motels, restaurants, and shops, all located in downtown Missoula. The University of Montana is a short walk across the Clark Fork River to the southeast. Missoula is in the heart of the Rocky Mountains of western Montana, surrounded by Precambrian to Pleistocene sedimentary rocks, Cretaceous batholiths, folds, thrust faults, and mineral deposits—great geology and great scenery!

SETTING AND ACCESS

Missoula is served by Delta, Northwest, and Horizon airlines, with direct flights from Salt Lake City, Minneapolis, Seattle, and Spokane. It is at the junctions of Interstate 90, U.S. 12 and U.S. 93, about 200 miles east of Spokane and 120 miles west of the mining city of Butte.

ACCOMMODATIONS

A block of 120 rooms has been reserved for meeting registrants at the Missoula Holiday Inn headquarters hotel (one block northeast of the Higgins Avenue Bridge, downtown), for the nights of April 15–18, 2000. A special rate of \$75 per room is guaranteed for GSA reservations made before March 15, 2000. The hotel is full service including airport shuttle, indoor pool, whirlpool, exercise room, excellent restaurant and lounge. It is the site of Saturday and Sunday Registration, Welcoming Party, Monday night banquet, and no-host cocktail party. It is three blocks from the Missoula Community

Theater (MCT) and one block from downtown stores and restaurants.

Lodging arrangements should be made directly with the hotel or motel. (Add 4% tax.) MCT is in the 400 block East Broadway (1 on map). The following are within easy walking distance of MCT. (*Asterisk indicates special meeting rates. To get this rate, you must indicate, at the time of booking, that you are with the Geological Society of America group.*)

1. MCT (location of meetings)
2. Holiday Inn Parkside, 200 South Pattee St. Headquarters; courtesy van. \$75 for 2 double beds.* (406) 721-8550; 1-800-399-0408; fax: 406-728-3472.
3. DoubleTree Hotel, 100 Madison St. Full service; courtesy van. Single \$70; double \$80.* (406) 728-3100, 1-800-222-8733, fax: 406-728-2530.
4. Best Western Executive Inn, 201 E. Main. Queen for 1 = \$45; for 2 = \$50;

double for 2 = \$55. (406) 543-7221; fax 406-543-7225.

5. Campus Inn, 744 E. Broadway. Courtesy van, heated pool, fitness center, continental breakfast. Single \$35; double \$45. (406) 549-5134, 1-800-232-8013.

6. Holiday Inn Express, 1021 E. Broadway. Single king \$69; 2-queen double \$69; 2-room King Suite \$89. (406) 549-7600; fax 406-543-2223.

7. Thunderbird Motel, 1009 E. Broadway. \$40 per room; hot tub room \$90. Indoor pool, free continental breakfast. (406) 543-7251; 1-800-952-2400.

REGISTRATION

Preregistration deadline:
March 10, 2000

Preregistration by mail will be handled by the Geological Society of America Meetings Department, P.O. Box 9140, Boulder, CO 80301-9140. Use the *Preregistration Form* provided in this announcement. Preregistration is recommended for field trips and special activities because of participation limits and required guarantees.

Full payment must accompany registration. Charge cards and personal checks are accepted as indicated on the preregistration form, one per professional or student. Copy the form for your records. Errors in charge card numbers will delay your registration. Unpaid purchase orders are not accepted. The confirmation will be your only receipt.

Badges must be worn for access to all activities, Sunday evening through Tuesday. Guest registration is required for those attending meeting activities including technical sessions. Guests (nongeologist spouse or friend) must be accompanied by a professional or student registrant. Students and K–12 professionals must show a current ID onsite in order to obtain these rates. Otherwise, the professional rate will apply. Members pay less; join now through the GSA Web site, www.geosociety.org, or at the meeting.

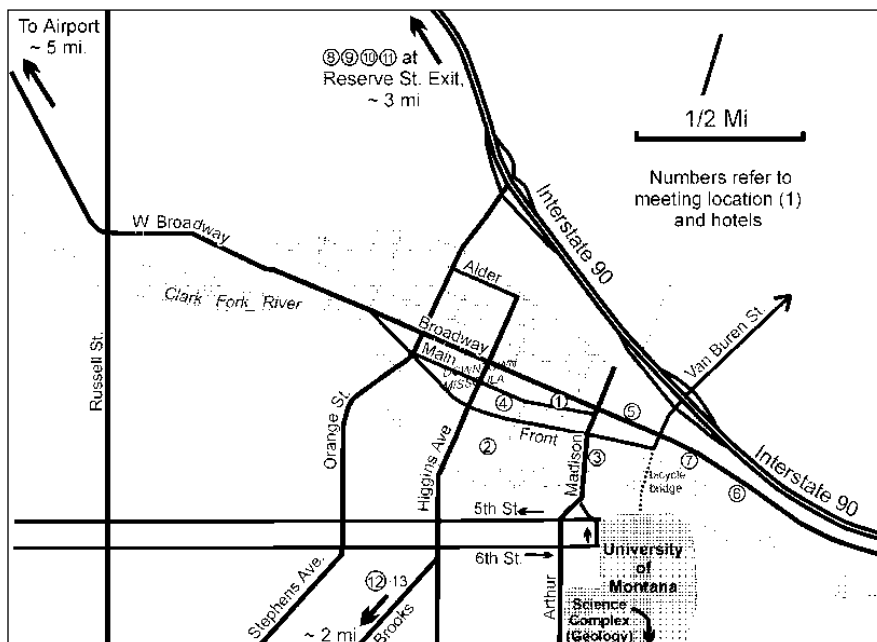
On-site registration will be available as follows: Sun. 4–7 p.m.: Holiday Inn Mon. 7:30 a.m.–4 p.m.; Tues. 7:30 a.m.–4 p.m.: MCT lobby (meetings location).

Cancellations, Changes, and Refunds

All requests for registration changes must be made in writing and *received* by March 17, 2000. GSA will refund or credit preregistration fees for cancellations received in writing by that date. No refunds or credits after that date. Refunds will be processed after the meeting. No refunds for on-site registration or ticket sales.

Accessibility for Registrants with Special Needs

GSA is committed to making events at the 2000 Rocky Mountain Section meeting accessible to all people. Special needs,



such as a wheelchair, will be provided upon request. Contact Don Hyndman, General Chair, by March 15, 2000; (406) 243-2241, dhyndman@selway.umt.edu.

WELCOMING PARTY

An informal icebreaker reception will be held Sunday evening, April 16, 8–10 p.m. in the atrium of the Holiday Inn Parkside, headquarters hotel. Visit old friends, make new ones. Learn more about special events, spouse activities, and sites around Missoula. Attendees must register before the gathering.

TICKETED EVENTS

Rocky Mountain Section Banquet. Holiday Inn Parkside, Monday, April 17, 7 p.m., with a lecture by Dave Alt on Glacial Lake Missoula Floods. Tickets \$17–18 (choice of meals). Purchase tickets through Preregistration or before Friday, March 17.

GSA Rocky Mountain Section Management Board Breakfast. Holiday Inn Parkside Boardroom, Tuesday, April 18, 6:30–8 a.m.

Riverside fun run (5 km) or walk (2 km) along river. Tuesday, April 18, 12:15 p.m. Free to meeting registrants. First prize for male and female categories is your choice of any book from Mountain Press Publishing Company (e.g., *Roadside Geology*).

GUEST EVENT

During meeting excursions for spouses and friends of meeting registrants: Rocky Mountain Elk Foundation, Fort Missoula Historical Museum. Tuesday, 1:30 p.m.–4:30 p.m., \$5, transportation provided.

TECHNICAL SESSIONS

Symposia

General information regarding symposia should be addressed to Marc Hendrix, Coordinator for Symposia and Technical Program, Dept. of Geology, University of Montana, Missoula, MT 59812, (406) 243-5278, marc@selway.umt.edu.

Abstract deadline: January 15, 2000.

1. Current Tectonic Research in the Northern Rocky Mountain Region: New Ideas and Directions. Lee Woodward, (505) 277-5309, University of New Mexico; Dave Lageson, (406) 994-3331, lageson@montana.edu, Montana State University.

2. Structural Analysis of the Rocky Mountain Fold and Thrust Belt. Jim Sears, (406) 243-5251, jwsears@selway.umt.edu, University of Montana.

3. Active Tectonics, Tectonic Geomorphology, and Paleoseismology of the Intermountain Seismic Belt (ISB) and Adjacent Regions. J. Ramon Arrowsmith, (602) 965-3541, ramon.arrowsmith@asu.edu, and Lee Amoroso, (602) 965-5081, lamoroso@asu.edu, Arizona State University.

4. Geophysics of the Intermountain West. Posters. Dave Brumbaugh, (602) 523-7191, david.brumbaugh@nau.edu, Northern Arizona University.

5. New Perspectives on the Structural Development, Stratigraphy, and Ore Emplacement in the Coeur d'Alene Mining District. Don Winston, (406) 243-5511 or 721-1016, winston@selway.umt.edu, University of Montana; Brian White, (509) 354-8066, bew6@cdc.gov, NIOSH-Spokane Research Lab; Ian Lange, (406) 243-4024, gardener@selway.umt.edu, University of Montana.

6. Magmatism and Orogenic Processes in the Rocky Mountains. David Foster, (352) 392-7316, dfoster@geology.ufl.edu, University of Florida, Gainesville; Tom Kalakay and Barbara John, University of Wyoming; Jim Sears, (406) 243-5251, jwsears@selway.umt.edu, University of Montana.

7. Sedimentary Basin Studies in the Rocky Mountains. Marc Hendrix, University of Montana. (see Coordinator for Symposia, above).

8. Effects of Fractures and Faults on Hydrogeology. Shemin Ge, University of Colorado, (303) 492-8323, ges@spot.colorado.edu; John McCray, Colorado School of Mines, (303) 384-2181, jmcrcray@mines.edu.

9. Surface-Groundwater Interactions in Fluvial Systems. William W. Woessner, (406) 243-5698, gl_www@selway.umt.edu, University of Montana.

10. Acid Rock Drainage Associated with Flooded Pit Lakes and Abandoned Mines. Chris Gammons, (406) 496-4763, cgammons@mtech.edu, Montana Tech.

11. Critical Geologic Intervals: Mass Extinctions and Recoveries, and Biotic Changes. George Stanley, (406) 243-5693, fossil@selway.umt.edu, University of Montana.

12. Tertiary Extensional Basins in Southwestern Montana. Rob Thomas, (406) 683-7615, r_thomas@wmc.edu, Western Montana College.

13. Late Quaternary Paleocology of the Northern Rockies. Eric Edlund, (406) 243-6126, edlund@selway.umt.edu, University of Montana.

14. Biogeochemistry of Yellowstone, Including Thermal Aspects, Soils, Streams. Nancy Hinman, (406) 243-5277, hinman@selway.umt.edu, University of Montana.

PROJECTION EQUIPMENT

Projection equipment will be provided for 2" x 2" slides that fit standard 35 mm carousel trays. Two slide projectors, an overhead transparency projector, and two screens will be available. *Authors should bring their own carousel trays.*

POSTER SESSIONS

Each poster booth will contain one 4' high x 8' wide board suitable for thumb tacks or push pins. If you need a table, please contact Ian Lange or Don Hyndman at least one month before the meeting.

WORKSHOPS

Stereo Aerial Photography as a Historical Geo-Data Source: Case Study for Landslide Hazard Identification. (*Sponsored by GSA Engineering Geology Division and U.S. Army Corps of Engineers.*) April 15–16.

This course will cover the derivation of geologic and environmental information from stereo aerial photography by providing a method for systematic analysis, description and interpretation. Stereo airphotos taken at different times in the past will be used to identify possible landslide hazard areas and to examine the same recent landslide near Missoula. Demonstration of GIS application. Students will make a synoptic field check of the landslide area.

Fee: Professionals \$250, students \$225; includes course references, supplies, aerial photographs, stereoscope use, and field trip transportation. Minimum: 10; maximum: 25. John Jens, (703) 428-6948, jjens@tecsunl.tec.army.mil, U.S. Army Corps of Engineers, Topographic Engineering Center, Digital Products Center, Alexandria, VA 22315-3864.

Roy J. Shlemon Mentor Program in Applied Geology. Two different programs, April 17 and 18, 12:00–1:30 p.m. Location to be announced on www.geosociety.org. For graduate and advanced undergraduate students, interactive workshops dealing with professional opportunities and challenges beyond graduation. Cost: \$10. Maximum 30; minimum 10. Lunch provided. Christine Brick, brick@selway.umt.edu. Preregistration required.

THEME SESSIONS

These sessions are designed for teachers at various levels.

1. Undergraduate Research: Research-based Learning in the Classroom; Teaching Science by Example. Chris Brick, (406) 549-6939, brick@selway.umt.edu.
2. Distance Education in the Geosciences: Experiences and Strategies for Teaching Geoscience via the Internet. Chris Brick, (406) 549-6939, brick@selway.umt.edu.
3. K–12 in the Geosciences. Half-day afternoon session, Monday, April 17, "What's New in Earth Science?"; talks and discussions with professors and researchers about their latest research in Montana and surrounding areas. Supplementary materials for you and your classes. Arrangements

Rocky Mountain *continued on p. 18*

being made for OPI renewal units. Chris Brick, (406) 549-6939, brick@selway.umt.edu. Free to K-12 professionals registered for one day or full meeting.

FIELD TRIPS

Contact trip leaders for details; the address for UM-led trips is: Dept of Geology, University of Montana, 32 Campus Drive #1296, Missoula, MT 59812-1296. Direct any general inquiries to Field Trip Co-chairs Don Winston, (406) 243-5511, at the U of M department address above (winston@selway.umt.edu), or Sheila Roberts, (406) 683-7017, at Dept. of Environmental Sciences, Western Montana College of the University of Montana, Dillon, MT 59725 (s_roberts@wmc.edu).

All field trips depart from and return to the main (north) parking lot of the Holiday Inn Parkside headquarters hotel. Field trip costs include transportation, shared lodging, lunch, and guidebook (for all trips).

Guidebook

A peer-reviewed *Guidebook to the Geology of Western Montana and Adjacent Areas* (Don Winston and Sheila Roberts, editors) will be published for the field trips of the meeting. Guidebook cost is \$25 at the meeting and \$30 afterwards. Professional registrants for the meeting will receive a \$10-off coupon for on-site purchase of the guidebook.

Premeeting

1. Tectonic Evolution of Bitterroot Metamorphic Core Complex. Structure, petrology, and geochronology of the complex exhumed by extensional shear in Eocene time, including mylonite, mid-crustal Cretaceous granites, shallow Eocene plutons, and hanging-wall meta-sedimentary rocks. Two days, April 15-16. David Foster, (352) 392-7316, dfoster@geology.ufl.edu, University of Florida. Cost: \$110, or \$140 for very special B&B; cost includes breakfast; minimum 8.

2. Glacial Lake Missoula: Shorelines and Sediments, Giant Ripples and Other Features from Catastrophic Drainage of the Lake. One day, April 16. Dave Alt, (406) 243-4761, or 543-5070, davealt@selway.umt.edu, University of Montana. Cost: \$45; minimum 8.

3. Quaternary Geology, Geomorphology, and Hydrology of the Upper Flathead Valley, Flathead County, Montana. Two days, April 15-16. Larry Smith, (406) 496-4379, larry@mbmgsun.mtech.edu, Montana Bureau of Mines and Geology; Lex Blood, (406) 752-5222, ext. 290, Flathead Community College, Kalispell, Montana; John Lafave, (406) 496-4306, jlafave@mbmgsun.mtech.edu, Montana Bureau of Mines and Geology. Cost: \$80, excluding lodging. Block of rooms (\$58 double, includes breakfast,

reserved at Hampton Inn, Kalispell). Minimum 10, maximum 35.

4. Impacts to the Surface and Groundwater Systems from 100 Years of Butte Mining and Smelting: the Clark Fork Superfund Site. One day, April 16. Christopher Gammons, (406) 496-4763, Cgammons@mtech.edu, Montana Tech; Joseph Griffin, Environmental Science and Engineering, Butte; William Woessner, (406) 243-5698, gl_www@selway.umt.edu, University of Montana. Cost: \$50; minimum 10, maximum 30.

5. Geology of the Western Lewis and Clark Line and Coeur d'Alene Mining District: New Structural, Stratigraphic, and Ore Genesis Interpretations. Two days, April 15-16. Brian White, Don Winston, and Ian Lange (see symposium 5). Cost \$105; minimum 10.

During meeting

6. Blackfoot Thrust, Just East of Missoula. Evening, 5-8 p.m., Monday, April 17. Jim Sears (see symposium 2), and Sue Clements. Cost \$5; minimum 5.

Postmeeting

7. Structural and Stratigraphic Evolution of the Rocky Mountain Foreland Basin in Central-Western Montana. Two days, April 19-20. Jim Sears, (406) 243-5251, jwsears@selway.umt.edu; Marc Hendrix, (406) 243-5278, marc@selway.umt.edu; with Ruth Lehrman, Ben Webb, Mike Taylor, Brian Priest, Brian Nixon, all at University of Montana. Cost: \$110; minimum 10, maximum 25.

8. Shallow-level Plutonism in the Sevier Fold and Thrust Belt East of the Pioneer Mountains, Montana. Structural and chronologic relationships between granitic plutons and thrusts in the foreland of the Sevier fold and thrust belt. 2-1/2 days, 3 p.m., April 18-7 p.m., April 20. Tom Kalakay, Barbara John, and David Foster (see symposium 6). Cost: \$180, includes breakfast; minimum 12.

9. Platinum Group Metal Mines in the Stillwater Complex, Montana; Surface and Underground; Mining Geology and Geotechnical Engineering Practices. 3 days, April 19-21. Ennis Geraghty, (406) 328-8407, egeraghty@stillwatermining.com, Stillwater Mining Co., Nye, Montana; Diane Wolfgram, (406) 496-4353, dwolfgram@mtech.edu, Montana Tech. Cost: professionals \$250; students \$200, includes Stillwater guidebook material but not guidebook for all trips. Minimum 10, maximum 30.

10. The Mississippian Lodgepole Formation, Little Belt Mountains, Central Montana: Carbonate Cycles and Waulsortian Mounds. 2 days, April 19-20. Randolf Burke, (701) 224-3682, North Dakota Geological Survey, Bismark. Cost: \$105; minimum 9, maximum 20.

11. Blackfoot Landslide and Debris Slide that Blocked the Blackfoot

River, Montana, on March 28, 1998, and Its Continuing Evolution. One day, April 19. Jennijo Brown and Don Hyndman, (406) 243-2241, dhyndman@selway.umt.edu, University of Montana. Cost: \$50; minimum 6.

12. Geology of the Lewis and Clark Trail in Montana and Idaho. Two days, April 18-20. Rob Thomas, (406) 683-7615, r_thomas@wmc.edu; Sheila Roberts, (406) 683-7017, s_roberts@wmc.edu, Western Montana College, Dillon. Cost: \$190; minimum 10, maximum 20.

STUDENT TRAVEL SUPPORT

Preference for support for five GSA Student Associates is given to presenters of papers and posters and to group applications. Send a letter of application which identifies all student travelers in the group, GSA Student Associate member numbers, and a summary of cost to Rocky Mountain Section Secretary Ken Kolm, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401, (303) 273-3932, fax 303-273-3858, kkolm@mines.colorado.edu. If you are presenting a paper or poster, include a copy of your acceptance notice. Ken Kolm must receive applications by Friday, March 17, 2000.

Rocky Mountain Section GSA will award free full or partial field trip registration for two students on each field trip. The student must write a letter describing why participation on the field trip will enhance his/her research or education. Letters may also address financial need and minority status. Send to David Mogk, Earth Sciences Department, Montana State University, Bozeman, MT 59717-0348, postmarked no later than March 10, 2000.

STUDENT ASSISTANTS WANTED

We offer free registration for the entire meeting plus \$5/hour to both undergraduate and graduate student assistants. Details and applications will be posted on the GSA meeting Web site.

EXHIBITS

The cost per booth is \$50 for a 12' x 10' space. Additional adjacent booths may be purchased for \$50 each. Contact Ian Lange, Dept. of Geology, University of Montana, Missoula, MT 59812-1296, (406) 243-4024, gardener@selway.umt.edu.

DETAILED INFORMATION

Additional information concerning registration, lodging, activities, and the program is on the Web at the addresses given at the start, and will also be provided in the Rocky Mountain Section *Abstracts with Programs*. Address general questions to Don Hyndman, (406) 243-2241, dhyndman@selway.umt.edu, Dept. of Geology, Univ. of Montana, 32 Campus Dr., Missoula, MT 59812-1296. ■

PREREGISTRATION FORM

GSA Rocky Mountain Section

Missoula, Montana
April 17-18, 2000

Preregistration Deadline: **March 10, 2000**
Cancellation Deadline: **March 17, 2000**

Register one professional or student per form.
Copy form for your records.


Please print clearly • THIS AREA IS FOR YOUR BADGE

First Name _____ Last Name _____
 Employer/University Affiliation _____ State or Country _____
 City _____

Mailing Address (use two lines if necessary) _____

City _____ State _____
 Country (if other than USA) _____
 Male Female

Business Phone _____
 Fax _____
 Home Phone _____
 E-mail _____

 Please inform us by March 10 of any special considerations that you or your guest require.
 I will need special considerations.

GUEST INFORMATION • Please print clearly • This area is for badge

First Name _____ Last Name _____ Male Female
 City _____ State or Country _____

MAIL TO:
GSA ROCKY MOUNTAIN SECTION MEETING, P.O. BOX 9140, BOULDER, CO 80301
FAX TO: 303-447-1133 or 303-443-1510
Remit in U.S. funds payable to: 2000 GSA Rocky Mountain Section Meeting
(All preregistrations must be prepaid. Purchase Orders not accepted.)

Payment by (check one): Check # _____
 American Express VISA MasterCard Discover Diners Club
 Card Number _____ Expires _____

Signature _____

PREREGISTRATION FEES	Full Meeting	One Day	Qty.	Amount
Professional Member*	(10) \$60 <input type="checkbox"/>	(11) \$40 <input type="checkbox"/>		\$
Professional Member (70 & older)*	(12) \$25 <input type="checkbox"/>	(13) \$20 <input type="checkbox"/>		\$
Professional Nonmember	(14) \$65 <input type="checkbox"/>	(15) \$45 <input type="checkbox"/>		\$
Student Member*	(30) \$30 <input type="checkbox"/>	(31) \$15 <input type="checkbox"/>		\$
Student Nonmember	(32) \$30 <input type="checkbox"/>	(33) \$15 <input type="checkbox"/>		\$
K-12 Professional	(60) \$30 <input type="checkbox"/>	(61) \$15 <input type="checkbox"/>		\$
Guest or Spouse	(90) \$10 <input type="checkbox"/>			\$
Field Trip Only†	(95) \$ 5 <input type="checkbox"/>			\$
*Member fee applies to any current Professional OR Student Member of GSA or Associated Societies listed below. Check member affiliation (to qualify for member registration discount):				
<input type="checkbox"/> (1) GSA Member # _____	<input type="checkbox"/> (2) AWG <input type="checkbox"/> (3) NAGT <input type="checkbox"/> (4) PS <input type="checkbox"/> (5) SEPM			
Discount does not apply to guest registrants.				
†Not required for K-12 teachers.				
TICKETED EVENTS				
1. Annual Banquet	April 17			
Southwestern Sirloin with Sun-Dried Tomato Sauce		(301) \$18		\$
King Salmon Filet in Court Bouillon		(302) \$18		\$
Sauteed Chicken with Wine, Herbs		(303) \$18		\$
Pasta Primavera		(304) \$17		\$
2. Deli Lunch (incl. salad, soup, drink)				
April 17—Smoked Turkey-Havarti Cheese (choose A <input type="checkbox"/> greens salad; B <input type="checkbox"/> pasta salad)		(305) \$ 9		\$
April 17—Olive & Vegetable Chutney (choose A <input type="checkbox"/> greens salad; B <input type="checkbox"/> pasta salad)		(306) \$ 9		\$
April 18—Roast Beef-Brie Cheese (choose A <input type="checkbox"/> greens salad; B <input type="checkbox"/> Dijon pasta)		(307) \$ 9		\$
April 18—Olive & Vegetable Chutney (choose A <input type="checkbox"/> greens salad; B <input type="checkbox"/> Dijon pasta)		(308) \$ 9		\$
3. GSA Rocky Min. Management Board Breakfast	April 18	(309) Free		\$
4. Riverside fun run/walk	April 18	(310) Free		\$
GUEST EVENT				
1. Rocky Min. Elk Foundation & Ft. Missoula Museum	April 18	(101) \$ 5		\$
WORKSHOPS				
1. Stereo Aerial Photography	April 15-16			
Professional		(601) \$250		\$
Student		(602) \$225		\$
2. Roy J. Shlemmon Mentor Program (Different programs each day.)	April 17	(603) \$ 10		\$
	April 18	(604) \$ 10		\$
FIELD TRIPS (Separate registration forms required for each field trip participant.)				
1. Tectonic Evolution of Bitterroot Metamorphic Complex with special B&B	April 15-16	(401) \$110		\$
		(402) \$140		\$
2. Glacial Lake Missoula	April 16	(403) \$ 45		\$
3. Quaternary Geology, etc. Flathead Valley	April 15-16	(404) \$ 80		\$
4. Geochemistry/Remediation of Clark Fort Superfund site	April 16	(405) \$ 50		\$
5. Geology of Lewis and Clark Line, Coeur d'Alene Mining	April 15-16	(406) \$105		\$
6. Blackfoot Thrust Just East of Missoula	April 17	(407) \$ 5		\$
7. Structural/Stratigraphic Evolution of Rky Mt. Foreland	April 19-20	(408) \$110		\$
8. Shallow Plutonism Sevier Fold and Thrust Belt	April 18-20	(409) \$180		\$
9. Platinum Metal Mines	April 19-21			
Professional		(410) \$250		\$
Student		(411) \$200		\$
10. Mississippian Carbonate Cycles	April 18-20	(412) \$105		\$
11. Blackfoot Landslide and Debris Slide	April 19	(413) \$ 50		\$
12. Geology of Lewis and Clark Trail, MT and ID	April 18-20	(414) \$190		\$
				TOTAL FEES \$

GSA Offers Awards in Geomorphology and Micropaleontology

Two GSA awards for support of research are a testimony to the generosity of the late W. Storrs Cole. The Gladys W. Cole Memorial Research Award provides support for the investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. It is to be given to a GSA Member or Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology. Funds cannot be used for work already accomplished, but recipients of a previous award may reapply if additional support is needed to complete their work. The amount of this award in 2000 will be \$11,000.

The second award, the W. Storrs Cole Memorial Research Award, was established to support research in invertebrate micropaleontology. This award will carry a stipend of \$9,000 in 2000 and will be given to a GSA Member or Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.

Additional information and application forms may be requested from the Research Grants Administrator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, e-mail lcarter@geosociety.org. Applications are now available on GSA's Web site www.geosociety.org. Applications will not be accepted by e-mail or facsimile.

All applications must be postmarked on or before February 1, 2000. Actions taken by the Committee on Research Grants will be reported to each applicant in April.

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

NORTHEASTERN SECTION ANNOUNCES TWO STUDENT GRANT PROGRAMS

UNDERGRADUATE STUDENT RESEARCH GRANTS

The Northeastern Section's student research grant program for 2000 is competitive and available only to undergraduate students.

To be considered for a research grant:

- ◆ The student must be enrolled at an institution within the Northeastern Section.
- ◆ The student must be a student associate or member of GSA.
- ◆ Applications must be postmarked no later than February 7, 2000.
- ◆ Grants will be awarded following the Northeastern Section Meeting in New Brunswick, New Jersey in March 2000.

STUDENT TRAVEL GRANT PROGRAM

The Northeastern Section's student travel grant program is open to graduate and undergraduate students.

To be considered for a travel grant:

- ◆ The student must be the presenter of the paper.
- ◆ The student must be a student associate or member of GSA.
- ◆ Applications must be postmarked no later than February 7, 2000.
- ◆ Grants will be awarded approximately 10 days prior to the Northeastern Section Meeting in New Brunswick, New Jersey in March 2000.

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

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

The Geological Society of America

2000 Research Grants Program for Students

The primary role of the Research Grants Program is to provide partial support for research in earth science by graduate students at universities in the United States, Canada, Mexico, and Central America. GSA strongly encourages women, minorities, and persons with disabilities to participate fully in this grants program. Eligibility is not restricted to GSA members. New application forms are available each fall in the geology departments of colleges and universities offering graduate degrees in earth sciences. Forms are mailed to GSA Campus Representatives, department secretaries, and chairpersons in the United States, Canada, and Mexico. Application forms and information are available on GSA's Web page, www.geosociety.org. Applications may be downloaded from the Web but may **not** be submitted by facsimile or e-mail. They are also available upon request from the Research Grants Administrator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301. *Please use only the current 2000 application and appraisal forms.*

Confidential evaluations from two faculty members are required from candidates for the M.S. or Ph.D. degree and must accompany applications submitted. PLEASE USE THE "APPRAISAL OF APPLICANT" FORMS, WHICH ACCOMPANY THE 2000 APPLICATION FORMS. APPLICATION FORMS WILL NOT BE ACCEPTED BY FACSIMILE OR E-MAIL.

The Geological Society of America awarded over \$395,000 in grants in 1999. The grants went to 212 students doing research for advanced degrees. The average amount awarded was \$1865. The largest grant was \$4500, but there is no predetermined maximum amount. Grants supported 45 percent of the applicants. Funding for this program is provided by a number of sources, including GSA's Penrose and Pardee endowments, the National Science Foundation, industry, individual GSA members through the GEOSTAR and Research Grants funds, and numerous dedicated research funds that have been endowed at the GSA Foundation by members and families.

The Committee on Research Grants will meet soon after the deadline to evaluate applications and award grants. In April, all applicants for grants will be informed of the committee's actions by the Executive Director/CEO of the Geological Society of America.

ALL APPLICATIONS MUST BE SUBMITTED ON THE 2000 FORMS
AND POSTMARKED BY FEBRUARY 1, 2000



1999



Crossing Divides



The 1999 GSA Annual Meeting, held October 25–28, brought 6,323 attendees to Denver, filling the corridors of the Colorado Convention Center.

Princeton

Chesapeake Invader

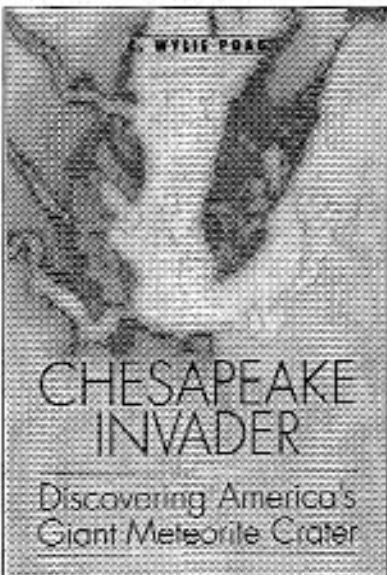
Discovering America's Giant Meteorite Crater

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Thirty-five million years ago, a meteorite three miles wide and moving sixty times faster than a bullet slammed into the sea bed near what is now Chesapeake Bay. The impact blasted out a crater fifty miles wide and one mile deep.

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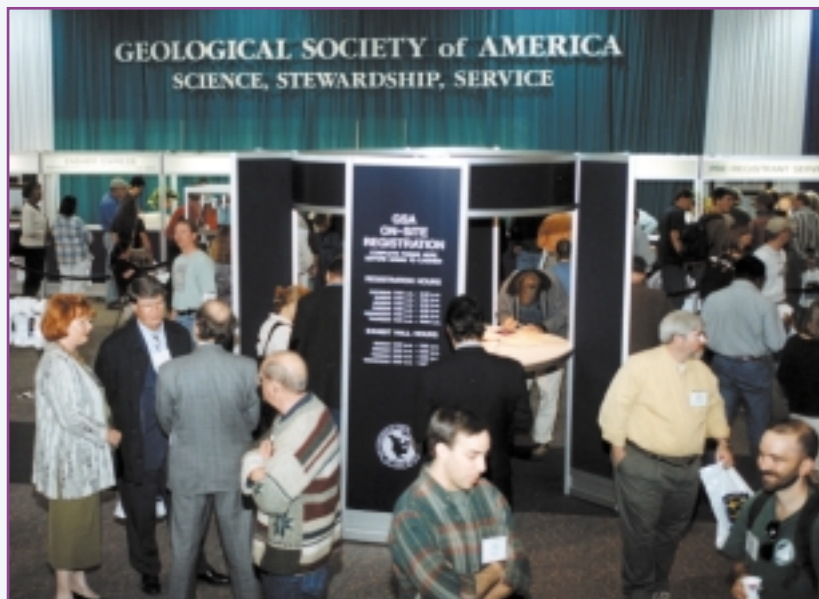
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Meetings at the meeting

Business meetings peppered the week as GSA governing bodies and those of its associated societies met from early morning to as late as the attendees could remain upright in their hotel conference room chairs. Minutes approved, resolutions passed, officers elected and committees appointed, the wheels of GSA and its associated societies are set to turn for another year.



The registration area was busy throughout the meeting.

Show me the rocks

Premeeting Thursday, October 21, saw the first of the field trippers heading out. A total of 21 trips before, during, and after the meeting, showcased the geology of the Colorado Plateau. Participants foraged for kimberlite collectibles in pipes and dikes in the Colorado-Wyoming state line area, learned of Front Range geologic hazards, reconnoitered tracks along Dinosaur Ridge, and studied the Red Rocks Park formations, among other geologic attractions.

Welcoming Party buzz among the booths

A parting of velvet ropes signaled the opening of the exhibit hall, where the outpouring of pamphlets was topped only by the pouring of beverages. The 171 exhibitors demonstrated their electron microscopes, fossils, books, and other wares throughout the meeting.



Subaru was a major sponsor.

By the numbers

A total of 2,914 abstracts were submitted for 218 technical sessions and symposia.

Some 27 workshops and courses helped attendees learn about or brush up on subjects such as radiogenic isotopes, sequence stratigraphy, and teaching geoscience to undergraduates.

The Employment Service offered 43 employers the opportunity to interview 174 applicants for 97 available positions.

Highlights

In the first of eight Pardee Keynote Symposia, Maintaining a Livable Earth: Conversations Among Concerned Geologists, the papers and discussions concerned geoscientists' role in public policy on the sustainability of Earth. Topics included radioactive waste, the relocation of the Cape Hatteras Lighthouse, and ozone depletion. Lively question-and-answer periods included questions from the floor about who will define sustainability, what standard of living will be used, and what sort of social structures work best to effect such a massive change in public policy.

The Pardee Keynote Symposium Geoscientists in the Legal System: The Challenge for the Next Century used as a basis for discussion the lawsuits claiming injuries caused from chemical contamination of town wells in Woburn, Massachusetts. Questions

from the audience led to discussions of whether there should be professional jurors for such complex cases, or whether juries should handle such cases at all. Can a jury of lay people understand the case well enough to make a decision? Are the legal system and the scientific method at odds with each other—one dealing in absolutes, the other in hypotheses and assumptions?

Another Pardee Keynote Symposium, Impact Events: Environmental Consequences and Their Influence on the Origin and Evolution of Life, delved into the questions of what the consequences for life and the environment are when objects collide with Earth, and whether organic material within these projectiles could survive such a collision. Much of the research focused on the Chicxulub impact



The breakfast attracted 1,000 hungry students.

A noon Hot Topic session, Hardrock Mining of Federal Lands, featured a lively exchange of opinion on the National Research Council's new report on the subject and associated recommendations for revising federal laws and regulations. This debate is particularly important because of the large scale of the issue: more than 350 million acres of public land, most of it in the West, is open to mining. The principal administrators of mining regulations, the U.S. Bureau of Land Management and the U.S. Forest Service, oversee 38% of the total land area of 12 western states.

A special session hosted by the American Institute of Professional Geologists focused on Geoscience Ethics Guidelines. Two electrifying questions—"When, if ever, is it acceptable for a professor to have sexual relations with a student?" and "When, if ever, is it appropriate for a professor to accept money for a consulting job, use university facilities (library, office, laboratories, or equipment) for the work, and not compensate the university for the overhead expenses related to those facilities?"—provoked considerable discussion.




GSA VP Sharon Mosher talks to breakfasting students.

and the K-T boundary, but much is also being learned from laboratory simulations, the composition of the gas and dust from Haley's comet, the collision of the Shoemaker-Levy comet with Jupiter, and data coming back from Mars. New information on what happens during and after a large impact (including long-term effects) can help determine the safest place for organisms to survive.

A poster session on Surficial Three-Dimensional Geologic Mapping attracted a considerable crowd. Most of the projects were parts of larger efforts to map not only the geology but also a wide variety of other data, including well locations, landfills, subsurface water, housing developments, natural vegetation, and faults. Some projects included public outreach. The Seattle Geologic Mapping Project has an active public education component that informs the community about potential earthquake and landslide hazards. The Wyoming Internet Map Server uses a GIS-structured database in its public outreach; the public and schoolchildren as young as the sixth grade are encouraged to create and modify maps in order to answer questions.

President Gail Ashley welcomes students.




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 and
Dr. William (Bill) Woessner
 University of Montana
 Missoula MT. 59812
 (406) 243-5698, gl_www@selway.umt.edu



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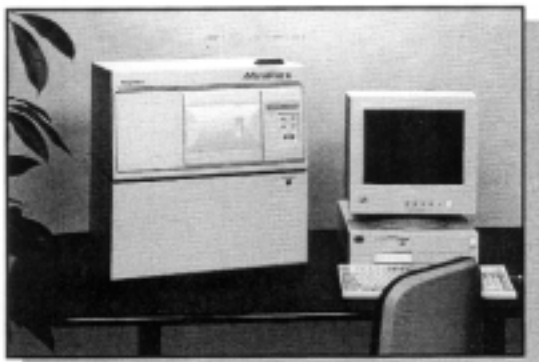
GSA Foundation Trustee Bob Fuchs makes sure the 20th Anniversary cake is edible.

An enthusiastic, standing-room-only crowd attended the special theme session Environmental Justice: Geocological, Social, and Philosophical Perspectives. Speakers maintained variously that scientific investigators no longer debate the reality of global warming, only how much money is to be made; that environmental justice is achieved when the need to develop and use natural resources is tempered by consideration of all parties involved, including environmental groups, local residents, religious groups, and poor people who cannot speak on their own behalf; and that geologists' unique perspective, which is derived from an understanding of deep time, an appreciation for the range of scales involved, and an ability to integrate other scientific data, has much to offer.

GSA President Gail Ashley's talk on her work at Olduvai Gorge in Tanzania gave the Presidential Address and Awards Ceremony audience a well-illustrated look at a truly integrative project: social scientists, biologists, physicists, and geologists studying the land and hominid occupation of it during a 50,000 year time slice starting about 1.75 million years ago. Ashley's focus on springs-groundwater discharge in the paleolandscape brings in hydrology, geochemistry, and ecology of modern environments as well. The Cat's Meow Quartet, dressed in khakis and singing about the vicissitudes—and joy—of field work provided a rousing finish to the presidential address, especially when Gail joined them in singing the final verses. It was a hard act to follow, but the awardees—M. Gordon (Reds) Wolman (Penrose Medal), Donald J. DePaolo (Day Medal), Peter C. Burns (Donath



Foundation President Lee Suttner thanks contributors.



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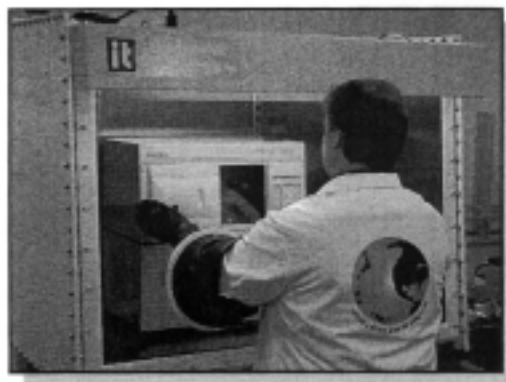
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Stephen Jay Gould accepts the first GSA Public Service Award.



Medal), Stephen J. Gould (first GSA Public Service Award), Priscilla C. Grew (AGI Medal in Memory of Ian Campbell), and Randolph W. Bromery (Distinguished Service Award) did their best. (The two other Distinguished Service awardees, Sue S. Beggs and Lynn M. Walter, were unable to attend.)

Earthquakes in Turkey, Greece, Taiwan, Mexico, and California kept seismologists busy in August, September, and October of 1999. A special noon session, The Izmit, Turkey, Earthquake, which attracted about 200 people, illustrated national and international study efforts, as scientists try to determine where the next earthquakes will happen and how to help people avoid the devastating results.



Gail Ashley joins the singing quartet after her presidential address.

"Don't take vision for granite" implored a poster presentation in the session Teaching Geology to the Disabled. Currently, 4% of earth, atmospheric, and ocean scientists have some sort of disability. Teaching students with disabilities within these fields can be a formidable challenge to those with no prior experience. The poster session offered

creative solutions, including the use of books on tape, software to convert files to audio, and thin aluminum sheets to make raised drawings to convey geologic concepts.

In the Hot Topic session Climate Changes, climate experts vied in short presentations and in brisk discussion to put forth their views on whether humans have done major or minor damage to Earth's climate and what can be done about it. All five presenters agreed that human pollutants have affected the slow but steady rise in temperatures, particularly at the poles, and four of the five felt that humans must try to ameliorate the problem. Regardless of how climate change has come about, one speaker said, variations must be dealt with by everyone, insurance companies and geologists alike.



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Poster sessions were a popular means of presentation.



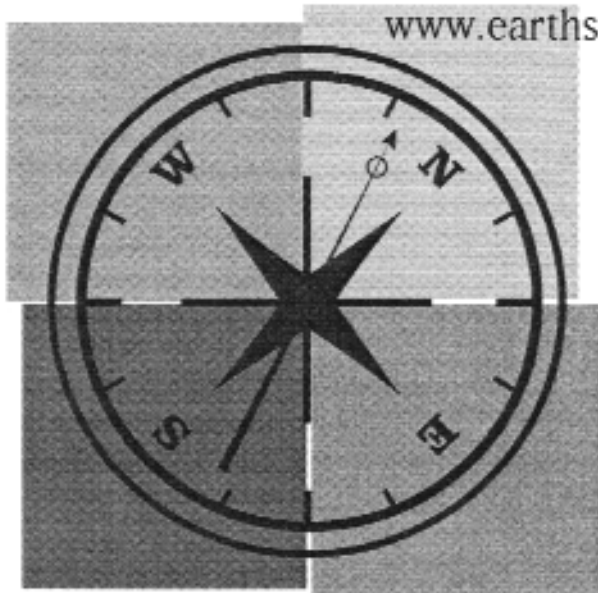
Authors Cornelia Dean (left) and Sarah Andrews (right) autograph their books in the exhibit area.



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This project has been developed with substantial financial assistance from SPARC, the Scholarly Publishing and Academic Resource Coalition, and the National Science Foundation.



“The GSA show is my favorite show to attend. Our prospective clients are enthusiastic, informative, and open to dialogue.”

**—Jim Dutkiewicz
Meiji Techno America**

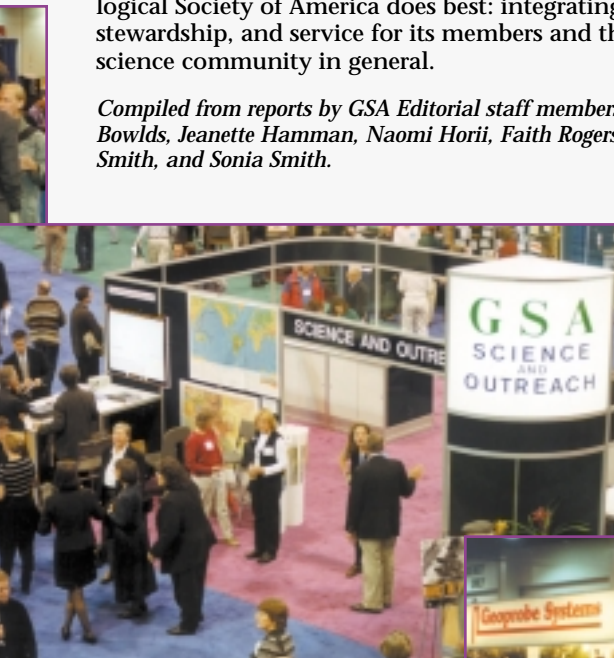


To a standing-room only crowd, geoscientists from different backgrounds discussed the creationism vs. evolution debate, ignited most recently by the Kansas School Board. Creationism vs. Evolution in the Classroom, a GSA Geology and Public Policy Forum, touched nerves in the attentive audience. The speakers advised listeners to avoid defensiveness with creationists, to work to expose their methods, and, echoing a theme heard throughout this 1999 GSA Meeting, to avoid ivory tower isolation.

The session Geologic Input to Public Decision-Making: The Need for Greater Predictive Capability explored the challenges to using prediction successfully. Speakers said that geologists must be active in pointing out potential problems, such as mudslides or heaving bedrock, that community leaders, homeowners, and developers must take into account.

Sessions and events ranging from art in teaching earth science to the uses of zoology in dating strata made the 1999 GSA Annual Meeting an example of what the Geological Society of America does best: integrating science, stewardship, and service for its members and the earth science community in general.

Compiled from reports by GSA Editorial staff members Larry Bowlds, Jeanette Hamman, Naomi Horii, Faith Rogers, Christie Smith, and Sonia Smith.



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Please Note: All prices are in U.S. dollars, except for hotel rates (which are quoted in Canadian dollars) or where otherwise indicated. Please check current exchange rates when you reserve your hotel rooms.

The 2000 meeting will be hosted by the Department of Earth Sciences, Simon Fraser University. Associated organizations include the Pacific Division of the Geological Survey of Canada, the B.C. Geological Survey, the Northwest Geological Society, the University of British Columbia, the Paleontology Society of America, the Paleontologic Alliance of B.C., and the Cordilleran and Pacific Sections of the Geological Association of Canada. The meeting venue is Robson Square Conference Centre, in the heart of downtown Vancouver and within walking distance of most major hotels, restaurants, and entertainment facilities (see map).

PREREGISTRATION

Preregistration deadline:
March 17, 2000

Preregistration will be handled by GSA headquarters. Use the registration forms in this announcement or download the PDF version from our Web site. Guest registration is required for those attending guest activities, technical sessions, and exhibits. Students and K-12 teachers must show a current ID in order to obtain reduced rates. On-site registration will be on the Plaza Level of the Robson Square Conference Centre and available starting late Wednesday afternoon, April 26. Members pay less! You can join now or at the meeting.

The *Abstracts with Programs* book may be purchased on-site in the registration area. Only a limited number will be available at the meeting.

TECHNICAL PROGRAM

A total of 24 symposia or theme sessions are scheduled for the meeting. Only titles and chairs are listed below; see www.eos.ubc.ca/cordgsa2000 for session descriptions. Most technical sessions will include both invited and volunteered papers. Additional discipline-related sessions will be scheduled on the basis of submitted abstracts.

Oral sessions will allow 15 minutes for presentation and three minutes for dis-

ussion. Equipment for each technical session consists of two 35 mm carousel projectors for 2" x 2" slides and one overhead projector for transparencies. Video projection or computer display equipment will not be generally available; specific requests for computer display equipment must be transmitted to the program chairs at least six weeks in advance, and rental charges will in part be paid by the presenter. Presenters are asked to *not* bring carousel trays; these will be provided at the speaker-ready room.

Posters will be on display for four hours; authors must be present for two hours. Each poster booth will contain two 4' x 8' tackable boards.

Address general questions to any of the program co-chairs: Bert Struik, Geological Survey of Canada, 101-605 Robson St., Vancouver, B.C. V6B 5J3, Canada, (604) 666-6413, bstruik@nrcan.gc.ca; Diana Allen, Earth Sciences, Simon Fraser University, Burnaby, B.C., V5A 1S6, Canada, (604) 291-3967, dallen@sfu.ca; or Derek Thorkelson, Earth Sciences, Simon Fraser University, Burnaby, B.C., V5A 1S6, Canada, (604) 291-5390, dthorkel@sfu.ca.

Symposia

1. Carboniferous to Recent Geological and Metallogenic Evolution of Central Canadian Cordillera. Bert Struik, Geological Survey of Canada, Vancouver, (604) 666-6413, bstruik@nrcan.gc.ca; Don MacIntyre, B.C. Geological Survey, Victoria, B.C., (250) 952-0440, Don.MacIntyre@gems1.gov.bc.ca.
2. Quaternary Geology of the Puget Lowland. (*Sponsored by the Northwest Geological Society.*) Kathy Troost, (206) 616-9769, ktroost@u.washington.edu; Derek Booth, (206) 543-7923, dbooth@u.washington.edu, University of Washington, Seattle; Ray Wells, U.S. Geological Survey, Menlo Park, (650) 329-4933, rwells@usgs.gov; Sam Johnson, U.S. Geological Survey, Lakewood, Colorado, (303) 273-8608, sjohnson@usgs.gov; Don Easterbrook, Western Washington University, Bellingham, (360) 650-3583, dbunny@cc.wvu.edu; Tim Walsh, Washington Dept. of Natural Resources, Olympia, (360) 902-1432, tim.walsh@wadnr.gov.

Theme Sessions

1. Circum-North Pacific Metallogenes. Warren Nokleberg, USGS Menlo Park, California, (650) 329-5732, wnokleberg@isdmnl.wr.usgs.gov; Suzanne Paradis, Geological Survey of Canada, Sydney, B.C., (250) 363-6732, paradis@pgc.nrcan.gc.ca.
2. Central American Metallogenes. Ken Dawson, North Vancouver, B.C., (604) 984-0102, kdawson@northvan.net.



Cordilleran continued on p. 30

3. Andes Metalotects. Dick Tosdal, University of British Columbia, Vancouver, (604) 822-2449, rtosdal@eos.ubc.ca; Andre Panteleyev, XDM Geological, Victoria, B.C., (250) 477-8192, xdmgeo@home.com.
4. Geochronology of Circum-Pacific Mineral Deposits. Jim Mortensen, University of British Columbia, Vancouver, (604) 822-6208, jmortens@eos.ubc.ca; Mike Villeneuve, Geological Survey of Canada, Ottawa, (613) 995-4018, mvilleneuve@gsc.nrcan.gc.ca.
5. Eocene Tectonics and Magmatism of the Cordillera. (*Sponsored by the GSA Structural and Tectonics Division.*) George Morris, University of Alberta, Edmonton, (780) 492-3265, morris@ualberta.ca; Peter Larson, Washington State University, Pullman, plarson@wsu.edu.
6. Gemstones of the Pacific Rim. Ted Danner, University of British Columbia, Vancouver, (604) 822-6892; George Simandl, B.C. Geological Survey, Victoria, (250) 952-0413, George.Simandl@gems2.gov.bc.ca.
7. Intrusion-Related Gold Systems—Geology and Metallogenesis of the Tintina Gold Belt. Craig Hart, Yukon Geology Program, Whitehorse, (867) 667-8519, Craig.Hart@gov.yk.ca; Richard Goldfarb, USGS, Lakewood, Colorado, (303) 236-2441, goldfarb@helios.cr.usgs.gov.
8. Harnessing Geothermal Resources. Mory Ghomshei, University of British Columbia, Vancouver, B.C., (604) 822-2540, ghomshei@mining.ubc.ca.
9. Metals and Their Mobility in Mountainous Environments. (*Sponsored by Pacific Section, Geological Association of Canada.*) Steve Cook and Ray Lett, B.C. Geological Survey, Victoria, (250) 952-0393, Stephen.Cook@gems8.gov.bc.ca; Ray.Lett@gems7.gov.bc.ca.
10. Paleontology of Cordilleran Terranes. (*Cosponsored by Paleontological Alliance of B.C. and Pacific Section of Paleontology Society of America.*) Ted Danner, University of British Columbia, Vancouver, (604) 822-6892; Mike Orchard, Geological Survey of Canada, Vancouver, (604) 666-0409, morchard@gsc.nrcan.gc.ca.
11. Searching for Barcodes in the Cordillera: Applications and Limits of New Provenance Methods. Paul Link, Idaho State University, Pocatello, (208) 236-3365, linkpaul@isu.edu; Bill McClelland, University of Idaho, Moscow, (208) 885-4704, wmccllell@uidaho.edu.
12. Terrane Accretion and Structural Evolution of the Southern Coast Mountains and Cascades Belts. Murray Journeay, Geological Survey of Canada, Vancouver, (604) 666-1130, mjourneay@gsc.nrcan.gc.ca.
13. Aquifer Management and Protection in Coastal Regions. Allan Dakin, Piteau Associates Engineering Ltd. North

- Vancouver, British Columbia, (604) 986-8551, radakin@piteau.com; Hans Schreier, University of British Columbia, Vancouver, star@unixg.ubc.ca.
14. Environmental Impacts of Mining and Mine Decommissioning Strategies. Leslie Smith, University of British Columbia, Vancouver, (604) 822-4108, lsmith@eos.ubc.ca.
 15. Rehabilitation of Contaminated Sites. Roger Beckie, University of British Columbia, Vancouver, (604) 822-6462, rbeckie@eos.ubc.ca.
 16. Geologic Input to Seismic Hazard Microzonation. (*Sponsored by Pacific Section, Geological Association of Canada.*) Vic Levson, B.C. Geological Survey, Victoria, (250) 952-0391, Vic.Levson@gems9.gov.bc.ca; Jack Boatwright, Menlo Park, California, (650) 329-5609, boat@samoawr.usgs.gov.
 17. AEG Session: Landslides and Other Slope Hazards in the Cordillera. (*Sponsored by the Association of Engineering Geologists, Committee on Landslides.*) Mike Hart, San Diego, California, (619) 578-4672, mwhart@aol.com.
 18. Terrane Paths: Experiments in Paleogeography. (*Sponsored by GSA Structural and Tectonics Division.*) Derek Thorkelson, Simon Fraser University, (604) 291-5390, dthorkel@sfu.ca; Steve Johnston, University of Victoria, (250) 721-6200, stj@uvic.ca.
 19. Brave New Worlds: Wrestling with Digital Information Management to Foster Geological Research. Sonia Talwar and Murray Journeay, Geological Survey of Canada, Vancouver, (604) 666-1131, stalwar@nrcan.gc.ca, mjourneay@gsc.nrcan.gc.ca.
 20. Undergraduate Research Posters. (*Sponsored by GSA Council on Undergraduate Research.*) Susan DeBari, Western Washington University, Bellingham, (360) 650-3588, debari@cc.wvu.edu.
 21. Pericratonic Terranes at the Ancient Pacific Margin of North America. Maurice Colpron, Yukon Geology Program, (867) 667-8235; fax 867-393-6232, Maurice.Colpron@gov.yk.ca.
 22. Integrating Landslide Hazard Information into Land-Use and Public Policy. (*Cosponsored by Cordilleran Geology & Public Policy Committee, Association of Engineering Geologists, Committee on Landslides, and GSA Engineering Geology Division.*) Jerome V. DeGraff, USDA Forest Service, Clovis, California, (559) 297-0706, ext. 4932, jdegraff/r5_sierra@fs.fed.us.

FIELD TRIPS

Preregistration Deadline:

March 17, 2000

Cancellation Deadline:

March 24, 2000

A field trip guidebook will be published by the Cordilleran Section of the Geological Association of Canada and is included in the registration cost for each

trip. It will also be available for sale at the meeting. Except for trip one, which departs from Calgary, field trips will depart from, and return to, the Robson Square Conference Centre. Unless otherwise stated, trip fees include transportation, meals, refreshments during the trip, and a guidebook. Lodging (double occupancy) is provided for multiday trips. You must be registered for the meeting to participate in a field trip.

More extensive trip descriptions are provided on the Web at www.eos.ubc.ca/cordgsa2000/. For additional information, contact the field trip leader or one of the field trip chairs: Brent Ward, Earth Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6, Canada, beward@sfu.ca; Lionel Jackson, Geological Survey of Canada, 101-605 Robson St., Vancouver, B.C. V6B 5J3, Canada, ljackson@gsc.nrcan.gc.ca; JoAnne Nelson, B.C. Geological Survey, P.O. Box 9320 Stn. Prov. Govt., Victoria, B.C. V8W 9N3, Canada, joanne.nelson@gems1.gov.bc.ca.

Premeeting

1. A Transect of the Southern Canadian Cordillera—Calgary to Vancouver. April 24–26. Ray Price, Queens University, Kingston, Ontario, (613) 533-6542, price@geol.queensu.ca. Includes accommodation in Calgary April 24–26. Limit: 45. Cost: \$420. Results from southern Cordilleran Lithoprobe transect; nature and evolution of accretionary orogen; implications for origin and growth of new continental crust. *Note:* This trip begins in Calgary, and registrants are responsible for transport to Calgary.
2. Paleontology of the Cache Creek and Quesnel terranes. (*Sponsored by the Paleontological Alliance of B.C.*) April 25–26. Ted Danner, University of British Columbia, Vancouver, (604) 822-6892 (no email); Mike Orchard, morchard@gsc.nrcan.gc.ca. Limit: 22. Cost: \$165. Devonian, Carboniferous, Permian, and Triassic strata; historic fusulinacean localities; unique biostratigraphic attributes compared with autochthonous successions to east.
3. Capsule Geology of the Vancouver Area. April 26. Jim Roddick, Geological Survey of Canada, Vancouver, B.C., (604) 666-2378, roddick@gsc.nrcan.gc.ca. Limit: 40. Cost: \$74. Includes young Quadra Sand, Oligocene precursors of Cascade volcanics, Upper Cretaceous to Paleogene sediments, underlying basement of granite and metamorphic rocks.
4. Engineering Geology and Natural Hazards of the Fraser River Delta. (*Sponsored by Pacific Section, Geological Association of Canada.*) April 26. Patrick Monahan, Brentwood Bay, B.C., (250) 652-9254, monahan@ampsc.com. Limit: 44. Cost: \$70. Urban and geological character of one of the most seismically active regions in Canada; techniques to investi-

gate deltaic soils and mitigate hazards and problems of construction.

Postmeeting

5. Quaternary and Engineering Geology of the Fraser and Thompson River Valleys, Southwestern B.C. April 30–May 1. John Clague, Simon Fraser University, Burnaby, B.C., (604) 291-4924, jclague@sfu.ca. Includes one night accommodation (shared), one breakfast, two lunches, one dinner. Limit: 42. Cost: \$140. Classic area of ice-sheet and alpine glaciation; landslides involving bedrock and Quaternary soils; Hope Slide.

6. Quaternary Stratigraphy and Geomorphology of South-Central British Columbia (and Wines of the Okanagan Valley). April 30–May 2. Robert J. Fulton, Geological Survey of Canada, West Bank, British Columbia, (250) 707-0793, robert_fulton@bc.sympatico.ca. Includes two nights accommodation (shared), two breakfasts, three lunches, two dinners. Limit: 44. Cost: \$255. Quaternary successions dating from Matuyama Reversed Polarity Chron through retreat of Late Wisconsinan glaciers; history and characteristics of Okanagan wine industry and visits to wineries.

7. Scraping Up the Mess—Outboard Terranes of Southern Vancouver Island. (Sponsored by Pacific Section, Geological Association of Canada.) April 30–May 2. Nick Massey, British Columbia Geological Survey, Victoria, (250) 952-0428, Nick.Massey@gems9.gov.bc.ca. Includes two lunches and one dinner. Limit: 12. Cost: \$225. Typical lithologies of two terranes that underplate Wrangellian rocks of Vancouver Island; possible connections between fore-arc intrusions in Leech River Complex and Metchosin Complex.

8. Tertiary Geology of the Eastern Flank of the Central Cascade Range, Washington. (Sponsored by Northwest Geological Society.) April 29–May 1. Saturday, April 29 evening departure. Eric Cheney, University of Washington, Seattle, (206) 543-1163, vaalbara@u.washington.edu. Includes two nights accommodation (shared), two dinners, two breakfasts, and two lunches. Limit: 26. Cost: \$293. Stratigraphy and structure of Eocene unconformity-bounded formations that shed light on location of Leavenworth fault of Chiwaukum graben and southern end of Straight Creek fault; Columbia River Basalt Group relative to age of uplift of present Cascade Range.

9. Quesnel Terrane—Always There? April 30–May 3. Robert I. (Bob) Thompson, Geological Survey of Canada, Sidney, British Columbia, (250) 707-0793, robert_thompson@bc.sympatico.ca. Includes four nights accommodation (shared), three days of meals, three lunches, two dinners, two breakfasts, and two lunches. Limit: 18. Cost: \$445. Evidence for stratigraphic base of "Quesnellia," Paleozoic North American

supracrustal rocks more than 100 km west of Okanagan Valley, west-dipping extension faults instead of crustal-scale detachment fault in north Okanagan Valley.

10. North Cascades Cretaceous Crustal Section: Changing Kinematics, Rheology, Metamorphism, Pluton Emplacement, and Petrogenesis from 0 to 40 Kilometers Depth. April 30–May 2. Robert Miller, San Jose State University, (408) 924-5025, rmiller@geosun1.sjsu.edu. Limit: 30. Cost: \$268. Structures, metamorphic units, and plutons in southern Cascades core; relationships among deformation, magmatism, and metamorphism during major vertical motion in Cretaceous magmatic arc—contraction, crustal loading, exhumation.

11. Teaching Geology along the Nooksack and Skagit Rivers (a primer for secondary and lower-division college field trips). (Sponsored by the Northwest Geological Society.) April 30–May 1. Tracy Furutani, North Seattle Community College, (206) 528-4501, furutani@seaccd.sccd.ctc.edu. Included: Lunch only (for both days). Limit: 25. Cost: \$84. Sites for illustrating points about petrology, geomorphology, and structural geology; ways in which field geology can augment classroom instruction.

12. Neogene Fault Systems of the Northern Cascadia Forearc. April 30–May 2. J. Murray Journeay, Geological Survey of Canada, Vancouver, (604) 666-1130, mjourneay@gsc.nrcan.gc.ca. Limit: 50. Cost: \$340. Neogene crustal response to oblique underplating and forearc slivering in subduction-accretion complex, southwestern British Columbia; Cascadia intra-arc region along Vancouver-Whistler corridor; inner Cascadia forearc region of southern Canadian Gulf Islands (transport by boat for shoreline access).

WORKSHOPS

1. Developing On-Line Geoscience Courses.

1A. Framework for Assembling On-line Geoscience Course Components. April 26, 9:00 a.m.–12:00 noon, Robson Square Conference Centre, Vancouver. Facilitators: Sonia Talwar, stalwar@nrcan.gc.ca, Geological Survey of Canada, Vancouver, (604) 666-1131; Michelle Lamberson, mlamberson@eos.ubc.ca, University of British Columbia, Vancouver, (604) 822-0865. Limit: 60. Cost: \$20.

1B. Piecing the Puzzle Together: Creating Your Own On-Line Geoscience Course Components. April 26, 1:00–4:30 p.m., SFU Burnaby Mountain Campus. Michelle Lamberson, University of British Columbia, Vancouver, (604) 822-0865, mlamberson@eos.ubc.ca; Sonia Talwar, Geological Survey of Canada, Vancouver, (604) 666-1131, stalwar@nrcan.gc.ca. Limit: 36. Cost: \$50. Bus transportation provided to and from the workshop.

2. Earthquakes and Engineering Geology in Southwest British Columbia: A Short Course and Field Trip. (Sponsored by Pacific Section, Geological Association of Canada.) April 26, 8:30 a.m.–5:00 p.m., Robson Square Conference Centre, Vancouver. Vic Levson, B.C. Geological Survey, Victoria, (250) 952-0391, Vic.Levson@gems9.gov.bc.ca. Limit: 50. Cost: \$35.

3. Roy J. Shlemon Mentor Program in Applied Geology. Workshop and field excursion for upper-level undergraduate and graduate students. April 28, 8:30 a.m.–5 p.m. Location to be announced on www.geosociety.org. Students wishing to attend should send a short letter of interest by March 1 to Jeff Fillipone, jfillipone@golder.com. Maximum: 30; minimum: 10. Lunch provided. Cost: \$10. Preregistration required.

K-12 EDUCATIONAL PROGRAMS

For further details, contact Robbie Dunlop, Earth Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6, Canada, (604) 291-4925, rdunlop@sfu.ca.

Activities for Grades 8–11:

The Science of Mining: A Resource Unit. (Sponsored by Mining Association of B.C.) April 26, 8:30 a.m.–12 noon, Robson Square Conference Centre. Eric Rustand, Norkam Secondary, 730 12th Street, -Kamloops, B.C. V2B 3C1, Canada, (250) 376-1272, erustand@cin.etc.bc.ca; Limit: 45. Cost: \$35.

Activities for Grades 11–12:

Earth Science 11/Geology 12: Resources and Ideas. (Sponsored by Mining Association of B.C.) April 26, 1–4:30 p.m., Robson Square Conference Centre. G. Steven Kellis, Centennial Secondary, 530 Poirer St., Coquitlam, B.C. V3J 6A8, Canada, (604) 936-7205; Jim Milross. Limit: 45. Cost: \$35.

STUDENT AWARDS AND SUPPORT

The GSA Cordilleran Section will present cash awards for graduate and undergraduate papers (both oral and poster). Awards range from US\$100 to \$250. Papers will be considered from any theme or discipline session. Students should submit their abstracts on the standard form. The student must be both first author and presenter and a student member or associate of the Cordilleran Section.

The GSA Cordilleran Section has \$14,000 available for travel subsidies for Student Members or Associates of the section who are presenting papers. Apply to Cordilleran Section Secretary Bruce A. Blackerby, Dept. of Geology, California State University, Fresno, CA 93740, (209) 278-2955, bruceb@csufresno.edu. Students must be a GSA Student Associate or Student Member as of January 31, 2000.

Cordilleran continued on p. 33

PREREGISTRATION FORM

GSA Cordilleran Section

Vancouver, British Columbia
April 27-29, 2000

Preregistration Deadline: **March 17, 2000**
Cancellation Deadline: **March 24, 2000**


Register one professional or student per form.
Copy form for your records.

Please print clearly • THIS AREA IS FOR YOUR BADGE

First Name _____ Last Name _____
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Mailing Address (use two lines if necessary) _____

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 Male Female
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 Fax _____
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 Please inform us by March 17 of any special considerations that you or your guest require.
 I will need special considerations.

GUEST INFORMATION • Please print clearly • This area is for badge

First Name _____ Last Name _____ Male Female
 City _____ State or Country _____

MAIL TO:
GSA CORDILLERAN SECTION MEETING, P.O. BOX 9140, BOULDER, CO 80301
OR
FAX TO: 303-443-1510 or 303-447-1133
Remit in U.S. funds payable to: 2000 GSA Cordilleran Section Meeting
(All preregistrations must be prepaid. Purchase Orders not accepted.)

Payment by (check one): Check # _____ Discover Diners Club
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PREREGISTRATION FEES

Please note: All fees are U.S. Dollars

Professional Member*	Full Meeting	One Day	Qty.	Amount
Professional Member (70 & older)*	(10) \$95	(11) \$60	<input type="checkbox"/>	\$
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Student Member*	(14) \$115	(15) \$65	<input type="checkbox"/>	\$
Student Nonmember	(30) \$25	(31) \$20	<input type="checkbox"/>	\$
K-12 Professional	(32) \$40	(33) \$25	<input type="checkbox"/>	\$
Guest or Spouse	(60) \$25	(61) \$10	<input type="checkbox"/>	\$
Field Trip Only	(90) \$15		<input type="checkbox"/>	\$
	(95) \$ 5		<input type="checkbox"/>	\$

*Member fee applies to any current Professional OR Student Member of GSA or associated societies listed below.
 Check member affiliation (to qualify for member registration discount):
 (1) GSA Member # _____ (2) AEG (3) GAC-Cord (4) GAC-Pacific
 (5) GSC Pacific (6) NWGS (7) PA-BC (8) PS (9) SFU (10) UBC
 Discount does not apply to guest registrants.

GUEST EVENTS

- Granville Island—Museum of Anthropology Tour April 27 (101) \$ 23
- Grouse Mountain April 28 (102) \$ 23

TICKETED EVENTS

- GAC Cordilleran Section, Meeting and Reception April 27 (301) \$ 3
- GSA Geology & Public Policy Committee and Education Committee Joint Breakfast Meeting April 28 (302) \$ 5
- Canadian Association for Women Geoscientists (Joint CAWG-AWG) Breakfast April 28 (303) \$ 7
- Paleontology Society, Cordilleran Section Luncheon April 28 (304) \$ 16
- GSA Cordilleran Section Business Meeting Luncheon April 29 (305) \$ 16

WORKSHOPS

- Developing On-line Geoscience Courses
- Assembling On-line Course Components April 26 (601) \$ 20
- Creating On-line Components April 26 (602) \$ 50
- Earthquakes, Engineering Geology, SW B.C. April 26 (603) \$ 35
- Roy J. Shlemmon Mentor Program April 28 (604) \$ 10

K-12 EDUCATIONAL PROGRAMS

- Science of Mining: A Resource Unit April 26 (650) \$ 35
- Earth Science 11/Geology 12: Resources and Ideas April 26 (651) \$ 35

FIELD TRIPS (Separate registration forms required for each field trip participant.)

- Southern Canadian Cordillera—Calgary to Vancouver April 24-26 (401) \$420
- CACHE Creek and Quesnel Terranes April 25-26 (402) \$165
- Capsule Geology of the Vancouver Area April 26 (403) \$ 74
- Engineering Geology, Natural Hazards, Fraser Delta April 26 (404) \$ 70
- Quaternary Engineering Geology, Fraser and Thompson Valleys April 30-May 1 (405) \$140
- Quaternary Stratigraphy and Geomorphology of South-Central British Columbia April 30-May 2 (406) \$255
- Scraping Up the Mess—Outboard Terranes April 30-May 2 (407) \$225
- Tertiary Geology, East Flank Central Cascade Range, Washington April 29-May 1 (408) \$293
- Quaternary Terranes—Always There? April 30-May 3 (409) \$445
- Tertiary Geology, Nooksack and Skagit Rivers April 30-May 2 (410) \$268
- Teaching Geology, Nooksack and Skagit Rivers April 30-May 1 (411) \$ 84
- Neogene Fault Systems, Northern Cascadia Forearc April 30-May 2 (412) \$340

TOTAL FEES \$ _____

Cordilleran *continued from p. 31*

Applications must be received by February 15, 2000.

GUEST PROGRAM

Granville Island—Museum of Anthropology Tour. 10 a.m.–4 p.m., Thursday, April 27. Cost: \$23.
Grouse Mountain. 1–5 p.m., Friday, April 28. This trip is weather dependent. Cost: \$23.

SPECIAL EVENTS

Welcoming Party. Wednesday, April 26, 6–9 p.m., Robson Ballroom, Robson Square Conference Centre.

The Great Earthquake of 1700 and Cascadia Earthquake Hazard. Friday, April 28, 8 p.m., MacGill Theatre, Robson Square Conference Centre. (For earthquake information for western Canada, see: www.pgc.nrcan.gc.ca/seismo/table.htm.)

BUSINESS MEETINGS

The following business and section meetings will be held at the Crowne Plaza Hotel Georgia unless noted.

1. Geological Association of Canada, Cordilleran Section Meeting and Reception. Thursday, April 27, 5–6:30 p.m., G.S.C. Sales Office, ground floor, 605 Robson St. Cost: \$3.
2. GSA Geology & Public Policy Committee and Education Committee Joint Breakfast Meeting. Friday, April 28, 7–8:30 a.m. Cost: \$5.
3. Canadian Association for Women Geoscientists (Joint CAWG-AWG) Breakfast. Friday, April 28, 7–8:30 a.m. Cost: \$7.
4. Paleontology Society, Cordilleran Section Luncheon. Friday, April 28, noon–2 p.m. Cost: \$16.
5. GSA Cordilleran Section Business Meeting Luncheon. Saturday, April 29, noon–2 p.m. Cost: \$16.

HOUSING

Rooms have been reserved at several hotels, all within a few blocks of the conference center (see map). All facilities are wheelchair accessible. Each has an extensive Web site that lists its features.

GSA does not handle hotel reservations. Each hotel has a toll-free number. Call the hotels directly and ask for the group rate for the “GSA 2000 Cordilleran section meeting” to obtain the prices quoted below. Quoted room rates are in Canadian dollars.

1. Sheraton Wall Centre, 1088 Burrard Street. 1-800-663-9253; fax 604-893-7123. Four blocks from conference center. Details available at www.sheratonwallcentre.com. Rates: C\$145 single/double/twin, C\$175 triple, C\$245 suites; Parking available for C\$18 per day; add 17% taxes.

Alternates Receive 1999 Student Research Grants

Each year when the Committee on Research Grants selects student grant recipients, they also select an alternate group of recipients in the event that some of the grantees return part or all of their funds because they have received funding elsewhere or have changed their research plans. As the returned funds become available, they are re-awarded by the Research Grants Administrator to the alternates named by the committee.

In 1999, two alternates received funding following the initial awarding of grants. They were: Brian P. Coffey, Virginia Tech, for “High Resolution Sequence Stratigraphy of Non-Tropical Mixed Carbonate/Siliciclastic Shelves,” and Brenda J. Chinnery, Johns Hopkins School of Medicine, for “A Morphometric Analysis of Form and Function in Neoceratopsian Dinosaurs.” ■

2. Crowne Plaza Hotel Georgia. 801 West Georgia Street. 1-800-663-1111 or (604) 642-5558, fax 604-642-5559. One block from conference center. Further details available at www.crowneplaza.com. Rates: C\$135 single/double/twin, C\$155 triple; add 17% taxes.
3. Century Plaza Hotel, 1015 Burrard Street. 1-800-663-1818; fax 604-682-5790. Four blocks from conference center. Further details available at www.centuryplaza.com. Rates: C\$90 single/double/twin, \$25 per extra person; add 17% taxes.
4. Best Western Downtown, 718 Drake Street. 1-888-669-9888; fax 604-669-9866. Seven blocks from conference center. Further details available at www.bestwesterndowntown.com. Rates: C\$89 single/double; add 17% taxes.
5. YWCA Hotel, 733 Beatty Street. 1-800-663-1424 or (604) 895-5830; fax 604-681-2550. Six blocks from conference center. Further details available at www.ywcahotel.com. Rates: C\$43 single, C\$60–83 double, C\$64–69 triple, with a variety of options available; add 17% taxes.

GETTING AROUND

GSA has selected Conventions in America (CIA) as the official travel agency for this meeting. You can receive the following discounts or the lowest available fares on any other carrier by using this free service. American Airlines and Canadian Air—save 5% to 10% on lowest applicable fares—take an additional 5% off with minimum 60-day advance purchase. Travel between April 18 and May 8, 2000. Avis Rent A Car—special low rates are available with unlimited free mileage. To book with CIA: call CIA at 1-800-929-4242, or use Web site: www.stellaraccess.com. NOTE: First time users must register and refer to your group #633. Call the airlines directly or use your own travel agency (but refer to the codes); American Airlines: 1-800-433-1790; Starfile #624OUL; Avis: 1-800-331-1600, AWD #J948900.

Vancouver International Airport is 16 km (11 miles) south of downtown Vancouver. The Vancouver Airporter bus operates seven days a week. Fare is C\$10 one way or C\$17 round trip. For more information, call Vancouver Airporter at 1-800-688-3141. Taxi fares from airport to downtown are about C\$25 and a trip will take 20–40 minutes. For information on public transit routes, schedules, and fares, see the Web site at: www.cmbuslink.com.

Cancellations, Changes and Refunds

All requests for registration additions, changes, and cancellations must be made in writing and received by *March 24, 2000*. No refunds will be made on cancellation notices received after this date. Refunds will be mailed from GSA after the meeting. Refunds for fees paid by credit card will be credited to the card number on the preregistration form. There will be NO refunds for on-site registration and ticket sales.

ACCESSIBILITY

The Cordilleran Section is committed to making every event at the 2000 meeting accessible to all persons interested in attending. Please indicate special requirements, such as an interpreter or wheelchair accessibility, on the meeting registration form, or contact the conference general chair (see Detailed Information).

DETAILED INFORMATION

For further information, contact the conference general chair: Peter Mustard, Earth Sciences, Simon Fraser University, Burnaby, B.C. V5A 1S6, Canada, (604) 291-5389, pmustard@sfu.ca, or visit www.geosociety.org/profdev/sectdiv/00cdmtg.htm or www.eos.ubc.ca/cordgsa2000/. ■



YEARS

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GSA FOUNDATION UPDATE

Lee J. Suttner, Foundation President

GSA Foundation Milestones

The year 2000 marks the 20th anniversary of the Geological Society of America Foundation. In 1980, through the wisdom, skills, and leadership of the founding trustees Robert Fuchs, Michel Halbouty, Hollis Hedberg, John Maxwell, Caswell Silver, and volunteers Howard Gould and Pete Palmer, the Foundation raised \$3.4 million in the first 18 months of its existence. This funding supported perhaps the single grandest publication project ever conceived by a scientific society: DNAG—the Decade of North American Geology series. Since its inception and the remarkable early success of DNAG, the Foundation has generated over \$15 million of gift revenue.

In the latest chapter of the Foundation success story, the \$10 million goal of the Second Century Fund Campaign for Earth, Education, and the Environment has been exceeded through a combination of cash contributions, planned gifts, and pledges. We congratulate Bob Fuchs, who was president of the Foundation when the GSA Council endorsed the campaign, and Bill Bromery, the lead-off chair of the campaign, and we thank the core of volunteers and the Foundation staff responsible for this extraordinary accomplishment.

We invite you to join us in celebrating 20 years of service, 20 years of giving, and foremost, the successful completion of the most ambitious fund-raising initiative in the history of our science.

But the Foundation is not just its visionary founders, its current trustees and volunteers, and its tireless and loyal headquarters staff. It is all of you whose generosity has made this institution not just a reality, but a huge success. You are the cause for celebration!

On behalf of the entire geoscience community, we thank you for your past generosity, but we also ask for your future support. Much remains to be done by our Society. GSA has awarded over \$6 million in research grants to more than 6,000 students, but with your help we can and should support far more. We must intensify our efforts

to keep geoscience in the eyes of the public and the policy makers. We must be leaders in introducing our youth to the wonders of Earth and its history. And we must be models for stewards of Earth's resources and environment.

Think back for a moment to your earliest memory of GSA. Was it a publication you saw? Was it a meeting you attended? Was it a field trip in which you participated? For me it was a *Bulletin* article I read as a college freshman in 1957 on the Pleistocene geology of Door County, Wisconsin, which is a few miles from my birthplace. The paper started me on a career path that has led to incredible personal satisfaction and pleasure. I did not know then, but I do know now, that over 75% of the cost of GSA's meetings, programs, and publications, such as the one that had a profound influence on my life, are subsidized by gifts and other revenue to the Society and its Foundation. Stated another way, for every dollar you pay in dues or registration fees to the Society, you and, most of all, students, receive more than \$3 of additional benefits. Consequently, giving a gift to the Foundation is like giving a gift to yourself.

We appreciate your past support, but also please do continue to give. GSA needs you to ensure that resources are available to confront the enormous challenges Earth and its population will present to us in the next millennium. ■

Digging Up the Past

Most memorable early geologic experience:

"In reflecting on how technology has simplified presentations at GSA meetings, I remember hand painting lantern slides and seeing one go up in smoke."

—Charles E. Chapin



Second Century Fund Leaders (Gifts of \$100,000 or more)

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Program Will Fund Travel to 31st IGC in Rio de Janeiro

The Geological Society of America is accepting applications for the 31st International Geological Congress (IGC) Travel Grant Program. The 2000 IGC will be held in Rio de Janeiro, Brazil, August 6-17.

To be eligible, an applicant must be a resident or citizen of the United States (includes students), must have a birth date after August 31, 1960, and must have an abstract for inclusion in the program of the 31st IGC.

Official application forms are available from the Grants Administrator, GSA Headquarters, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301. Along with the form, applicants must include a copy of the abstract that was submitted to the 31st IGC. Applications must be supported by two letters from current or recent supervisors; students may use faculty members. Qualifying applications and letters of support must be post-marked no later than February 15, 2000. Applicants will be notified of results by April 3, 2000. ■

New GSA Fellows

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New GSA Members

The following Members were elected by Council action during the period from February to October 1999.

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Erin P. Argyilan	Carlotta B. Chernoff	Kris Fields	Christopher R. Hudon	Andrew H. Lee
Kenneth J. Arroyo	Jordan A. Clayton	Julie M. Ford	Nancy J. Huebner	Christy L. Lee
Viorel N. Atudorei	Peggy S. Clements	Bobby G. Forrest	Chad K. Hults	King-Sing A. Lee
Sydney T. Bacchus	Matthew R. Coglton	Geoffrey L. Fraser	James D. Hunt	Stacey N. Lengyel
Marcello Badali	Kimberly S. Collings	Adrienne T. Freda	Donald T. Hurdle	Jennifer A. Levine
Victoria A. Baeder-Helmke	Heather J. Collins	Harry M. Fried	David C. Hurum	J. Chris Lewers
Elizabeth A. Bailey	Jason E. Combs	Virginia Friedman	Kiseong Hyeong	George Linn
Nicole M. Bailey	Jocelyne M. Comstock	Tod A. Frolking	Lesley A. Hymers	Terence D. Livingston
Robin A. Bailey	Jeffrey S. Conaway	Richard L. Fuller, II	Roman S. Ianev	Stelios M. Logothetis
David W. Baker	Guy J. Consolmagno, SJ	Piercarlo Gabriele	Tissa H. Illangasekare	Jeffrey D. Loofboro
Blair H. Baldwin	Angie M. Cook	Dana D. Gagliano	Walter A. Illman	Arthur B. Losey
Charles E. Banks	Thomas A. Cooper	Abhijit K. Gangopadhyay	Mark E. Indrebo	Norman A. Lovan
Kirsten M. Bannister	Ilene R. Corbo	James E. Gardner	Jessica Irwin	Suzanne V. Lowe
Dave L. Barbeau	Donald A. Cornell	Linda P. Garinger	Steve A. Israel	Amelia G. Lustig
Susan L. Barbour	Patrick G. Courtney	Heather A. Garrish	Scot K. Izuka	Denise M. Mack
Rich Barclay	Louise J. Criscenti	Elizabeth A. Garrison	John O. Izzo	Haruyoshi Maeda
Carlo Baroni	Stefanie A. Crisman	Heather K. Gastineau	Joachim Jacobs	Michael T. John Maher
Polly Bass	Ryan A. Crosbie	Joseph S. Gatoula	Tandara M. Jarboe	Salah El-Din R. Mahmoud
Mona L. Becker	Katherine M. Cummings	Mark S. Gell	Steven P. Jenson	Mark J. Malfair
Michael M. Benedetti	Dave Curtis	Harold A. Geller	Duncan I. Johannessen	Mario A. Maningas
Christopher A. Berg	Ann M. Dansart	Suman Ghosh	Philip L. Johnson	Janet E. Mann
Jill S. Betts	Terrance A. Davis	Anthony C. Gibson	Raymond H. Johnson	Maira A. Manning
Peter G. Betts	Zachary J. Davis	Martin P. Gilgallon	Brian Jones	Marc A. Marcoux
Warren H. Bigelow	Sharon K. Day	Bradley R. Gill	David M. S. Jowett	Anton H. Maria
James J. Blair	Frederick D. Day-Lewis	Stephanie A. Gillain	Michael J. Jurasius	Jeffrey R. Martin
Nigel J. Blamey	Jesse M. DeCarlo	Joe A. Giller	Heidi A. Justman	Mark R. Martin
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Kelly T. Blough	Kato T. Dee	Alexander F. H. Goetz	Peter Kaplan	Erika P. Maschmeyer
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George T. Bonheyo	Aaron C. DeNosaquo	Leonel A. Gomez	Anna K. Karsten	James H. Mayer
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Beth Brady	Steven Domber	Kristin J. Hadden	Shahab D. Khan	Neil J. McInnes
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Alicia Bravo	Leanne M. Drake	Edward F. Hall	Michael J. Kirby	Sandra N. McLaren
Christopher Michael	David L. Drosselmeyer	Edward F. Hall	Douglas J. Kirwin	Joseph W. McMurray
Breeding	Timothy M. Duda	Maria T. Hall	James S. Klaus	Michele E. McRae
Eileen M. Brennan	Timothy S. Dulaney	Martin P. Hand	R. L. Klein	David W. Mercer
Michael A. Brennan	Deanna M. Duncan	James J. Harmon	Candice L. Kloss	Patrick Mercier-Langevin
Anne Briais	Colleen A. Dunlevy	Stephen Harney	David W. Kobilka	
M. Scott Broadwell	Arjan H. Dykstra	Debra J. Harp-Sepulvado	Jennifer L. Koch	
		Bruce Hartel		

New Members *continued on p. 38*

NewMembers
continued from p. 37

Richard L. Merhar
Nicole S. Metzger
Karen J. Michelsen
Daniel P. Miggins
Galen W. Miller
Jeffrey J. Miller
Ronald Lynn Miller
Robyn D. Mitchell
Juana M. Montane
Laurent G. J. Montesi
Lorena B. Moore
Peter L. Moore
Ann E. Morey
Karen S. Morgan
Matthew L. Morgan
Galina S. Morozova
Michael Morykin
Steven A. Moskowitz
Thomas W. Muntean
Susan G. Murphy
Marlar Myo Myint
John M. Nadeau
Ravi Nandigam
Joanna L. Nelson
John B. Nelson
Travis A. Nelson
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Pamela J. Newbrough
Paige E. Newby
Tammy Nguyen
Kyle K. Nichols
David F. Nicklin
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Hiroshi Ohmoto
Michael O. Olawuyi
Kevin M. Orzech
Christopher J. P. Oze
Alan V. Pace
Oona R. Padgett
Mark E. Pagenkopp
James E. Pahel
Yu-chul Park

Melissa A. Parker
Panagiota V. Passinos
David T. Paul
Evan B. Perry
Jennifer L. Perry
Nathan T. Petersen
Christian R. Petrich
Shaili M. Pfeiffer
Sandin E. Phillipson
Jennifer L. Piatek
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Barton E. Plant
Brandi K. Pool
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Michael E. Potter
Karl A. Pracht
Jason R. Price
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Andrzej Przepiora
Donne E. C. Puckle
Brad Purnell
David R. Pyles
Jay Quade
Bern J. Qualheim
Randy P. Rabideaux
Laura K. Rademacher
Tina A. Ramsey
Amir Hussain Rangwala
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Rebecca L. Robbins
Bonnie B. Robinson
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Wilfredo Rosado
Emily K. Rose
Reginald A. Rose
Lisa L. Rossiter

Joanna Russell
M. Catherine Ryan
Tim H. Ryan
Lynn M. Sabido
Perry J. Samson
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Jose E. Sastre
Tanner A. Sattler
Maryellen Sault
Melissa A. Schaar
Michael R. Schafer
David A. Schmidt
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Douglas J. Schnoebelen
Adam Schoonmaker
Anthony A. Schuetze
William H. Schulz
Rina Schumer
David A. Seabrook
Kathryn J. Seadler
Stanka Sebela
Sergio A. Sepulveda
Sue Shallenberger
Wayne C. Shanks III
Tracey G. Sharman
Jay C. Sheely
Benjamin A. Sheets
H. David Sheets
Lori A. Sheil
Nathan D. Sheldon
Scott A. Shimel
Nellow Simukonde
Michael Sisk
James T. Smith
Karlene R. Smith
Mark T. Smith
Stephen L. Smith
Susan M. Smith
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Robert L. Sousa
Leigh A. Soutter
Nicole A. Spaun
Chris M. Spies
William G. Stanley
Carol A. Stein
Claudia L. Stewart

Christiane W. Stidham
John M. Stiteler
Greg M. Stock
Robert L. Stollar
David A. Stonestrom
Scott M. Stookey
Mark S. Strevels
Adelir J. Strieder
Matthew D. Strine
Selena M. Stubbs
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Robert A. Sullivan
Beau C. Suthard
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John Toth
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Julia E. Underwood

Edward J. Valek
Martin Valencia-Moreno
John G. Van Hoesen
Bill A. Van Sickle
D. J. Veillon
Carlos Y. Veliz
Samuel B. Vinson
Ann Vlad
Karl von Heimburg
Richard J. Wachtman
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Elizabeth A. Wallace
Michael J. Wallin
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Charles A. Washburn
John R. Washburn
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William J. Weaver
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Martha M. Wulftange
Bridget R. Wyatt
Hongwei Yin
Elim Yoon
Cecile G. Zachary
Brent J. Zaprowski
Lena Zetterstrom
Carole L. Ziegler

The following new Members have transferred from Associate status:

Lisa M. Adamo
Julie A. Adgursion
Laurel L. Alexander
Kyle R. Anderson
V. Michelle Anderson
Alicia K. Armstrong
Kelsy L. Azar
Jennifer L. Barr
Chandra C. Bell
John C. Bennett
Ryan M. Bennett
Amy E. Benoit
Jon P. Berntsen
Roberto E. Biaggi
Karel A. Bielstein
Nicole R. Bilodeau
Brian C. Bird
Brian J. Black
Laura J. Blake
David F. Boutt
Christina M. Brachle
Robert A. Bridges
Rick Bullard
Andrew T. Calvert
Steve D. Carlson
Luke Martens Cates
Neil A. Caudill
Denise S. Chidester
Elli D. Chouparova
Erik M. Clapp
David G. Coler

Melissa V. Connely
Walter K. Conrad
Bill A. Cook III
Matthew F. Cooke
Tim D. Cope
Sara Cowles
Lance W. Crabtree
Jennifer A. Curtis
Gregory A. Dehn
Aaron DeNosaquo
James M. Devine
Travis A. Doll
Leigh M. Fall
Richard J. Fink
Riley E. Flanagan-Brown
Ludwig J. Frank II
Joseph J. Gilbert
Lisa D. Gilley
Alexander Glass
Cory J. Godwin
Elizabeth R. Goeke
Heather R. Golding
Allen M. Gontz
Scott W. Grasse
Bernard Guest
Scott A. Hageman
Jenney M. Hall
Christine L. Hallman
Nevin M. Henderson
Tessa M. Hill
Susan M. Hinesley

Brook L. Holcombe
Deana M. Hudgins
Janet V. Hurley
Brian M. Hynek
Jennifer M. Jackson
Yun-Deuk Jang
Christopher L. Johnson
Benjamin R. Jordan
Thomas J. Kalakay
Robert P. Karinen
Anna K. Karsten
Julie R. Kelley
April E. Kinchloe
Robert L. King
Alexander J. Kirk
Erin R. Kraal
Ching-Huei Kuo
Brian A. Landau
Eric D. Larson
Christopher J. Leger
John V. Leone
Nancy F. Little
Alberto Lobo-Guerrero
Elizabeth A. Magno
Elizabeth A. Magno
Carrie A. Maher
Peter R. Malecki
L. Lynn Marquez
Cindy M. Martin
Kathleen A. Marty
Michael E. Matthews
Rebecca G. Mattison

Kurt J. McCoy
Claire M. McKee
Alexander S. McKenzie-
Johnson
Terrie R. McManus
Tucker McNulty
Debra L. Meritt
Stacey E. Metzler
Daniel P. Michaud
Radford Mitchell
Michael D. Morgan
Elizabeth J. Myers
Kimberly J. Neilson
Torrey G. Nyborg
Michael E. O'Connell
Mark G. O'Dea
Michael A. O'Driscoll
Matthew L. Paige
Kenneth R. Papp
Christopher J. Pellowski
Sarah R. Pietraszek-Mattner
James H. Powell, Jr.
Joshua D. Raub
Sarah E. Rieboldt
Joshua H. Ring
Geoffrey D. Risse
Alycia L. Rode
Susan M. Rosi
Juan A. Ruiz
Cal Ruleman
Erin Maiya Rust

Ilsa Mae Schiefelbein
Ian Spencer Schofield
Jeffrey M. Schroeder
Sarah M. Scott
Eric Shih
Bryan N. Shuman
Justin I. Simon
Richard W. Slaughter
Ramona L. Smith
Yomari Enid Soto
Kurt J. Steffen
Kimberly K. Stonesifer
Drew P. Storm
Keith W. Stuart
William C. Suess
Jason F. Thomason
Kristy L. Tramp
Natalie E. Uschner
Thomas P. Van Biersel
Melanie A. Vierkorn
Craig A. Webb
Julie M. Welch
Michael Willett
Shelly A. Witham
Keri L. Wolfe
Gregory M. Yanagihara
Jijun Zhang

New GSA Associates

The following Associates became affiliated with the Society during the period from February to October 1999.

Brooks G. Abeln	Christie Dumas	Jeremy S. Kinman	Erich R. Mueller	Katrina D. Smolen
Amanda J. Abling	Claire E. Dumford	Kathryn R. Klein	Alfonso M. Munoz II	Lori L. Smothers
Bernadette D. Acker	Brent S. Duncan	Melissa M. Klinger	Lin Murphy	Paul J. Sorenson
David B. Adams	April D. Durham	Jack A. Knaub	Ryan T. Murphy	Tanya A. Sosa
Anthony P. Alati	Rahul Dutta	Brendan M. Kober	Mychal R. Murray	Alex B. Sparks
Daniel S. Alessi	Lise S. Easter	Joshua C. Koch	Charles L. Myers	Mary E. Spinelli
Nichole T. Alhadeff	Kathleen E. Eck	Beth A. Koehler	Alexis K. Navarre	Sara E. Spradlin
Angel L. Alicea Leon	Tina B. Edwards	William C. Koeppen	Bryce T. Nelson	Jamie P. Stapleton
Patricia T. Allen	Beth J. Feingold	Patrick R. Kormos	James B. Nicholas	Jesse R. Starr
Erica C. Allis	Mary C. Finch	William J. Kosmer	Karen I. Novakowski	Ryan P. Stepler
Daniel W. Allison	Corina A. Fiore	Brian M. Kristall	Lisa S. Novins	Roger A. Stradal
Anita L. Anderson	Christy M. Fitzsimmons	Cynthia A. Kuklis	Kenneth E. Nye	Todd S. Street
Paula E. Anderson	Matthew D. Fleahman	Kathryn A. Lamb	Adrienne J. Oakley	David F. Sunderlin
John D. Andrzejewski	Brittany R. Flokstra	Joseph B. Lambert	Melissa R. Owen	John D. Surber, Jr
Julie C. Angel	Philip E. Foster	James L. Lantowski	Ryan E. Padgett	Philip A. Suriano
Stacey Anne Archfield	M Si Fotovat	Joshua L. Lawson	Sandra L. Palko	Matthew S. Swanson
Jacqueline Arellano	Guinevere Fredriksen	Jessica E. Lazzuri	Chadwick W. Parish	Deanna M. Swicegood
Nathan C. Arnold	Christopher J. Freeman	Jill C. Lemacks	Kiran Patankar	Laura M. Symmes
Maryann M. Ashworth	Katharine J. Fulcher	Andrea M. Lencse	Clint P. Penfield	Mike A. Taylor
Dana Austin	Erin Fulton	Richard R. Lessard	Megan L. Perkins	Rebecca A. Tedford
John F. Bacon	Benjamin S. Furey	Rianda G. Levin	Diane Persing	Michael G. Tennyson
John P. Baird	Stephanie A. Furgal	Miranda I. Lofflin	Carl J. Pierce, Jr.	John R. Thatcher
Abigail K. Barker	Lucas E. Gamble	Lindy London	Debbie A. Pierce	Sarah R. Tietz
Mary L. Barnes	Stacy Gardipee	Yvette C. Lopez	Jill E. Pine	Kristin S. Toth
Allison A. Barta	Alanna M. Garrison	B. Scott Lundin	Mark D. Pollock	Laura B. Troeger
Lara A. Baugh	Emily M. Geraghty	Kristen R. Lydy	Michael A. Procsal	Paul R. Troop
Rashmi L. Becker	Todd J. Gillihan	Aaron W. Lyman	David V. Prouty	Kenton J. Trubee
Amanda M. Berglund	Robert J. Gillis	Matt T. MacKinnon	Christina M. Pulliam	Joy M. Turnbull
Robert M. Bergstrom	Amy K. Gilmer	Daniel R. MacPhee	Erin L. Rasmusson	Monica M. Turner
Hairani Blanchard	Jason P. Gowers	Derek J. Main	Jimmy L. Ray	John E. Uselding
Nathan O. Blythe	John T. Gracely	Samantha Manburg	Tamera L. Renninger	Erin E. Van Evera
Lena A. Bohm	April J. Graves	Gabriela Marcano	Dominique Richard	Martin D. Van Oort
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James R. Bonelli	Lesley J. Gunther	Cheryl M. Mathenia	Melissa D. Roberts	Yvette M. Villegas
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Ernest J. Bovenizer	Emily K. Hall	Glenn R. McCaslin	Richard A. Rodriguez	Keri E. Walker
Jared T. Bowman	Emily A. Harbert	Jason D. McClaughry	Steven A. Rogers	Velma L. Walker
MaryCatherine Boyett	Lori A. Harchar	Annie M. McCoy	Sean Paul Ronde	Kim C. Walton
Yvonne K. Branan	Jessica M. Harford	Amanda L. McGahey	Monica J. Roth	Aaron R. Wartenberg
Barbara L. Brocks	Steven D. Harms	Drew C. McGowan	Carrie E. Rowe	Dana A. Watzke
Eric R. Brose	Karen Ann Harper	Jill M. McQuirter	Michael C. Rowe	Beverlie M. Weir
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Gerrit R. Bulman	Shawn D. Haven	John W. Menthe, Sr.	Anne E. Sawyer	Christopher A. Williams
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Kathleen R. Carey	Peter E. Heitzmann	Steven A. Mikulencak	Nicholas J. Scala	Mary Kate Wimberly
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Sarah L. Chardavoyne	Michael W. Hertle	Jody L. Millette-Larned	Michael J. Schmidt	Brett Woodward
Andrew R. Coleman	Meghan M. Hicks	David H. Millner	David P. Schneider	Donna Wright
Andrew M. Collins	Jason H. Holloman	Elizabeth L. Milodragovich	Matthew O. Schuchard	Heather M. Wright
Brian W. Collins	Letha C. Honea	Miodrag M. Milovanovic, Jr.	David W. Scovel	Brett J. Wyss
Amanda Cook	Sarah E. Hood	John M. Mitsdarfer	Shane C. Seals	Steven C. Yankay
Brian S. Cook	Megan F. Hooker	Kristine L. Mize	Shannon S. Seifert	Abigail E. Yeany
Maureen A. Cornett	Sheryl L. Horton	Jere A. Mohr	John W. Sharkey III	Melissa K. Yenko
Christine Cosimano	Robert A. Houston	Edwin N. Monin, Jr.	David A. Shields	Matthew D. Young
Brian J. Coven	Mark L. Howe	Kate A. Montgomery	Lora K. Shrake	Beth L. Yurek
Jeffery M. Crevier	Leslie Hsu	Trey Montgomery	Michael J. Shuler, Jr.	Rhonda M. Zampa
Donald B. Crisler, Jr.	Elizabeth A. Hubbard	Kelly Moore	Sarah L. Silver	Victoria L. Zapper
Joshua A. Cwikla	Camille M. Hutchinson	Matt E. Moore	Laura L. Slade	Gara C. Zarda
Wendy S. Dagley	Katherine E. Inderbitzen	Jean M. Morrison	Justin Smith	Christa L. Ziegler
Eric J. Dahl	Dawn D. Ison	Philadelphia Jane Morrow	Meagan L. Smith	Justin A. Zumbro ■
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Steve Dousman	Michael Kennedy			
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2000 Meetings

March

March 6–11, 17th Interior Alaska Mining Conference: Mining in the New Millennium—Challenges and Opportunities in Alaska, Fairbanks Alaska. Information: Tom Bundtzen, P.O. Box 73069, Fairbanks, AK 99707, (907) 458-8951, fax 907-458-8511, bundtzen@mosquitonet.com, <http://mineral.uafsmc.alaska.edu/fbxama.htm>.

May

May 23–26, Eighth International Conference on Ground Penetrating Radar, GPR 2000, Gold Coast, Australia. Information: gpr2000@csee.uq.edu.au (preferred option), fax: 61-7-3365-3684; GPR 2000 Conference Secretariat,

Dept. of Computer Science & Electrical Engineering, University of Queensland, Qld 4072, Australia, www.cssip.uq.edu.au/gpr20http://www.cssip.elec.uq.edu.au/gpr2000.html.

October

October 11–13, Computer Simulation in Risk Analysis and Hazard Mitigation, Bologna, Italy. Information: Karen Savage, RISK 2000/1479, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK, phone 44-238-029-3223, fax 44-238-029-2853, ksavage@wessex.ac.uk. (Abstract deadline: February 22, 2000.)

November

November 5–8, Atmospheric, Surface, and Subsurface Hydrology and Interactions, American Institute of Hydrology Annual Meeting, Research Triangle Park, North Carolina. Information: AIH, 2499 Rice St., Ste. 135, St. Paul, MN 55113, (651) 484-8169, fax 651-484-8357, AIHydro@aol.com, www.aihydro.org.

First GSA Field Forum,
March 18–22, 2000

Glaciohydraulic Supercooling,
Basal Freeze-on, Stratified Basal
Ice, and "Deformable Till Beds":
Matanuska Glacier, Alaska

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Starting salary and rank will be commensurate with degree and experience. Review of applicants will begin on 15 February, 2000.

Applicants should send a letter of application, curriculum vitae and the names and e-mail addresses of three references to: Dr. Scott M. Ritter, Faculty Search Committee, Department of Geology, Brigham Young University, Provo, UT 84602 (scott_ritter@byu.edu). BYU, an equal opportunity employer, is sponsored by the Church of Jesus Christ of Latter-Day Saints and requires observance of Church standards. Preference is given to member of the sponsoring Church of Jesus Christ of Latter-Day Saints.

GEOLOGY INSTRUCTOR UNIVERSITY OF TENNESSEE, CHATTANOOGA

The University of Tennessee at Chattanooga (UTC) Department of Physics, Geology, and Astronomy anticipates funding for a non-tenure track, full-time position at the Geology Instructor level, beginning August 2000. The Department seeks a geologist in any area of geology, preferably soft rock geology. The successful candidate will teach at the undergraduate level, primarily introductory laboratory sessions, and lecture in historical geology, paleontology, and physical geology. A master's degree in geology is required before beginning the employment. Please submit a letter of application, resume, statements of research interest, and three letters of reference by March 15, 2000, to: Habte Giorgis Churnet, Head, Department of Physics, Geology, and Astronomy, The University of Chattanooga, Chattanooga, TN 37403.

The University of Tennessee at Chattanooga is an equal employment opportunity/affirmative action/Title IX Section 5041 ADA Institute.

SIMON FRASER UNIVERSITY DEPARTMENT OF EARTH SCIENCES ASSISTANT PROFESSORSHIP IN STRUCTURAL GEOLOGY

The Department of Earth Sciences at Simon Fraser University invites applications for a tenure-track assistant professorship in structural geology commencing September 1, 2000. A Ph.D. is required and previous research, teaching, or industry experience is desirable. It is expected that the research activities of the successful candidate will complement some aspect of our existing research interests within the Department. The successful candidate will develop a field-oriented research program, and supervise both graduate and undergraduate students. Teaching responsibilities will include structural geology, field camps, and advanced courses in the appointee's field of expertise. Eligibility for registration as a professional geoscientist (P.Geo) with the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) is desirable.

For additional information about this position, see <http://www.sfu.ca/earth-sciences/>.

In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. Simon Fraser University is committed to the principle of equity in employment and offers equal employment opportunities to qualified applicants. The position is subject to budgetary approval.

Applicants are requested to submit a curriculum vitae, a statement of research and teaching interests, and the names and addresses of three referees. Applications or requests for further information should be directed to: Dr. E. J. Hickin, Chair, Department of Earth Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Phone (604) 291-4657; Fax: 604-291-4198; E-mail: hickin@sfu.ca.

The closing date for applications is January 31, 2000.

DEPARTMENT CHAIR / PETROLOGIST CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO

The Department of Geological Sciences at California State University, San Bernardino seeks a department chair (1/3 time-base) and petrologist at the level of Associate Professor or Professor for a position that will begin in September 2000. Primary teaching responsibilities (2/3 time-base, roughly two courses per quarter) will include Mineralogy, Optical Mineralogy, Igneous and Metamorphic Petrology, and Geochemistry, and other general geology courses as needed.

We seek a leader who can instill positive morale and can help a small department grow. The successful candidate should have a commitment to excellent undergraduate teaching and to involving undergraduates in research. A Ph.D. in the geological sciences and prior leadership experience are required. Prior, successful experience teaching at least some of the courses mentioned above and in publishing peer-reviewed research is also required.

Send letter of application along with curriculum vitae, undergraduate and graduate transcripts, three letters of

recommendation, a statement of past leadership experience and current professional goals, and any other pertinent materials to Sally McGill, Acting Department Chair, Department of Geological Sciences, California State University, San Bernardino, 5500 University Parkway, San Bernardino, CA 92407-2397.

Review of applications will begin on February 14, 2000, and will continue until the position is filled.

The Department of Geological Sciences offers B.S. and B.A. degrees in geology, including a proposed option in Environmental Geology. For more information about the position, the university and the department, please see: <http://geology.csusb.edu>.

California State University, San Bernardino is an equal opportunity employer committed to a diversified workforce.

LOW-TEMPERATURE GEOCHEMISTRY U.S. GEOLOGICAL SURVEY, ANCHORAGE, AK

The USGS is seeking candidates to design and conduct research on low-temperature (<100 °C) geochemical processes involving minerals, water, soil, and related materials (e.g., organic matter and bacteria) in mineralized and unmineralized terranes. Investigations will include geochemical backgrounds and baselines, surface and ground water exchange, acid mine drainage, bioavailability of metals, and environmental assessments of public lands.

This is a full-time, permanent position with a starting salary range between \$45,235 and 53,793 per year plus a 25% Cost of Living Allowance. We are seeking candidates who have conducted multidisciplinary field studies in arctic and subarctic environments as well as capability in modeling rock-water interaction and metal speciation. A Ph.D. in geochemistry is desirable. U.S. citizenship is required. The job announcement and application materials can be found on the Web at <http://www.usajobs.opm.gov>. The U.S. Geological Survey is an equal opportunity employer

THE AUSTRALIAN NATIONAL UNIVERSITY INSTITUTE OF ADVANCED STUDIES

Director of the Research School of Earth Sciences
The University is seeking to appoint a Director of the Research School of Earth Sciences, following conclusion of the term of the current Director early in 2001.

The Research School of Earth Sciences, which is one of nine research schools and two centres comprising the Institute of Advanced Studies, consists of research groups in environmental geochemistry and geochronology, geodynamics, geophysical fluid dynamics, environmental processes, geochronology and isotope geochemistry, ore-genesis, petrophysics, petrochemistry and experimental petrology, and seismology and geomagnetism.

At present the School has about 40 academic staff, supported by research officers, professional, technical, and administrative staff and 40 PhD students, in a non-departmental structure. The School has outstanding support facilities in mechanical and electronic workshops.

The University is seeking an intellectual leader of international distinction with the demonstrated capacity to

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manage an academic organisation. The Director is responsible for the operation and development of the Research School of Earth Sciences, for its leadership as an academic enterprise and for the management of its human and other resources. Applicants will have experience in research management and the ability to sustain and develop linkages within the School and University, with other universities and research institutions in Australia and overseas, and with government and industry. She/he will also have the ability to promote the image of the School, the Institute and the University, and the ability to be a catalyst for attracting research funds.

The successful candidate will be offered a continuing appointment as Professor of the University. The term of office as Director, normally for a period of five years, will be fixed by the University in consultation with the successful candidate. Remuneration will include superannuation, the use of a fully maintained University vehicle and other benefits.

Enquiries: Professor Frank Jackson, Director of the Institute of Advanced Studies and Chair of the Board of the Institute of Advanced Studies; telephone (02) 6279 8487; E-mail: Frank.Jackson@anu.edu.au Professor Ian McDougall, Research School of Earth Sciences; telephone (02) 6249 4136; E-mail: Ian.McDougall@anu.edu.au

Contact: Angela M Devlin, Secretary to the Selection Committee; telephone (02) 6249 5997; E-mail: Angela.Devlin@anu.edu.au Further particulars and selection criteria must be obtained before applying.

Closing date: 7 February 2000. Ref: RSES 11.11.1
Information on how to apply may be obtained from the ANU Web page — <http://www.anu.edu.au/hr/jobs> or by telephoning/emailing the contact.

EARTHQUAKE PHYSICIST / SEISMOLOGIST UNIVERSITY OF CALIFORNIA, RIVERSIDE

The Department of Earth Sciences invites applications for an anticipated tenure-track position to be filled at the assistant professor level. The applicant must hold a Ph.D. in geophysics or related field and have a strong commitment to both excellence in research and teaching. The successful applicant will be expected to establish a vigorous extramurally funded research program at UCR, to supervise graduate students, and to teach graduate or undergraduate courses in seismology and the physics of earthquakes. Applicants with specific interests in the physics of earthquakes are especially invited to apply. The applicant is expected to complement existing department strengths in tectonophysics, mechanics of deep and intermediate focus earthquakes, seismic hazard estimation,

and studies of earthquake precursors. An ability to integrate field-based observations with experiment and theory is desirable. Evaluation of applicants will commence January 31, 2000; the committee will consider new applications until the position is filled, however. Information about Earth Sciences at UCR is available on the Web at <http://cnas.ucr.edu/~earth/es.html>. Applications, including a vita, publication list, statement of research and teaching interests, and 3 letters of recommendation should be sent to: Dr. Stephen Park, Chair, Geophysics Search, Department of Earth Sciences, University of California, Riverside, California 92521. email: magneto@ucrmt.ucr.edu. The University of California is an Equal Opportunity / Affirmative Action employer.

ASSISTANT PROFESSOR IN SOLID-EARTH GEOPHYSICS INDIANA UNIVERSITY, BLOOMINGTON

The Department of Geological Sciences at Indiana University, Bloomington, is seeking an outstanding scientist for a tenure-track position in solid-earth geophysics at the assistant professor level. We are seeking a colleague in any area of solid-earth geophysics whose areas of research will maximize linkages among active field- and analytical-based research programs in our department (<http://www.indiana.edu/~geosci>). Applicants should include a personal statement describing research and teaching interests, a detailed curriculum vitae, and the names and addresses of four references. Applications should be submitted before January 31, 2000, but the position will remain open until filled. Applications should be sent to: Geophysics Search Committee Chair, Department of Geological Sciences, Indiana University, 1001 East 10th Street, Bloomington, IN 47405. Indiana University, as an Equal Opportunity/Affirmative Action Employer, encourages the candidacies of women and minorities.

ASSISTANT PROFESSOR -- GEOSCIENCE EDUCATION WRIGHT STATE UNIVERSITY

The Department of Geological Sciences invites applications for a tenure-track position for an assistant professor specializing in Geoscience Education, to begin September 2000. Teaching will include undergraduate classes in Earth Science and science methods courses for preservice K-12 teachers. Additionally, competence and interest in teaching courses in undergraduate mineralogy and petrology is preferred. Participation in program develop-

Classifieds *continued on p. 42*

STATE OF OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES Engineering Geology

An Engineering Geology position is open at the Oregon Department of Geology and Mineral Industries (DOGAMI). This position focuses on mapping debris flow run out zones for land management purposes. The candidate must have field mapping experience that includes landslide mapping and characterization, technical landslide analyses and GIS skills. Preference will be given to candidates with a Master's degree or higher in Geology or Engineering, professional license(s), experience in Western Oregon or similar terrain, and who have developed landslide maps with GIS tools. This position is temporary (about 2/1/2000 to 6/30/2001), is based in Portland and requires travel throughout the state. Salary range is \$3,415 to \$4,776 a month.

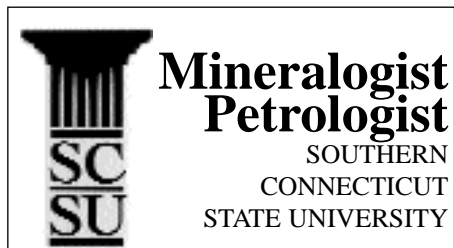
For application forms, send a request letter and resume to Yumei Wang, DOGAMI, 800 NE Oregon St., #28, Portland, Oregon 97232. Job opens December 20, 1999 and closes January 21, 2000. Hiring date of approximately February 10th, 2000.

Classifieds *continued from p. 41*

ment for, and teaching in, a growing Master's program for in-service K-12 teachers in the Department of Geological Sciences is expected. The individual selected will work closely with the Department of Teacher Education, with the possibility of joint appointment. Knowledge of distributed learning technologies and K-12 teaching experience is highly desirable. The successful applicant will be expected to develop an active program of scholarship in science education, including publications and external funding. Candidates must have at least an MS degree in Geological Sciences and must have earned a Doctorate in Geological Sciences or Science Education by September, 2000 with a strong emphasis in Geological Sciences. Applicants should submit a detailed resume with a description of research and teaching interests, and the names, addresses, phone numbers, and e-mail addresses of at least three references to Chair, Faculty Search Committee, Department of Geological Sciences, Wright State University, Dayton, OH 45435-0001. Review of applications will begin on February 1, 2000, and continue until the position is filled. Wright State University is an affirmative-action/equal-opportunity employer.

KECK GEOLOGY CONSORTIUM FACULTY POSITIONS ON SUMMER UNDERGRADUATE RESEARCH PROJECTS

We seek geoscientists who can provide research expertise and mentor students, including those from ethnic and racial groups underrepresented in the sciences, in our undergraduate research groups. The first position is for a



The Earth Science Department at Southern Connecticut State University (<http://www.scsu.ctstateu.edu>) invites applications for a tenure-track position at the assistant professor level, beginning August 2000. A Ph.D. is required at the time of appointment. We seek a collegial, field-based geologist with a strong commitment to undergraduate education and student-involved research. Teaching responsibilities will include introductory geology lecture and laboratory, mineralogy and hand-specimen petrology. Candidates with interests and demonstrated skills in environmental geology and soils are particularly suitable. A willingness to participate in summer field camp and to teach evening courses is also desirable.

The Earth Science department is a comprehensive earth sciences department with five full-time faculty and several adjuncts who support a broad-based earth science curriculum with concentrations in geology, oceanography, meteorology, environmental earth science, mineral resources and earth science education. Southern Connecticut State University is part of the four campus Connecticut State University system and hosts 11,500 students in the urban setting of New Haven, CT.

To apply, please send a curriculum vitae, a statement of teaching and research interests and experience, copies of transcripts, and letters from three referees by March 15 to: John W. Drobnyk, Chairman, Earth Science Department, Southern Connecticut State University, 501 Crescent Street, New Haven, CT 06515.

sedimentologist to work with Mars Global Surveyor data at NASA Goddard. The second opening is for a person to assist with studies of structural and petrologic controls on weathering and landscape evolution at City of Rocks, southern Idaho. Candidates may be employed in academia, industry, or government. A stipend of \$4500 and all expenses are paid for participation in a 4-5 week summer project. Further information can be found at www.carleton.edu/curricular/GEOL/resource/keck/keck.html. Interested persons should contact Dr. Cathryn A. Manduca, Keck Geology Consortium Coordinator at (507) 646-4425 or cmanduca@carleton.edu.

TENURE-TRACK FACULTY POSITION HYDROGEOLOGY, UNIVERSITY OF IDAHO

The Department of Geological Sciences at the University of Idaho is soliciting applications for a full-time, tenure-track faculty position in hydrogeology to begin in the fall, 2000. A Ph.D. is required at the time of appointment. The successful candidate must be committed to undergraduate and graduate education and to developing an externally-funded research program. Salary and rank will be commensurate with experience.

The University of Idaho, located in Moscow, is the state's primary institution for graduate education and research. The Department of Geological Sciences is part of the College of Mines and Earth Resources and enjoys close working relations with the Idaho Geological Survey and the Idaho Water Resource Research Institute, which are located on campus. The 13 member faculty has a strong commitment to undergraduate and graduate education and is particularly interested in candidates who will complement existing strengths in integrated field and laboratory research and education. Interested applicants should inspect the department web site for additional information (www.mines.uidaho.edu/geology). Hydrogeology carries particular significance to the state of Idaho, owing to the importance of ground water resources to agriculture and industry and the Idaho National Engineering and Environmental Laboratory.

The hydrology program has dedicated laboratories for teaching and research. Also, the Groundwater Research Site facility, a grid of wells on campus, provides a unique opportunity for practical instruction and experimentation.

Applications, with a curriculum vitae, statement of research interests and teaching philosophy, and the names, addresses, telephone numbers, and email addresses of five references should be sent to John Oldow (oldow@uidaho.edu), Department of Geological Sciences, University of Idaho, P.O. Box 443022, Moscow, ID 893844-3022.

Search and selection procedures will be closed when a sufficient number of qualified candidates have been identified, not earlier than March 1, 2000.

To enrich education through diversity, the University of Idaho is an equal opportunity/affirmative action employer.

PLANETARY SCIENTIST SMITHSONIAN INSTITUTION NATIONAL AIR AND SPACE MUSEUM

The Smithsonian Institution, National Air and Space Museum, Center for Earth and Planetary Studies (CEPS) is seeking a staff Research Scientist in the field of Earth and planetary sciences. Applicants should be able to contribute to ongoing CEPS work in: Planetary geology and geophysics investigations using a range of in situ and remote sensing data; development of new techniques or instruments for these investigations; terrestrial field and remote sensing studies addressing the nature of processes common to planetary solid surfaces; and development of museum exhibits and educational programs related to the center's areas of expertise. For more information on CEPS, see <http://www.nasm.edu/ceps>. For complete vacancy announcement see <http://www.nasm.edu/nasm/joinnasm/jobs/job.htm>. This is a GS 12/13, Federal Civil Service position. Salary range \$48,796-\$75,433 based on experience. Applications must be received by February 3, 2000. For a complete application package call Tom Lawrence, (202) 287-2432. Announcement number 99MH-1303. EEO.

TENURE-TRACK FACULTY POSITION IN PETROLOGY, OBERLIN COLLEGE

The Department of Geology at Oberlin College invites applications for a tenure-track faculty position in the College of Arts and Sciences. Initial appointment to this position will be for a term of four years, beginning July 1, 2000 and will carry the rank of Assistant Professor.

We seek candidates with a specialization in igneous and/or metamorphic petrology, especially individuals with broad interests who are willing and able to teach outside of their specialization. The incumbent will be responsible for four courses per year. One of those courses will be an

advanced course in igneous and metamorphic petrology (with laboratory). In addition, the incumbent will teach an intermediate level course (with laboratory) appropriate to their expertise, an introductory physical geology course with laboratory, and a topical introductory course for non-majors (without laboratory). He or she will also be expected to participate in the full range of faculty responsibilities, including academic advising, service on committees, and sustained scholarly research.

Among the qualifications required for the appointment is the Ph.D. degree in hand or expected by December 2000. Candidates must demonstrate interest and potential excellence in undergraduate teaching. Successful teaching experience at the college level is desirable.

The Department consists of four full-time faculty members. We have about 35 majors, with approximately equal numbers of men and women. The faculty encourages students to conduct Honors and other research projects; many of our students eventually earn Ph.D.s in earth sciences. The Department has an extensive petrological teaching collection, and the facilities and a technician to make thin sections. XRD, SEM, and other analytical tools are available for both teaching and research. The College is committed to helping the incumbent set up his or her research facilities, has a generous faculty leave program, and has yearly competitions for research grants.

To be assured of consideration, letters of application, including a curriculum vita, graduate academic transcripts, and three letters of recommendation should be sent to Steven F. Wojtal, Chair, Department of Geology, Oberlin College, Oberlin, OH 44074 (steven.wojtal@oberlin.edu) by February 4, 2000. Application materials received after that date may be considered until the position is filled. Salary will depend on qualifications and experience. Oberlin College has admitted women since its beginnings in 1833 and has been historically a leader in the education of African Americans.

SAINT LOUIS UNIVERSITY ADDITIONAL POSITION JUST AVAILABLE!

The Department of Earth and Atmospheric Sciences now has 2 tenure-track positions at the Assistant Professor level to be filled for the fall of 2000.

We are looking for geoscientists who can conduct a vigorous research program and teach at both the graduate and undergraduate levels. Although we prefer one position to be the area of tectonics or tectonophysics, the other can be in any area of geoscience. Both positions are expected to enhance and strengthen our research and graduate programs in geology and seismology. Our geoscience faculty has expertise in tectonics, seismology, gravity, crustal structure and fluids, sedimentary processes, igneous petrology and paleontology. Candidates must possess a Ph.D. at the time of appointment. Breadth and enthusiasm in teaching at the undergraduate level and the ability to motivate students are obvious assets.

Our department emphasizes a strong connection between geology and geophysics and offers excellent atmospheric science programs; it also benefits from an extensive and well-maintained computer network. The university has recently implemented a multi-million-dollar initiative to enhance research facilities and provide opportunities for cutting-edge research. The campus provides an attractive urban environment. Visit our web site at <http://www.eas.slu.edu> to see more about the programs and activities in our department and at Saint Louis University. Applicants should submit a statement of teaching and research interests, a Curriculum Vita, and the names, addresses (including e-mail) and telephone numbers of four references to: The Chairman, Department of Earth and Atmospheric Sciences, Saint Louis University, 3507 Laclede Avenue, St. Louis, Missouri 63103. For further details, contact: (314) 977-3131 or search@eas.slu.edu. Applications will be received up to January 31, 2000, or until the position is filled.

Saint Louis University, a Catholic, Jesuit institution dedicated to education, research and healthcare, is an affirmative action, equal opportunity employer and encourages applications from women and minorities.

POSTDOCTORAL FELLOWSHIPS IN EARTH SCIENCES UNIVERSITY OF WISCONSIN, MADISON

The Department of Geology and Geophysics announces two postdoctoral fellowships, funded by the Albert and Alice Weeks bequest to the department.

The fellowships are each for one year, with the possibility for renewal for an additional year. We anticipate that the positions will begin in August or September 2000. Salary will be approximately \$34,000 per year.

A Ph.D. is required at the time of appointment. Applications from all areas of Earth Science are encouraged. Applicants must contact one or more UW-Madison fac-

ulty to develop a collaborative research project for inclusion in the application.

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

Application must be received by January 21, 2000. Applicants should also ensure that three letters of recommendation reach the department by that date.

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

HYDROGEOLOGIST FLORIDA INTERNATIONAL UNIVERSITY

The department of Geology at Florida International University (FIU) invites applications for a tenure-track position in hydrogeology to be filled at the assistant professor level. A Ph.D. in hydrogeology, groundwater hydrology, or a closely related field is required. Duties include teaching undergraduate and graduate courses, and supervising M.S. and Ph.D. graduate students in hydrogeology. The successful applicant is expected to conduct innovative research on fluid flow and/or solute transport in porous media, including (but not limited to) representation of geological heterogeneity in models, numerical modeling or stochastic analysis of flow and/or transport, movement of non-aqueous phase liquids in the subsurface, or flow in fractured media. Applicants should send a resume (c.v.), statements of teaching and research interests, and the contact information (name, address, phone number, e-mail address) for three references to: Dr. Michael Gross, Search Committee Chair, Department of Geology, Florida International University, Miami, FL 33199 USA.

Application deadline is January 31, 2000. FIU is a member of the State University System of Florida and an equal opportunity/affirmative action/equal access employer.

VIRGINIA DIVISION OF MINERAL RESOURCES

RECRUITMENT AD FOR POSITION 00428. The Virginia Division of Mineral Resources is seeking a research geologist to perform stratigraphic and subsurface geological studies of the Appalachian Plateaus and Valley and Ridge Provinces. Will work independently and as part of a multi-disciplinary team to complete geological projects that support environmentally sound development of Virginia's gas and coal resources. Experience in sequence-stratigraphy, field mapping, subsurface geology, and digital databases required. Experience in: geophysical log interpretation; digital mapping and contouring; gas or coal geology; and/or web page creation, is desirable. Position is located in Abingdon, Virginia. Salary range is \$30,929 to \$48,287. Send resume to: Department of Mines, Minerals and Energy, Human Resources Office, 202 North 9th Street, Richmond, VA 23219. Resumes must be received by 5:00 p.m., February 1, 2000. Telephone (804) 692-3215; fax 804 692-3237, TDD 800-828-1120. EQUAL OPPORTUNITY EMPLOYER.

ASSOCIATE DEAN FOR THE DIVISION OF ENVIRONMENTAL SCIENCES — UC DAVIS

The College of Agricultural and Environmental Sciences invites nominations and applications for the position of Divisional Associate Dean for the Environmental Sciences, encompassing departments of Land, Air and Water Resources; Environmental Toxicology; Environmental Science and Policy; Wildlife, Fish and Conservation Biology; and Landscape Architecture. The Division is one of three in the College. The Associate Dean will provide academic and administrative leadership and will interface with other environmental programs on campus, including the John Muir Institute of the Environment. The Divisional Associate Dean works with department chairs and faculty to develop programmatic priorities in teaching, research, and outreach, and represents divisional programs to external clientele and other colleges and schools. The successful candidate must have a Ph.D. in a relevant biological, physical science, or social science and must qualify for a tenured appointment at the Full Professor level. The Associate Dean position will be an 11-month appointment for a five-year term (renewable). The Associate Dean also will have an academic appointment in a appropriate department in the College and is expected to maintain an active research program.

Applications: Applicants should submit a curriculum vitae, copies of relevant publications, a statement of interest and the names and addresses of four references to: James D. MacDonald, Executive Associate Dean, College of Agricultural and Environmental Sciences, University of California, One Shields Ave., Davis, CA 95616. This position is open until filled, but to ensure consideration, applications should be received by January 15, 2000.

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

FACULTY POSITION IN SEDIMENTARY GEOLOGY UNIVERSITY OF SOUTHERN CALIFORNIA

The Department of Earth Sciences, University of Southern California, is currently searching for a tenure-track faculty member in sedimentary geology at the assistant or associate professor level to begin September 2000.

We seek an accomplished individual with primary research interests in marine sedimentary rocks, linking global paleoenvironmental and ecological change through study of the stratigraphic record. Interests in land-based field research, carbonate systems, and the ability to integrate one or more analytical approaches, are desirable.

The successful candidate will be expected to foster interaction with ongoing programs in paleobiology, marine geology, paleoceanography, marine geochemistry, paleomagnetism, and paleoclimatology. Teaching responsibilities will include undergraduate offerings in general education and sedimentary geology as well as graduate offerings in the area of specialty. Major USC facilities include XRD and XRF systems, stable and radioisotope labs, a computer/GIS facility, and the Center for Electron Microscopy and Microanalysis.

Screening of applicants will begin January 15, 2000, and continue until the selection is made. Applications including curriculum vitae, a statement of teaching and research interests, and the names of three references should be sent to: Professor David J. Bottjer, Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089-0740 (e-mail: dbottjer@earth.usc.edu). USC is an equal opportunity/affirmative action employer. Applications from women and individuals from underrepresented groups are strongly encouraged.

ST. CLOUD STATE UNIVERSITY, DEPARTMENT OF EARTH SCIENCES

St. Cloud State University seeks applications for an Assistant Professor of Earth Sciences to begin August 28, 2000. Salary commensurate with qualifications and experience.

Responsibilities: Teach undergraduate physical geology for majors and general education earth science courses. Additional teaching to include one or more of the following upper division courses for majors: earth materials, field geology, structural geology/tectonics, or geophysics. Additional responsibilities include participation in undergraduate research program, appropriate scholarly activity, continued professional development, advising and university/community service.

Qualifications: Ph.D. in geology required; experience in solid earth and field geology; university level teaching experience preferred. Specialty areas of igneous/metamorphic petrology, structural geology, or tectonics preferred. Experience in Precambrian terranes desirable. Demonstrated classroom expertise and commitment to excellence in teaching. Evidence of ability to establish a research program involving undergraduates. Ability to teach and work with person from culturally diverse backgrounds.

Apply to: Garry Anderson, Search Chair, Department of Earth Sciences, St. Cloud State University, 720 4th Avenue South, St. Cloud, MN 56301-4498. Send resume, transcripts (unofficial acceptable for initial screening) and names, addresses and telephone numbers of three references by January 28, 2000.

SCSU is committed to excellence and actively supports cultural diversity. To promote this endeavor, we invite individuals who contribute to such diversity to apply, including minorities, women, GLBT, persons with disabilities and veterans.

DIRECTOR, MUSEUM OF GEOLOGY FACULTY POSITION ANNOUNCEMENT

South Dakota School of Mines and Technology (SDSM&T), located at the foot of the Black Hills in western South Dakota, is seeking applicants for a Director of the Museum of Geology. The successful candidate will hold faculty rank. The position will be available beginning July 1, 2000.

Responsibilities for this position will include: administering the Museum facility and its collections; advancing the Museum's role in the educational and outreach missions of the university through interaction with external

groups and pursuit of external funding opportunities; and management of the Master's degree program in Paleontology, including participation in guidance of students and delivery of the curriculum.

This position requires an earned doctorate in paleontology, geology or a related field, or the equivalent. Candidates should have significant leadership experience in a natural history museum or other business, non-profit, or academic organization, including demonstrated success in managing programs, personnel, and finances. Teaching and research experience are desirable.

Submit curriculum vitae and the names, phone numbers, and e-mail addresses of three references to: Dr. Sangchul Bang, Dean, College of Earth Systems, South Dakota School of Mines and Technology, 501 East St. Joseph Street, Rapid City, SD 57701.

Review of applications will begin on March 1, 2000, and will continue until the position is filled.

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

TENURE-TRACK POSITION IN HYDROGEOLOGY

The Department of Geology & Planetary Science at the University of Pittsburgh invites applications for a tenure-track faculty position in hydrogeology at the assistant professor level. We are particularly interested in an individual who can combine field and/or laboratory studies with hydrologic modeling to build a competitive and interdisciplinary research program focused on hydrologic systems and water resources. A Ph.D. is required at the time of appointment, with specialization in hydrogeology or a related field.

The successful candidate will be expected to develop an active, externally funded research program, including supervision of M.S. and Ph.D. students and undergraduate research projects. Teaching duties will include undergraduate and graduate courses in geology and hydrogeology. We especially seek someone who will contribute to the department's growing environmental program, and who would complement one or more of our existing programs in environmental geology, low temperature/isotope geochemistry, climate change, geographic information systems, remote sensing, geomorphology, paleomagnetism, and planetary science.

Applicants should submit a resume (including past and current grant support), statement of research and teaching interests, copies of relevant publications, and the names and addresses of at least four references to Hydrogeology Search Committee, Department of Geology & Planetary Science, 321 Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15260, USA.

Applications deadline February 15, 2000. For additional information, see our web site: <http://www.geology.pitt.edu>.

The University of Pittsburgh is an equal opportunity/affirmative action employer. Women and members of underrepresented minority groups are especially encouraged to apply.

LECTURER/UNIVERSITY OF PITTSBURGH

The Department of Geology & Planetary Science at the University of Pittsburgh invites applications for a faculty position at the level of lecturer in Geology and Planetary Science. This position is outside of the tenure stream, and would begin with the Fall Term 2000–2001, subject to budgetary approval. The Department offers undergraduate BS degrees in Geology and Environmental Geology and an interdisciplinary BA degree in Environmental Studies, in addition to MS and Ph.D. programs. Teaching duties will include a combination of introductory courses, such as Geology, Environmental Geology, Oceanography, and World Physical Geography, and upper-level undergraduate courses in the candidate's area of specialization. We are particularly interested in an individual who could teach existing courses or develop new courses in one or more of the following areas: global change, economic geology/petroleum geology, geographic information systems, geophysics/exploration geophysics, and mineralogy. Initial appointment is for one year; position is renewable as a multi-year appointment, subject to performance review. A Ph.D. is required at the time of appointment.

Applicants should submit a resume, statement of teaching interests, relevant teaching materials, and names and addresses of at least three references to Lecturer Search Committee, Department of Geology and Planetary Science, 321 Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15260-3332, U.S.A.

Application deadline is February 15, 2000. For additional information, see our web site: <http://www.geology.pitt.edu>.

The University of Pittsburgh is an equal opportunity/affirmative action employer. Women and members of underrepresented minority groups are especially encouraged to apply.

Classifieds continued on p. 47

Geology of the Grand Canyon—Lee's Ferry to Pierce Ferry

April 7-14, 2000 • 8 days, 7 nights



Participants of a GSA river trip socializing at the end of the day in the Grand Canyon. Photo by Ivo Lucchitta.

Scientific Leader: Ivo Lucchitta, U.S. Geological Survey, Flagstaff, Arizona

Ivo Lucchitta's interests include continental extension (from the perspective of Colorado Plateau-Basin and Range interface); history of Grand Canyon and Colorado River; and Quaternary geology and geomorphology, especially as applied to southwestern drainage systems.

Description

Explore the classic stratigraphy of one of the world's most fascinating and accessible geologic records, including Tapeats Limestone, Bright Angel Shale, and Vishnu Schist. Although millions have traveled the Colorado River's erosional path through the Kaibab plateau, GSA's trip offers a rare combination of expert geological leadership and stimulating intellectual companionship. Emphasis will be on the interaction between geology and people.

Fees and Payment

\$1,750 for GSA Members; \$1,850 for Nonmembers. A \$300 deposit is due with your reservation and is refundable through February 1, less a

\$50 processing fee. The total balance is due *March 1, 2000*. Minimum: 14. We are holding 14 spaces. Any additional spaces will be based on availability. Included: Guidebooks to the river; geologic guide; transportation to and from Las Vegas and the river; water-proof bags for clothes; life jacket; camping gear, including two-person tent, sleeping bag and pad, and eating utensils; continental breakfast before put-in on day 1 and all river meals; soft drinks on the river. Not included: Airfare to Las Vegas, lodging and meals in Las Vegas, and alcoholic beverages.

Deformation, Dinosaurs, and Darwin

Salta, Argentina • July 23-August 12, 2000 • 21 days, 20 nights



View of the Neogene Cordillera Oriental from the Cuesta del Obispo in Salta Province, Argentina. Photo by James H. Reynolds.

Scientific Leaders: James Reynolds, Magstrat, LLC, Webster, North Carolina, and Brevard College, Brevard, North Carolina; Dorothy L. Stout, Cypress College, Cypress, California

Jim Reynolds has spent the past 15 years investigating the uplift history of the Andes. Using magnetostratigraphy, Jim and his colleagues are developing a relatively precise chronostratigraphy across the many tectonic provinces that we will visit. In addition to his work at Magstrat, LLC and Brevard College, he holds an adjunct position at the University of Pittsburgh.

Dottie Stout has been leading geological expeditions around the world since 1978, exploring China, South America, Africa, Europe, Indonesia, Australia, and Russia. Dottie is past president of the National Association of Geology Teachers, is currently on GSA Council, and is temporarily on leave as a program director at the National Science Foundation.

Description

This thousand-mile journey down the east side of the Andes encompasses a variety of the tectonic provinces associated with variations in the Nazca plate subduction angle that range from subhorizontal to moderately steep. The trip begins in Salta and Jujuy provinces in northwestern Argentina, where Proterozoic, Paleozoic, Mesozoic, and Cenozoic strata and structures are spectacularly displayed. Other sites to be visited: (1) The Train to the Clouds, Parque Nacional de Reyes—a jungle excursion renowned for its animals and birds; environmental geology problems caused by active alluvial fans in the Quebrada de Humahuaca; and new interpretations and connections of Grenville rocks. Cambrian-Ordovician strata with North American affinities will be examined, as will views of a porphyry copper complex on the 20,000-ft-high Sierra de Famatina. (2) Valle de la Luna National Park, the area in which the oldest known dinosaurs were discovered,

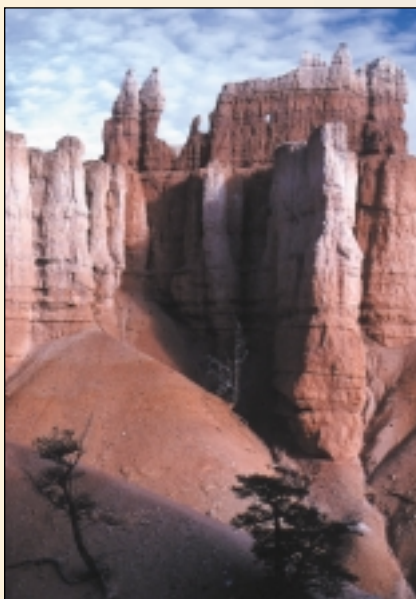
includes views of Aconcgua; a bus ride to Los Penitentes ski area along the route that Darwin took when he traversed the Andes from Valparaiso, Chile (weather dependent); Buenos Aires; and Iguazu Falls.

Fees and Payment

\$3,900 for GSA Members; \$4,000 for nonmembers. A \$300 deposit is due with your reservation and is refundable through June 1, less \$50 processing fee. The total balance is due *June 1, 2000*. Minimum: 20; maximum: 30. Included: Guidebook, ground transportation, lodging for twenty nights, based on double occupancy, and meals for 21 days. Not included: Airfare to Argentina and alcoholic beverages.

Valley of Fire in Southern Nevada, Toroweap Valley of the Grand Canyon, Zion and Bryce Canyon National Parks of Southern Utah

Dixie College, St. George, Utah • June 10–15, 2000 • 5 days, 6 nights



Eocene Claron Formation, Bryce Canyon National Park, Utah. Photo by Martin Miller.

Scientific Leaders: Spence Reber, Chevron USA (retired); Janice Higgins, Dixie College, St. George, Utah

Spence Reber spent 37 years as a petroleum geologist for Chevron USA. He was the field trip leader for Chevron's Structural Geology Seminar for 22 years, during which he traversed the areas to be visited. Spence has remained active in geology. He is a groundwater consultant for most cities and towns in southwestern Utah, and teaches geology at the Institute for Continued Learning at Dixie College in St. George.

Janice M. Higgins received both her bachelor and master degrees in geology from Brigham Young University in Provo, Utah, and a secondary teaching certificate from Metropolitan State College in Denver, Colorado. She has worked as an exploration geologist in the oil industry and as a physical and earth science teacher in Colorado and Utah. She is currently a project geologist with the Utah Geological Survey mapping program, producing geologic maps and the accompanying text for 7.5 minute quadrangles. Janice is also an adjunct instructor of geology at Dixie College in St. George, Utah.

Description

This GeoHostel will be of interest and challenging to the professional geologist or geophysicist, yet understandable and fascinating to others. The structure and stratigraphy of the region are exceptionally well exposed, and each field trip stop will display elements of both. The participants will be housed in dorm facilities at Dixie College, located in historic St. George, Utah. St. George is a thriving community of more than 50,000, nestled in a valley surrounded by picturesque hills and mountains. It was ranked 6th in a recent survey of the 10 most popular and desirable retirement communities in the United States.

The field trips planned for each day will begin and end in St. George. A brief show-and-tell with handouts will be given in the morning before going out into the field. All of the field

trips will be on hard surface roads, and walking will not be strenuous. The weather in the region is generally warm and sunny, with daytime temperatures ranging from 70 to 90 °F and nighttime temperatures ranging from 50 to 60 °F. Bring your camera and binoculars for this GeoHostel.

Fees and Payment

\$800 for GSA Members; \$900 for nonmembers. A \$100 deposit is due with your reservation and is refundable through May 1, less \$20 processing fee. The total balance is due *May 1, 2000*. Maximum: 32. Included: Classroom programs and materials; field trip transportation; lodging for six nights (single occupancy, or double for couples); breakfast and lunch daily, and welcoming and farewell events. Not included: Airfare to and from St. George, Utah; transportation during hours outside field trips; and other expenses not specifically included.

Geology of the Lewis and Clark Expedition: Lost Trail Pass to the Columbia River

University of Montana, Missoula, and Sacajawea Select Inn, Lewiston, Idaho • July 15–20, 2000 • 5 days, 6 nights



Along the Lewis & Clark Trail in the Bitterroot Valley, Montana. Photo by Rob Thomas.

Scientific Leaders: Rob Thomas and Sheila Roberts, Western Montana College, Dillon, Montana

Rob Thomas is currently an associate professor and chair of the Department of Environmental Sciences at Western Montana College in Dillon. He developed an interest in the geology of the Lewis and Clark Expedition as a result of 13 years of research and teaching in southwestern Montana. His focus has been on the origin and timing of extensional tectonism in southwestern Montana, the dynamics of carbonate platform development and destruction, Cambrian mass extinctions, and field-based geoscience program development.

Sheila Roberts is currently an associate professor of geology in the Department of Environmental Sciences at Western Montana College in Dillon. Her focus has been on Pleistocene paleoclimates recorded in saline lacustrine sediments. Sheila is also a strong advocate for service learning in the geosciences, and has mentored her students on several community service projects along the Lewis and Clark trail in southwestern Montana. A native Montanan, Sheila is a knowledgeable guide to the history and geology of the Lewis and Clark Expedition.

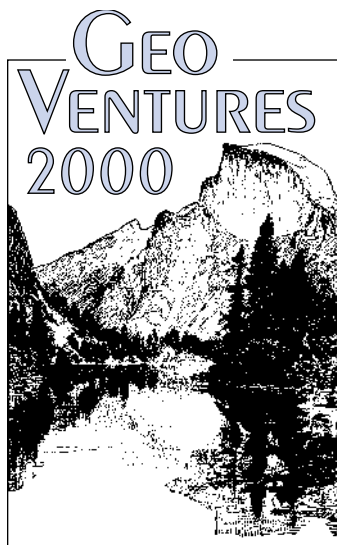
Description

From 1804 to 1806, Meriwether Lewis and William Clark journeyed through the recently acquired Louisiana Territory on the order of President Thomas Jefferson. From August to October of 1805 they traversed the continental divide, traveled down the Bitterroot Valley, over the Bitterroot Range, and on to the Columbia River. This trip will be a geological

GeoVentures *continued on p. 46*

GeoVentures *continued from p. 45*

and historical tour of that famous landscape. The expedition will have two base camps, Missoula, Montana, and Lewiston, Idaho. The geological component of this GeoHostel will include field trips to see Proterozoic and Phanerozoic sedimentary rocks; Mesozoic compressional structure; Mesozoic igneous rocks and mylonites of the Idaho batholith; and Tertiary volcanics of the Challis arc and the Columbia Plateau. Side trips will investigate accretionary terranes and the John Day Formation. The historical component will include stops at important landmarks from the Lewis and Clark expedition such as the Lost Trail, Traveler's Rest, Lolo Pass, and Nez Perce villages.



best to help find a suitable roommate, but if none is found, the single rate will apply.

Age Requirement: Participants must be at least 21 years old.

For GSA Members and Friends

CALL TODAY! HOLD A SPOT FOR YOURSELF AND FRIENDS

We encourage you to make your decision as soon as possible.

Single or Shared

Accommodation: Some trip fees are based on double occupancy. However, if you wish single accommodations, a limited number of rooms are available at extra cost on a first-come, first-served basis. In the case of double occupancies, we will do our

Fees and Payment

\$900 for GSA Members; \$1,000 for nonmembers. A \$100 deposit is due with your reservation and is refundable through June 1, less \$20 processing fee. The total balance is due *June 1, 2000*. Maximum: 32. Included: Classroom programs and materials; field trip transportation; lodging for six nights (single occupancy, or double for couples); breakfast and lunch daily, dinner on Sunday, and welcoming and farewell events. Not included: Airfare to and from Missoula, Montana; transportation during hours outside field trips; and other expenses not specifically included.

Health Recommendations and Special Needs: You must be in good physical health. Any physical condition requiring special attention, diet, or treatment must be reported *in writing* when the reservation is made. We will do our best to accommodate special needs, including dietary requirements and physical disabilities. Please feel free to discuss your situation with us.

Cancellation Processing Fee: Deposits and payments are refundable, less processing fee, up to the cut-off date. Termination by an individual during a trip in progress for any reason whatsoever will not result in a refund, and no refund will be made for unused parts of the trip.

Full Itineraries: A detailed itinerary and helpful travel information are available from GSA. Contact Edna Collis, GeoVentures coordinator, at 1-800-472-1988, ext. 134, fax 303-447-1133, ecollis@geosociety.org.

REGISTER TODAY!

Send a deposit to hold your reservation; please pay by check or credit card. You will receive further information and a confirmation of your registration within two weeks after your reservation is received.

Name _____

Institution/Employer _____

Mailing Address _____

City/State/Country/ZIP _____

Phone (business/home) _____

Guest Name _____

GSA Member # _____

	DEPOSIT PER PERSON	NO. OF PERSONS	TOTAL PAID DEPOSIT
GT001—Grand Canyon	\$300	_____	\$ _____
GT002—Argentina	\$300	_____	\$ _____
GH003—Utah	\$100	_____	\$ _____
GH004—Montana	\$100	_____	\$ _____
	TOTAL DEPOSIT		\$ _____

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Credit Card # _____ Exp. Date _____

Signature _____

I've enclosed no deposit, but I'm interested. Please send information.

MAIL OR FAX REGISTRATION FORM AND CHECK OR CREDIT CARD INFORMATION TO:

2000 GSA GeoVentures, Member Services
P.O. Box 9140, Boulder, CO 80301
fax 303-447-1133 or 303-443-1510

MAKE CHECKS PAYABLE TO: GSA 2000 GeoVentures

Classifieds *continued from p. 43*

U. S. GEOLOGICAL SURVEY CHIEF SCIENTIST FOR USGS

WESTERN MINERAL RESOURCES TEAM

Supervisory Geologist (1350)/Geophysicist (1313)/Chemist(1320)/Physical Scientist(1301)..

The U.S. Geological Survey invites qualified earth scientists to apply for a permanent, full-time position as Chief Scientist of the Western Mineral Resources Team. The position is located at the USGS offices in either Menlo Park, CA, Tucson, AZ, Spokane, WA, or Anchorage, AK.

The Western Mineral Resources Team conducts interdisciplinary research in the states of Arizona, California, Nevada, Oregon, Washington, Utah, Idaho, and Alaska. This research is related to (1) geologic framework and genesis of mineral deposits, (2) mineral-resource evaluations, and (3) environmental issues related to mineral deposits and minerals development. The Team includes scientists with expertise in economic geology, geochemistry, mineralogy, geophysics, structural geology, tectonics, industrial minerals, and mineral economics. Research activities support primarily the USGS Mineral Resources Program.

The successful candidate will have a distinguished record of published research beyond the Ph.D. and demonstrated ability in science management, combined with an innovative, visionary approach to interdisciplinary studies of mineral resources. He or she will provide scientific leadership for ongoing projects throughout the western states and will actively seek out new scientific opportunities within the USGS and in collaboration with other federal bureaus, state and local organizations, and private-sector interests. The Chief Scientist also contributes to the development of USGS programs by acting as a consultant and advisor to regional and program managers. The Chief Scientist oversees the work of approximately 80 research scientists, technicians, and other support personnel primarily located in Menlo Park, CA, Tucson, AZ, Spokane, WA, Reno, NV, and Anchorage, AK, but also in Seattle, WA and Flagstaff, AZ.

Starting salary depends on experience and qualifications, ranging between \$67,298 and \$102,907 in Tucson and Spokane, between \$71,869 and \$109,985 in Menlo Park, and between \$63,567 and \$97,201 (Plus 25% COLA) in Anchorage, AK.

For detailed announcement, including specific qualification requirements, see www.usgs.gov/ohr. Refer to Vacancy Number CH-0-0076. Please send required documents to: U.S. Office of Personnel Management, Chicago Service Center, 230 South Dearborn Street, DPN 30-3, Chicago, IL 60604. Please direct questions to: mbollier@usgs.gov. Deadline for applications: 01/31/00. The USGS is an Equal Opportunity Employer.

U. S. GEOLOGICAL SURVEY CHIEF SCIENTIST FOR USGS

WESTERN EARTH SURFACE PROCESSES TEAM

Supervisory Geologist(1350)/Geophysicist (1313)/Chemist(1320)/Physical Scientist(1301). Duty location: Tucson, AZ

The U.S. Geological Survey invites qualified earth scientists to apply for a permanent, full-time position as Chief Scientist of the Western Earth Surface Processes Team. The position is located at the USGS office on the University of Arizona campus, Tucson, Arizona. This position combines ongoing responsibility for geologic mapping with the development of topical and areal studies of earth surface processes in the United States west of the Rocky Mountains. The Team includes scientists with expertise in surficial processes, geologic mapping, landslides, potential-field geophysics, energy resources, and geographic information systems. Activities of the Team support the Earth Surface Dynamics Program, the National Cooperative Geologic Mapping Program, the Landslides Program and the Energy Resources Program.

The successful candidate will have a distinguished record of published research beyond the Ph.D. and demonstrated ability in science management, combined with an innovative, visionary approach to interdisciplinary studies of earth surface dynamics. He or she will provide scientific leadership for ongoing projects throughout the western states and will actively seek out new scientific opportunities within the USGS and in collaboration with other federal bureaus, state and local organizations, and private-sector interests. The Chief Scientist also contributes to the development of USGS programs by acting as a consultant and advisor to regional and program managers. The Chief Scientist is also expected to work closely with faculty, students and staff at the University of Arizona to maximize available resources and to develop joint research projects in the American Southwest. The Chief Scientist oversees the work of approximately 65 research

scientists, technicians, and other support personnel located primarily in Menlo Park, CA but also in Tucson, AZ, Flagstaff, AZ, Riverside, CA, and Spokane, WA.

Applications are welcomed from candidates with scientific interests such as the following:

- Analysis of sedimentary processes in surficial systems and their variability with respect to tectonic and climatic processes.
- Multidisciplinary research that interfaces with geotechnical and hydrogeological engineering applications
- Forward modeling of complex natural systems involving hydrologic, biologic and geologic components
- Application of new technology in the analysis of geomorphologic processes

Starting salary ranges between \$67,298 and \$102,907 per annum, depending on experience and qualifications. USGS researchers in Tucson are customarily extended faculty privileges by the University of Arizona.

For detailed announcement, including specific qualification requirements, see www.usgs.gov/ohr. Refer to Vacancy Number CH-0-0075. Please send required documents to: U.S. Office of Personnel Management, Chicago Service Center, 230 South Dearborn Street, DPN 30-3, Chicago, IL 60604. Please direct questions to: rbarnes@usgs.gov. Deadline for applications: 01/31/00. The USGS is an Equal Opportunity Employer.

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BOOKS: Geology and History of Geology. Used, out-of-print, and rare. Free Catalog. Patricia L. Daniel, BS, MS, Geology. 618 W. Maple, Independence, KS 67301 ph: (316) 331-0725, fax: (316) 331-0785. email: pldaniel@horizon.hit.net website: www.hit.net/~pldaniel

Opportunities for Students

Undergraduate Research Opportunities, Keck Geology Consortium/Undergraduate Research Opportunities. The Keck Geology has openings in its summer research program for both sophomore and junior students. Sophomore students who are members of ethnic or racial groups underrepresented in the sciences and have completed at least one geology course are invited to apply for five weeks of research investigating Mars at the Goddard Space Flight Institute or studying the impact of land use on sedimentation and water quality on the Cannon River in SE Minnesota. Junior students who have declared a geology major are invited to apply for any of four projects involving four weeks of summer research followed by term or year of independent study at the student's home institution. Students receive a stipend of \$1200 and expenses. All students must be U.S. citizens or permanent residents and have a faculty sponsor who agrees to supervise the student's work at the home institution. Information and application materials are available at www.carleton.edu/curricular/GEOL/resource/keck/keck.html or from Dr. Cathryn A. Manduca, Keck Geology Consortium Coordinator at (507) 646-4425, or e-mail: cmanduca@carleton.edu. Student selection will begin February 13, 2000.

Graduate Fellowships/Boise State University. The Department of Geosciences seeks applicants for graduate teaching and research fellowships in the M.S. Geophysics, M.S. Geophysics, and Ph.D. Geophysics programs beginning fall semester 2000. Each fellowship includes a competitive stipend plus all tuition and fees. Current research is in the following areas: petrology, structure and tectonics, stratigraphy and paleontology, Quaternary geology and geomorphology, neotectonics, watershed hydrology and surficial processes, paleoclimatology and paleoceanography, hydrogeology, and engineering and environmental geophysics. Additional information including descriptions of specific research projects, faculty profiles, and program requirements available at <http://cgiss.boisestate.edu/geoweb/home.html>. Request application materials from Dr. Paul Donaldson, Department of Geosciences, Boise State University, 1910 University Drive, Boise, ID 83725, Voice: (208) 426-3639, fax: 208-426-4061, e-mail: pdonalds@boisestate.edu. Application deadline: 15 January 2000.

Graduate Student Support Opportunities in Earth Sciences, Lehigh University. The Department of Earth and

Environmental Sciences of Lehigh University has Graduate Student Fellowships for highly qualified individuals. The department has active research programs in tectonic studies (geochronology, stable isotope geochemistry, low temperature geochemistry, seismology, high resolution geophysics, structural geology, paleomagnetism) and surficial processes (low temperature geochemistry, fluvial and tectonic geomorphology, glacial geology, hydrology, and limnology). Please contact Prof. D. Morris, Dept. of Earth and Environmental Sciences (dpm2@lehigh.edu) or see our Web page for more details (<http://www.ees.lehigh.edu>).

Master's/Ph.D. Fellowship Available, Baylor University. The Department of Geology at Baylor University is pleased to announce the creation of the Wendlandt Fellowship, available to an outstanding incoming graduate student in the fall of 2000. The fellowship is supported by an annual stipend of \$14,000 plus full tuition. More detailed information on the fellowship and on available graduate programs can be obtained at: www.baylor.edu/~Geology/studentinfo.html. In addition to the Wendlandt Fellowship, there are also a number of teaching assistantships available at \$12,000/yr + tuition (Master's) or \$15,000/yr + tuition (Ph.D.s). For information or application please contact Dr. Thomas Goforth, Baylor University Dept. of Geology, PO Box 97354, Waco, TX 76798-7354; (254) 710-2361; e-mail: tom_goforth@baylor.edu.

Graduate Assistantships available, University of Akron: The Department of Geology, University of Akron, has multiple graduate assistantships in our MS program available for Fall 2000. Students with a GPA of 3.0 or above are invited to apply for 9-month assistantships valued at \$9,500 with a full remission of tuition and fees. Research interests of our twelve faculty range from the traditional areas of geology and geophysics to a specialization in Quaternary Research covering such topics as hydrogeology, paleoclimate reconstruction, glacial geology, ancient lake systems, surficial processes, karst systems, aqueous geochemistry, and GIS. Akron is undergoing a cultural resurgence marked by new construction across campus and the adjacent downtown area. The city is located adjacent to extensive green spaces in neighboring Cuyahoga Valley National Recreation Area. Prospective students can request an information package or learn more about the graduate program and current research opportunities by visiting the departmental website (<http://www.uakron.edu/geology/>) or can contact the Graduate Advisor, Department of Geology, University of Akron, Akron, OH 44325-4101 for additional information.

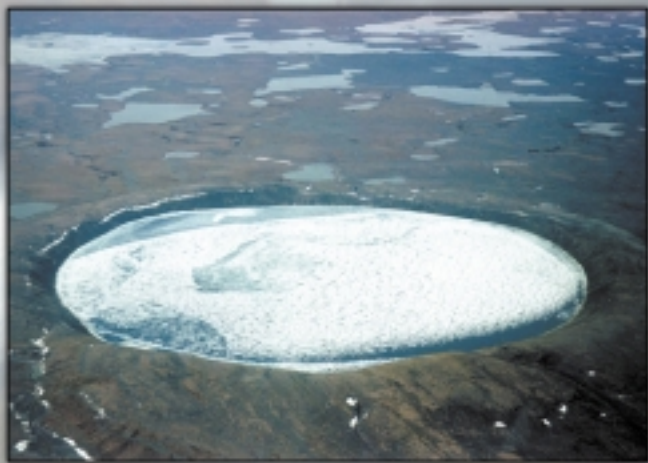
Two Applied Geohydrology Summer Research Assistantships: Kansas Geological Survey, Lawrence, Kansas. These are 12-week summer positions open to students at any university. The individual will participate in a variety of field activities in support of KGS research programs. The theme of the activities in the summer of 2000 will be hydraulic test methods and direct push technology. Start approx. 5-15-00. Salary \$5,500 for 12-week appointment. Required: Relevant coursework in earth sciences or engineering; interest in hydrogeology; and ability to participate in moderate physical activity in mid-summer temperatures in Kansas. First consideration given to applications postmarked by 2-15-00. For complete description, reference #66146 at <http://www.kgs.ukans.edu/General/jobs.html> or contact Annette Delaney at (785) 864-3965. For further information contact Jim Butler at jbutler@kgs.ukans.edu. The University of Kansas is an EO/AA employer.

Graduate Fellowships/Department of Geological Sciences/Florida State University. The Department welcomes applications for competitive fellowships open to students pursuing a Ph.D. in any area of the geological sciences covered by specialties of the faculty. These 12-month fellowships offer a \$15000 stipend plus tuition waiver. Application materials may be requested from: Ms. Tami Karl, Department of Geological Sciences, Florida State University, Tallahassee, FL 32306-4100, karl@gly.fsu.edu. Applicants are urged to visit our web site (<http://www.gly.fsu.edu/>). In addition to research and teaching facilities housed in a newly renovated building on the main FSU campus, the isotope geochemistry program is housed in state-of-the-art facilities at the National High Magnetic Field Laboratory (<http://www/magnet.fsu.edu/science/programs/isotope/index.html>). The department also maintains strong collaborative ties with the Departments of Meteorology, Oceanography, and Chemistry, the Geophysical Fluid Dynamics Institute and the new interdisciplinary School of Computational Sciences and Information Technology (<http://www/cse.fsu.edu/>). ■

Available now!

Large Meteorite Impacts and Planetary Evolution II

Edited by
B. O. Dressler and V. L. Sharpton



Special Paper 339

Large Meteorite Impacts and Planetary Evolution II

edited by B. O. Dressler and V. L. Sharpton

Impact specialists, or other scientists interested in the fields of geoscience and planetology, will appreciate the wide range of topics in this 33-chapter volume: impact cratering mechanics; geophysical signatures of impact structures (e.g., Chesapeake Bay, Chicxulub, Mjølnir, Barents Sea, Sudbury, Slate Islands); formation and differentiation of impact melts (e.g., Sudbury); shock metamorphism and shock attenuation (e.g., Slate Islands); terrestrial impact structures

under investigation (e.g., Morokweng, Lycksele, Popigai); and the origin of carbon, including diamonds, in impact deposits (e.g., Sudbury, Chicxulub ejecta).

This special volume is the outcome of a second international conference on Large Meteorite Impacts and Planetary Evolution (Sudbury 1997) attended by more than 150 scientists representing approximately 15 countries. Presentations on the Sudbury Structure are introduced by a summary of the understanding of this structure before the 1997 conference and are followed by concluding remarks outlining unresolved problems. This volume contains papers of interest to all geoscientists who investigate the effects of impacts and planetology.

SPE339, 472 p.

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