1999 Izmit, Turkey Earthquake Was No Surprise

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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.

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 Marmaara 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...

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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Fairmont, Wisconsin
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Ernest E. Glick
North Little Rock, Arkansas
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Olcott Gates
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Melvin L. Hill
Lakeview, Colorado
April 8, 1999
Donald E. Gault
Vallecito, California
March 29, 1999
Russell M. Jeffords
Houston, Texas
January 1999
James E. Gillis, Jr.
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continuously recording Global Positioning
System (GPS) stations and a relatively
dense network of GPS survey sites to mon-
itor strain accumulation on the various
branches of the fault in the Marmara
region. This effort is providing informa-
tion on the various phases of the earth-
quake 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
(Storey et al., 1997; Reilinger et al., 1997a; Clucas et
al., 2000). As a result, rather complete seis-
mic, 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 inter-
actions.

ACTIVE TECTONICS OF THE EAST-
ERN 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
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, intra-plate 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 of the Anatolian (Turkish) plate. The leading edge of the African plate is being subducted along the Hellenic trench at a rate of about 10 mm/yr. Differential northward motion of Arabia results in 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).
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.
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 earthquake 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

We are grateful to Francisco Gomez, Laura Serpa, and Sue Kay for constructive reviews. This study was supported in part by National Science Foundation grant EAR-9304554 and NASA grant NAGS-6145.

REFERENCES CITED


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Earthquake continued from p. 5


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

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 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.ig.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.

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.
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 increase, further straining an exhaustible supply.

We have plowed the ground and heavily fertilized and/or irrigated our crops, realizing short-term gain, but not really 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.
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Call for Nominations

**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.

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**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 exceptional 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).
**REGISTRATION, ACCESSIBILITY, AND ABSTRACTS BOOK**

**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 wheelchair 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**

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.


10. Lake Records of Biogeochemical Cycling and Climate. Gabriel Filippelli, IUPUI, (317) 274-3795, gfilippe@iupui.edu; James M. McAnus; Lakes Observ, University of Minnesota, Duluth, jmcmcanus@umn.edu.


12. Soil Science and Quaternary Geology: Past and Future Partners? Robert Hall, IUPUI, (317) 274-7154, rhall@iupui.edu; Bill Hofstetter.


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 DeCaprariis, IUPUI, (317) 274-7732, pdecapr@iupui.edu.


17. Trilobite History and Paleobiology. (Sponsored By North-Central Section, Paleontological Society.) Don Mikulic, Illinois State Geological Survey, Champaign, (217) 244-2518, mikulic@geoerv.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@sgs.uiuc.edu. Cost: $75, includes lab supplies, lunch, and break service.

2. Fundamentals of GIS. April 5, 8:30 a.m.–12 noon. Pam Hoque, CEEES, (317) 274-7104, fax 317-274-7966, pogue@iupui.edu. Cost: $30, includes lunch and 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 Hoque, IUPUI CEEES, (317) 274-7104, pogue@iupui.edu. Direct all inquiries about field trip arrangements to Pam Hoque. 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/secldiv/northc/00ncmtg.htm.

Premeeting


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 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 Reps 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.

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
GSA North-Central Section
Indianapolis, Indiana
April 6–7, 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 ___________________________
Mailing Address (use two lines if necessary)
City ___________________________ State or Country ___________________________
ZIP Code ___________ Country (if other than USA) ___________________________

Male □ Female □
Business Phone (_______) ______-__________
Fax (_______) ______-__________
Home Phone (_______) ______-__________
E-mail ___________________________

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 #__________
□ American Express □ VISA □ MasterCard □ Discover □ Diners Club

Card Number ___________________________ Expires ___________________________
Signature ___________________________

ADVANCE REGISTRATION FEES

Professional Member* ___________________________ (10) $75 □ (11) $40 □ __ $_________
Professional Member (70 & older)* ___________________________ (12) $25 □ (13) $20 □ __ $_________
Professional Nonmember ___________________________ (14) $80 □ (15) $45 □ __ $_________
Student Member* ___________________________ (30) $30 □ (31) $20 □ __ $_________
Student Nonmember ___________________________ (32) $35 □ (33) $25 □ __ $_________
K–12 Professional ___________________________ (60) $25 □ __ $_________
Guest or Spouse ___________________________ (90) $10 □ __ $_________
Field Trip Only ___________________________ (95) $5 □ __ $_________

*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

1. Determination of Water-Soluble Metals in Contaminated Soil . . . . . . . . . . . . . . . April 5 (601) $75 __ $ ___________
2. Fundamentals of GIS . . . . . . . . . . . . . . . . . . . . . . . . . . . April 5 (602) $30 __ $ ___________
3. Experience with Digital Orthophotos . . . . . . . . . . . . . . . . . . April 5 (604) $30 __ $ ___________
4. Roy J. Shlemon Mentor Program . . . . . . . . . . . . . . . . . . . April 6 (603) Free __ $ ___________

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

1. Furthering the Understanding of the St. Louis Limestone . . . . . . . . . . . . . . . . . April 4 (401) $25 __ $ ___________
2. Pennsylvanian Incised Valley Fills . . . . . . . . . . . . . . . . . . . . . . . . April 5 (402) $40 __ $ ___________
3. Building Stone Walking Tour of Downtown . . . . . . . . . . . . . . . April 5 (403) $20 __ $ ___________
4. A Vertical Tour through the Classic Cincinnatian . . . . . . . . . . . . . . . April 8 (404) $45 __ $ ___________
5. Glacial, Hydrological, Engineering & Other Perspectives . . . . . . . . . . . . . . April 8 (405) $56 __ $ ___________
6. Glacial and Nonglacial Quaternary Stratigraphy
   One-day . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . April 8 (406) $50 __ $ ___________
   Two-day . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . April 8–9 (407) $120 __ $ ___________
7. Geology, Hydrology, and Water Quality . . . . . . . . . . . . . . . . . . . . . . April 8 (408) $40 __ $ ___________

TICKETED EVENTS

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

GUEST TOUR

1. Historic Downtown . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . April 6 (101) $25 __ $ ___________

TOTAL FEES $__________
Final Announcement

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.
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 Pre-registration 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 Inn Parkside Boardroom, Tuesday, April 17, 7:00–10:30 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.

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GUEST EVENT
During meeting excursions for spouses and friends of meeting registrants: Rocky Mountain Elk Foundation, Fort Missoula Historical Museum, Tuesday, April 18, 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.

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.


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@cdo.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 Kakay and Barbara John, University of Wyoming; Jim Sears, (406) 243-5251, jwsears@selway.umt.edu, University of Montana.


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, jmccray@mines.edu.


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

13. Late QuaternaryPaleoecology of the Northern Rockies. Eric Edlund, (406) 243-6126, edlund@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 workshop will cover the derivation of geologic and environmental information from stereo aerial photography by providing a method for systematic analysis, description and interpretation. Stereo aerial photos 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.


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 workshop, 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 continued on p. 18
Rocky Mountain continued from p. 17

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 geochemistry of the complex exhumed by extensional shear in Eocene time, including mylonite, midcrustal Cretaceous granites, shallow Eocene plutons, and hanging-wall metasedimentary 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.


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@mttech.edu, Montana Tech; Joseph Griffin, Environmental Science and Engineering, Butte; William Woessner, (406) 243-5698, gw@selway.umt.edu, University of Montana. Cost: $50; minimum 10, maximum 30.


6. During meeting

2. 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.

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, jsears@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, dwolfram@mttech.edu, Montana Tech. Cost: professionals $250; students $200, includes Stillwater guidebook material but not guidebook for all trips. Minimum 10, maximum 30.


12. Geology of the Lewis and Clark Trail in Montana and Idaho. Two days, April 18–20. Rob Thomas, (406) 683-7613, 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.
Register one professional or student per form. Copy form for your records.

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

First Name ___________________________ Last Name ___________________________
City ___________________________ State or Country ___________________________

MAIL TO:
GSA ROCKY MOUNTAIN 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 Rocky Mountain Section Meeting
(All preregistrations must be prepaid. Purchase Orders not accepted.)

Payment by (check one): ☐ Check # ___________________________
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--GSA TODAY, January 2000--
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.

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

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.

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 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.

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.
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...
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.

“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.
“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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CORDILLERAN SECTION, GSA
96th Annual Meeting

Vancouver, British Columbia
April 27–29, 2000
www.geosociety.org/profdev/sectdiv/cord/00cdmtg.htm
or www.eos.ubc.ca/cordgsa2000/

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 discussion. 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.

Presenters 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
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, dbunney@cc.wwu.edu; Tim Walsh, Washington Dept. of Natural Resources, Div. of Geology & Earth Resources, Olympia, (360) 902-1432, tim.walsh@wadnr.gov.

Theme Sessions
2. Central American Metallotects. Ken Dawson, North Vancouver, B.C., (604) 984-0102, kdawson@northvan.net.

Cordilleran continued on p. 30
Cordilleran continued from p. 29

3. Andes Metallotects. Dick Tosdal, University of British Columbia, Vancouver, (604) 822-2449, rtosdal@eos.ubc.ca; Andre Pantalevych, XDM Geological, Victoria, B.C., (250) 677-8192, xdmgeo@home.com.


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, morriss@ualberta.ca; Peter Larson, Washington State University, Pullman, plarson@wsu.edu.


10. Harnessing Geothermal Resources. Mory Ghomshi, University of British Columbia, Vancouver, B.C., (604) 822-2540, ghomshi@mining.ubc.ca.

11. Metals and Their Mobility in Mountainous Environments. (Sponsored by Pacific Section, Geological Association of Canada.) Steve Cook and Ray Llett, B.C. Geological Survey, Victoria, (250) 952-0393, Stephen.Cook@gems8.gov.bc.ca; Ray.Llett@gems7.gov.bc.ca.


13. Searching for Barcodes in the Cordilleran: Applications and Limits of New Provenance Methods. Paul Link, Idaho State University, Pocatello, (208) 236-3365, linkpaul@isu.edu; Bill McCelland, University of Idaho, Moscow, (208) 885-4704, w.mccelland@uidaho.edu.


17. Rehabilitation of Contaminated Sites. Roger Beckie, University of British Columbia, Vancouver, (604) 822-6462, rbeckie@eos.ubc.ca.


19. Mining and Mine Decommissioning Strategies. (Sponsored by the Association of Engineering Geologists, Committee on Landslides.) Mike Hart, San Diego, California, (619) 578-4672, mwhart@aol.com.

20. Terrane Paths: Experiments in Paleogeography. (Sponsored by GSA Structural and Tectonics Division.) Derek Thorkelson, Simon Fraser University, Vancouver, (604) 291-5390, dthorkef@sfu.ca; Steve Johnston, University of Victoria, (250) 721-6200, stj@uvic.ca.


22. Undergraduate Research Posters. (Sponsored by GSA Council on Undergraduate Research.) Susan DeBari, Western Washington University, Bellingham, (360) 650-3588, debari@cc.wwu.edu.


24. Integrating Landslide Hazard Information into Land-Use and Public Policy. (Sponsored 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, jdegrafff@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, trips 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 156, Canada, beward@sfu.ca; Lional 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 Sn. 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.


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 2. John Clague, Simon Fraser University, Burnaby, B.C., (604) 291-4924, jclague@sfu.ca. Includes one night accommodation (shared), one breakfast, two lunches, two dinners. Limit: 44. Cost: $445. Classic area of ice-sheet and alpine glaciation; landslides involving bedrock and Quaternary soils; Hope Side.


8. Tertiary Geology of the Eastern Flank of the Central Cascade Range, Washington. (Sponsored by Northwest Geological Society.) April 26–May 1. Satur- 

**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.


**WORKSHOPS**


12. Piecing the Puzzle Together: Creating Your Own On-Line Geoscience Course Components. April 26, 1:00–4:30 p.m., SFU Burnaby Mountain Campus. Michele Lamberson, University of British Columbia, Vancouver, (604) 822-0865; mlambers@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.


3. Roy J. Shlenon 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 156, Canada, (604) 291-4925, rdunlop@sfu.ca.

**Activities for Grades 8-11:**

1. 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@ctc.bc.ca; 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**

Vancouver, British Columbia  
GSA Cordilleran Section  
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.

### PREREGISTRATION FEES

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<th>Category</th>
<th>Full Meeting Qty</th>
<th>One Day Qty</th>
<th>Amount</th>
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<tr>
<td>Professional Member*</td>
<td>(10) $95 □</td>
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<td>Professional Member (70 &amp; older)*</td>
<td>(12) $25 □</td>
<td>(13) $20 □</td>
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<tr>
<td>Professional Nonmember</td>
<td>(14) $115 □</td>
<td>(15) $65 □</td>
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<tr>
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<td>(30) $25 □</td>
<td>(31) $30 □</td>
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<td>(32) $40 □</td>
<td>(33) $25 □</td>
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<tr>
<td>K–12 Professional</td>
<td>(60) $25 □</td>
<td>(61) $10 □</td>
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<tr>
<td>Field Trip Only</td>
<td>(95) $5 □</td>
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*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

1. Granville Island—Museum of Anthropology Tour . . . . . April 27 (101) $23 □ $___________
2. GAC Cordilleran Section, Meeting and Reception . . . . April 27 (301) $3 □ $___________
3. Canadian Association for Women Geoscientists (Joint CAWG-AWG) Breakfast . . . April 28 (303) $7 □ $___________
4. Paleontology Society, Cordilleran Section Luncheon . . . . . . . . . . . . April 28 (304) $16 □ $___________
5. GSA Cordilleran Section Business Meeting Luncheon . . . . . . . . . . . . April 29 (305) $16 □ $___________

**WORKSHOPS**

1. Developing On-line Geoscience Courses  
   1A. Assembling On-line Course Components . . . . . . April 26 (601) $20 □ $___________
   1B. Creating On-line Components . . . . . . April 26 (602) $50 □ $___________
2. Earthquakes, Engineering Geology, SW B.C. . . . . . . April 26 (603) $35 □ $___________
3. Capsule Geology of the Vancouver Area . . . . . . April 26 (604) $10 □ $___________
4. Developing Geology, Natural Hazards, Fraser Delta . . . . . . April 26 (605) $35 □ $___________

**K–12 EDUCATIONAL PROGRAMS**

1. Science of Mining: A Resource Unit . . . . . . . . . . . . . . . . . . . . . April 26 (650) $35 □ $___________
2. Earth Science 11/Geology 12: Resources and Ideas . . . . . April 26 (651) $35 □ $___________

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

1. Southern Canadian Cordillera—Calgary to Vancouver . . . . . . . . . . . April 24–26 (401) $420 □ $___________
2. Cache Creek and Quesnel Terranes . . . . . . . . . . . . . . . . . . . . . April 25–26 (402) $165 □ $___________
3. Capsule Geology of the Vancouver Area . . . . . . . . . . . . . . . . . . . . April 26 (403) $74 □ $___________
4. Engineering Geology, Natural Hazards, Fraser Delta . . . . . . . . . . . April 26 (404) $70 □ $___________
5. Quaternary, Engineering Geology, Fraser and Thompson Valleys . . . . . . . . . . . . . . . April 30–May 1 (405) $140 □ $___________
7. Scraping Up the Mess—Outboard Terranes . . . . . . . . . . . . . . . . . . . . April 30–May 2 (407) $225 □ $___________
8. Tertiary Geology, East Flank Central Cascade Range, Washington . . . . April 29–May 1 (408) $293 □ $___________
9. Neogene Fault Systems, Northern Cascadia Forearc . . . . . . . . . . . . . . . . . . . . April 30–May 1 (412) $340 □ $___________

**TOTAL FEES $___________**

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

**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 # □ American Express □ VISA □ MasterCard □ Discover □ Diners Club

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Signature
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.”

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.ywcanet.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.starcaraccess.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 #6240UI; Avis: 1-800-331-1600, AWD #948900.

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.cmdbuslink.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/prodev/sectdiv/00cdmtg.htm or www.eos.ubc.ca/cordgsa2000/.
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 to a moment in 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.

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

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Randolph W. & Cecile T. Bromery
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John F. & Carolyn V. Mann, Jr.
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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
Donors to the Foundation, October 1999

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*Second Century Fund.

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 postmarked no later than February 15, 2000. Applicants will be notified of results by April 3, 2000.
### New GSA Fellows

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

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<thead>
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<th>Name</th>
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<td>Aaron C. DeNiscoaso</td>
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<td>Martha M. Griffin</td>
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<td>R. L. Klein</td>
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<td>David L. Drosselmyer</td>
<td>Martin P. Hand</td>
<td>Candice L. Kloss</td>
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<td>Timothy M. Duda</td>
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<td>Jennifer L. Koch</td>
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<td>Deanna M. Duncan</td>
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<td>Colleen A. Dunley</td>
<td>Bruce Hartel</td>
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<tr>
<td>Arjan H. Dykstra</td>
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<td>New Members continued on p. 38</td>
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### New GSA Members

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<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Paul A. Abell</td>
<td>Jed M. Adolph</td>
<td>Ulrich C. C. Koehler</td>
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<td>Curtis C. Albert</td>
<td>Sunnie A. Aburme</td>
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<td>George E. Adams</td>
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<td>Steven M. Aldis</td>
<td>Sarah A. Kubik</td>
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<td>Mansoor Ali</td>
<td>Terry G. Kuroda</td>
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<td>Eileen M. Brennan</td>
<td>Simone R. Alin</td>
<td>J. Scott Kuykendal</td>
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<td>Diana M. Allen</td>
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<td>Ricardo Amaya-Martinez</td>
<td>Andrew M. Lake</td>
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<td>Michael A. Budd</td>
<td>Douglas J. Anderson</td>
<td>Robert E. Lamon</td>
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<tr>
<td>Henry S. Chaffetz</td>
<td>June K. Anderson</td>
<td>Stephan H. Landry</td>
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<td>Russell G. Clark</td>
<td>Karen E. Anderson</td>
<td>Ledyn J. Lang</td>
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<td>Kyle R. Anderson</td>
<td>Anthony O. Larenas</td>
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<td>Erin P. Argylgin</td>
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<td>Kenneth J. Arroyo</td>
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<td>Sydney T. Bacchus</td>
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<td>Marcello Badali</td>
<td>Alvaro E. Leal Faber</td>
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<td>Victoria A. Baeder-Helmke</td>
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<td>George Linn</td>
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<td>Kirsten M. Bannister</td>
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<td>Dave L. Barbeau</td>
<td>Stelios M. Logothetis</td>
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<td>Susan L. Barbour</td>
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<td>Rich Barcday</td>
<td>Arthur B. Losey</td>
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<td>Carlo Baroni</td>
<td>Norman A. Lovan</td>
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<td>Polly Bass</td>
<td>Mona L. Becker</td>
<td>Suzanne S. Lowe</td>
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<td>Michael M. Benedetti</td>
<td>Amelia G. Lustig</td>
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<td>Jill S. Betts</td>
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<td>Myriam P. Martinez</td>
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<td>Joshua K. Borrell</td>
<td>Erika P. Maschmeyer</td>
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<td>Rachael F. Bosch</td>
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<td>David S. Boyer</td>
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<td>Michael T. Bradley</td>
<td>Tanjia L. Maynard</td>
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<td>Beth Brady</td>
<td>Stephen J. McCandles</td>
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<td>Jill A. Brandon</td>
<td>Matthew C. McCaughey</td>
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<td>Alicia Bravo</td>
<td>Tim S. McConnico</td>
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<td>Christopher Michael</td>
<td>John E. McCray</td>
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<td>Kara J. McCormmon</td>
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<td>Martin W. McIvor</td>
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<td>Neil J. McInnes</td>
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<td>Anne Brais</td>
<td>Michael T. McKee</td>
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<td>M. Scott Broadwell</td>
<td>Sandra N. McLaren</td>
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<td>Patrick Mercier-Langevin</td>
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</tbody>
</table>

*New Members continued on p. 38*
The following new Members have transferred from Associate status:

Lisa M. Adamo  
Julie A. Adguson  
Laurel L. Alexander  
Kyle R. Anderson  
V. Michael Anderson  
Alicia K. Armstrong  
Kelsey L. Azar  
Jennifer L. Barr  
Chandra C. Bell  
John C. Bennet  
Ryan M. Bennett  
Amy E. Benoit  
Jon P. Berntsen  
Roberto E. Briggi  
Karel C. Bristow  
Nicole R. Bilodeau  
Brian C. Bird  
Brian J. Black  
Laura J. Blake  
David F. Boullo  
Christina M. Brache  
Robert A. Bridges  
Rick Bullard  
Andrew T. Calvert  
Steve D. Carlson  
Luke D. Mangels  
Neil A. Caudill  
Denise S. Chidester  
Elli D. Choupoura  
Erik M. Clapp  
David G. Coler  
Melissa V. Connolly  
Walter K. Conrad  
Bill A. Cook III  
Matthew F. Cooke  
Tim R. Reese  
Sara Cowles  
Lance W. Crabtree  
Jennifer A. Curtis  
Gregory A. Dehn  
Aaron Deitersau  
James M. Devine  
Travis A. Doll  
Leigh M. Fall  
Richard J. Fink  
Riley A. Eisenmann-Brown  
Ludwig J. Frank II  
Joseph J. Gilbert  
Lisa D. Gilley  
Alexander Glass  
Cory J. Godwin  
Elizabeth R. Goede  
Heather R. Golding  
Allan M. Gontz  
Scott W. Grase  
Bernard Guest  
Scott D. Haman  
Jenney M. Hall  
Christine L. Hallman  
Nevin M. Henderson  
Tesa M. Hill  
Susan M. Hinesley  
Brook L. Holcombe  
Deana M. Hudgins  
Janet V. Hurley  
Brian M. Hynek  
Jane A. Jackson  
Yun-Deung Jang  
Christopher L. Johnson  
Benjamin R. Jordan  
Thomas J. Kakayak  
Robert P. Karlin  
Anna K. Karsten  
Julie R. Kelley  
April E. Kinchole  
Robert L. King  
Aiden E. Kirke  
Erin R. Kraai  
Ching-Huei Kuo  
Brian A. Landau  
Eric D. Larson  
Christopher J. Leger  
John V. Leone  
Nancy F. Little  
Alberto Lobo-Guerrero  
Elizabeth A. Magno  
Carrie A. Maher  
Peter G. Miesci  
Lynn M. Pliszak  
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. McRitt  
Stacey E. Metzler  
Daniel P. Michael  
Radford Mitchell  
Michael D. Morgan  
Elizabeth J. Myers  
Kimberly J. Nelson  
Torrey G. Nyborg  
Michael E. O'Connell  
Michael G. O'Dea  
Michael A. O'Driscoll  
Matthew L. Paige  
Kenneth R. Papp  
Christopher J. Pelloski  
Sarah R. Pietraszek-Mattner  
James H. Powell, Jr.  
Joshua D. Raub  
Sarah E. Reidlott  
Joshua H. Ring  
Geoffrey D. Riesz  
Alya L. Rode  
Susan M. Rossi  
Juan A. Ruiz  
Cal Ruleman  
Erin Mayra Rust  
Ilsa Mae Schieblein  
Ian Spencer Schofield  
Jeffrey M. Schroder  
Sarah M. Scott  
Eric W. Smith  
Bryan N. Shuman  
Justin I. Simon  
Richard W. Slaughter  
Ramona L. Smith  
Yoon-Joo H. Soto  
Kurt J. Steffen  
Kimberly K. Stonesifer  
Drew P. Storm  
Keith W. Stuart  
William T. Sullivan  
Jason F. Thomason  
Kristy L. Tramp  
Natalie E. Uschner  
Thomas P. Van Bierl  
Melanie A. Vierkorn  
Craig A. Webb  
Julie E. Welch  
Michael Willett  
Shelby A. Witham  
Keri L. Wolfe  
Gregory M. Yanagahara  
Jijun Zhang  
Edward J. Vakel  
Martin Valencia-Moreno  
John G. Van Hoesen  
Bill A. Van Siclen  
D. J. Veillon  
Carlos Y. Veliz  
Samuel B. Vinson  
Ann Vlad  
Karl von Heimburg  
Richard J. Wachtman  
Thomas C. Walker  
Elizabeth A. Wallace  
Michael J. Wallin  
Tim Walsh  
Hong Wang  
Charles A. Washburn  
John R. Washburn  
Naoki Watanabe  
Yasushi Watanabe  
James H. Weaver  
Egon T. Weber II  
Peter K. Weller  
Paul R. Weisenborn  
Wendy L. Wempe  
Susan M. Whitaker  
David C. White  
Philip S. Whiston  
Felicia M. Widemann  
Jason A. Wiles  
Christopher G. Willan  
George D. Willard  
Nathan B. Williams  
Melan S. Winfield  
Kirsten M. Witte  
David S. Wolf  
Benjamin A. Wolfe  
Martha M. Wulfmair  
Bridget W. Wyatt  
Hongwei Yoon  
Cecile G. Zachary  
Brent J. Zaprowski  
Lena Zettlstrom  
Carole M. Liegler
The following Associates became affiliated with the Society during the period from February to October 1999.

Brooks G. Abeln
Amanda J. Aebly
Bernadette D. Acker
David B. Adams
Anthony J. Alati
Daniel S. Alessi
Nichole T. Alhadef
Angel L. Alicea Leon
Patricia T. Allen
Erica C. Allen
Daniel W. Allison
Anita L. Anderson
Paula E. Anderson
John D. Andrejezowski
Julie C. Angel
Stacey Anne Archfield
Jacqueline Arendlano
Nathan C. Arnold
Maryann M. Ashworth
Dana Austin
John F. Bacon
John P. Baird
Abigail K. Barker
Mary L. Barnes
Barbara A. Bart
Lara A. Baugh
Rashmi L. Becker
Amanda M. Berglund
Robert M. Bergstrom
Hairani Blanchard
Nathan C. Blythe
Lena A. Bohm
Barbara E. Boland
Janice L. Boller
James R. Bondell
Kayelee A. Boswick
Ernest J. Bovenizer
Jared T. Bowman
Mary Catherine Boyett
Yvonne K. Branan
Barbara L. Brooks
Eric R. Brose
Heidi R. Brown
Caroline R. Bruno
Christopher J. Bujalski
Gerrit P. Bulman
Sarah E. Byerly
Kathleen R. Carey
Seth Carson
Juan Pablo Centeno
Sarah L. Cervantes
Andrew R. Coleman
Andrew M. Collins
Brian W. Collins
Amanda Cook
Brian S. Coole
Maureen A. Cornett
Christine Cosimano
Brian J. Covens
Jeffrey M. Crewer
Donald J. Crusier Jr.
Joshua A. Cwikla
Wendy S. Dagley
Eric J. Dahl
Luis Dameral
Daniel Danowski
Eric J. Davis
Mary K. Davis
Shawnetta J. Davis
Edith S. Day
Kimberly S. Deal
Sheri L. Deskins
Laura S. Dickerson
Wendy L. Dinius
Karen E. Dodson
Joseph F. Dom
Steve Dousman
Duncan G. Drummond
Christie Dumas
Claire E. Durwood
Brent S. Duncan
April D. Durham
Rahul Dutta
Lise S. Easter
Kathryn E. Eck
Tina B. Edwards
Mary C. Finch
Corina A. Fiore
Christy M. Fitzsimmons
Matthew D. Flehaean
Brittany R. Floksra
Philip E. Foster
M. Si Fotovat
Guinevere Fredriksen
Christopher J. Freeman
Katharine J. Fulcher
Erin Fulton
Benjamin S. Furey
Stephanie A. Furgal
Lucas E. Gamble
Stacy Gardipee
Allana M. Garrison
Emily M. Geraghty
Todd J. Gillihan
Robert J. Gillis
Amy K. Gilmer
Jason P. Gowers
John T. Gracy
April J. Graves
Heidi A. Guetschow
Kidy E. Gunn
Lesley J. Gunther
Daniel T. Hadad
Emily K. Hall
Emily A. Harbert
Lori A. Harchar
Jessica M. Harford
Steven D. Harms
Karen Ann Harper
Wendy A. Harris
Melanie A. Harrop
Mary Lea R. Hart
Shaun D. Haven
Sarah J. Hawkins
Peter E. Heitzmann
Tabitha M. Hensley
Tomas Hernandez Jr.
Michael D. Hertle
Meghan M. Hicks
Jason H. Hollosen
Letha C. Honea
Sara H. Hood
Megan T. Hooker
Sheryl L. Horton
Robert A. Houston
Mark L. Howe
Leslie Hsu
Elizabeth A. Hubbard
Camille M. Hutchinson
Katherine E. Inderbitzen
Dawn D. Isom
Joan Jach
Jennifer S. Jackson
Dan J. Jacobs
Sherene A. James
Adrienne C. Johnson
Stephanie J. Johnson
Troy H. Johnson
Matthew D. Johnston
Jennifer J. Jones
Florence C. Katinovas
Michael A. Kae
Sandy K. Kellm
Michael Kennedy
Meredith W. Kenworthy
Jeremy S. Kinman
Kathryn R. Klein
Melissa M. Klinger
Jack A. Knab
Brendan M. Kober
Joshua C. Koch
Beth A. Koehler
William C. Koeppe
Patrick R. Kornos
William J. Kosmer
Brian M. Kristal
Cynthia A. Kuikis
Kathryn A. Lamb
Joseph C. Lambert
James L. Lantisowski
Joshua L. Lawson
Jessica E. Lazuri
Jill C. Lamacks
Andre C. Lance
Richard R. Lessard
Giana D. Levin
Miranda I. Loflin
Lindy London
Yvette C. Lopez
B. Scott Lundin
Kristen R. Lydy
Aaron W. Lyman
Matt T. Mackinnon
Daniel M. Tamee
Derek J. Main
Samantha Manburg
Gabriela Marciano
Rachael I. Marks
Damian M. Martin
Cheryl M. Mathenina
Sambath Mau
Glenn R. McCaslin
Jordon D. McClaughry
Annin D. McCay
Amanda L. McCahey
David C. Mcgowan
Jill M. McQuoter
Andrew T. Mead
Scott R. McRae
Justin M. Meek
John W. Menthe, Sr.
Scott M. Mikkelsen
Steven A. Mulkenscek
Matthew R. Miles
Jessica A. Miller
Jody L. Millette-Larred
David H. Millner
Elizabeth L. Milodragovich
Miodrag M. Milovanovic Jr.
John M. Mitscherter
Kristine L. Mize
Jere A. Mohr
Edwin N. Monin Jr.
Kate R. Montgomery
Trey Montgomery
Kelyn M. Moore
Matt E. Moore
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Philadephia Jane Morrow
Adam A. Motes
Erich R. Mueller
Alfonso M. Munoz II
Lin Murphy
Ryan T. Murphy
Mychal R. Murray
Charles L. Myers
Alexis K. Navarre
Bryce T. Nelson
James B. Nicholson
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Lisa S. Novins
Kenneth E. Nye
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Melissa R. Owen
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Sandra L. Palco
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Kiran Patankar
Clinton P. Penford
Megan L. Perkins
Diane Persing
Carl J. Pierce, Jr.
Debbie A. Pierce
Jill E. Pine
Mark D. Pollock
Michael A. Procsal
David V. Prouty
Christina M. Pulliam
Erlin L. Rasmussen
Jim M. Ray
Tamera L. Renninger
Dominique Richard
Mathew E. Ritter
Kathryn A. Roberts
Melissa D. Roberts
Mathieu Rochon
Richard A. Rodriguez
Steven A. Rogers
Sean Paul Rode
Monica J. Roth
Carrie E. Rowe
Michael C. Rowe
Douglas M. Sanders
Kelly N. Sandlin
Beth L. Sanzenbacher
Anne E. Sawyer
Nicole M. Sace
Nicholas J. Scala
Stephanie J. Schauer
M. Bernadette Scheller
Michael J. Schmidt
David P. Schneider
Mathew O. Schuchard
David W. Scoeval
Shane C. Seals
Shannon S. Seifert
John W. Sharkey III
David A. Shields
Lora K. Shaker
Michael J. Shuler Jr.
Sarah L. Silver
Lauren L. Slade
Justin Smith
Deegan L. Smith
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Lori L. Smothers
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Sara E. Spaldin
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Roger A. Stradal
Todd S. Street
David F. Sunderland
John D. Surber Jr.
Philip A. Suriano
Matthew S. Swanson
Deanna M. Swicegod
Laura M. Symmes
Mike A. Teller
Rebecca A. Tedford
Michael G. Tennyson
John R. Thatcher
Sarah R. Tietz
Kristin S. Toth
Laura B. Troeger
Paul R. Troop
Kenton J. Trubee
Joy M. Tumbl
Monica A. Turk
John E. Useiding
Erin E. Van Evera
Martin D. Van Oert
Kathryn E. van Roosendaal
Stephanie M. Vance
Yvette M. Villegas
Robert L. von Zeverin
Keri E. Walker
Velma L. Walker
Kim C. Walton
Aaron R. Wartenberg
Dana A. Watzke
Beverlie M. Weir
Laurie A. Whitesell
David M. Whiting
Ann K. Widrig
Christopher A. Williams
Elizabeth Wilson
Mary Kate Wimberly
Russell T. Willio
Erich A. Wolff
Brett Woodward
Donna Wright
Heather M. Wright
Brett J. Walton
Steven C. Yank
Abigail E. Yeany
Melissa K. Yenko
Mathew D. Young
Beth J. Zawick
Rhonda M. Zampa
Victoria L. Zapper
Gara C. Zarda
Christa L. Ziegler
Justin A. Zumbro
First GSA Field Forum, March 18-22, 2000

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

For Registration Information Contact Dept. of Earth and Environmental Sciences, Lehigh University, Bethlehem, PA 18015. (610) 758-3659 • fax 610-758-3864 • ebe0@lehigh.edu.

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Positions Open

TENURE-TRACK POSITION BRIGHAM YOUNG UNIVERSITY The Department of Geology at Brigham Young University invites applications for a tenure-track Professional Faculty position beginning as early as 1 May, 2000. The primary duties for this position would be to oversee and operate a new electron microprobe facility. The successful candidate will have an advanced degree in geology (Ph.D. preferred) and several years of experience in operating a Cameca SX50 or other comparable electron microprobe. Duties would include assisting faculty and students in use of the microprobe as well as routine instrument maintenance. The successful candidate may teach an Instrumental Methods course as well as one course per year in his or her area of expertise. 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 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 members 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 position 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: Halge Giorgis Churnet, Head, Department of Physics, Geology, and Astronomy, The University of Chattanooga, Chattanooga, TN 37403. The University at Chattanooga is an equal opportunity/affirmative action/Title IX Section 504/America ADA Institute.

SECTION 2000 MEETINGS

March

May

October

November

CLASSIFIED ADVERTISING

Send letter of application, curriculum vitae and the names and e-mail addresses of three references to: Dr. Scott 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 members of the sponsoring Church of Jesus Christ of Latter-Day Saints.

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 position 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 a tenure-track position. 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 Geosciences, College of Natural Sciences, 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 1, 2000. Priority in 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 help a small department reach success. The successful candidate should have a commitment to excellence in 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 vita, 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.

The Department of Geosciences 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) geological 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 $45,000-$50,000 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, geochemistry, geophysical fluid dynamics, environmental processes, geochronology and isootope geochemistry, oceanography, 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 Ph.D. 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
mediate focus earthquakes, seismic hazard estimation, strengths in tectonophysics, mechanics of deep and inter-

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. Teaching will include undergraduate classes 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/hs.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-
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 should 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 experience and broad exposure to the students from minority and racial groups underrepresented in the sciences, in our undergraduate research groups. The first position is for a full-time faculty position. The second position is for a part-time faculty position. The third position is for a research assistant position.

**The Department of Geology at the University of Idaho**

is seeking applications for a full-time, tenure-track faculty position in hydrogeology to begin in the fall, 2000. Applications are invited from candidates with expertise in groundwater flow models, remote sensing, hydrogeochemistry, and the development and application of hydrogeological research tools. The successful candidate will be expected to develop an active program of scholarship in education technologies and K-12 teaching experience. The position 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 field, laboratory, and computer laboratories. Interested applicants should send the department web site for additional information (www.mines.uidaho.edu/geology). Hydrogeologists who have significant experience in groundwater flow models, remote sensing, and the application of computer technologies in hydrogeology are encouraged to apply.

**THE DEPARTMENT OF GEOLOGY AT THE UNIVERSITY OF OREGON**

is seeking applications for a full-time, tenure-track faculty position in sedimentology to begin in the fall of 2000. The position is sponsored by the CCPP and is expected to be part of the University of Oregon's Sedimentology Program. The successful candidate is expected to develop an active program of scholarship in education technologies and K-12 teaching experience. The position 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 field, laboratory, and computer laboratories. Interested applicants should send the department web site for additional information (www.mines.uidaho.edu/geology). Hydrogeologists who have significant experience in groundwater flow models, remote sensing, and the application of computer technologies in hydrogeology are encouraged to apply.

**SMITHSONIAN INSTITUTION**

**NATIONAL MUSEUM OF NATURAL HISTORY**

The Smithsonian Institution, National Air and Space Museum, Center for Earth and Planetary Studies (CEPS) is seeking a full-time scientific staff position. The incumbent will have responsibility for the preparation 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.si.edu. Applications will be reviewed until March 1, 2000. For complete information see the Smithsonian Institution’s Job opportunities on the web site at www.nasm.si.edu/jobslots.htm. Applications must be received by February 3, 2000. Search and selection procedures will be closed when a sufficient number of qualified applicants have been identified, but not earlier than March 1, 2000.

**THE UNIVERSITY OF IDAHO**

is an equal opportunity/affirmative action employer.

**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 in both research and education. Applicants must be expected 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 topics course for non-majors (without laboratory). He or she will also be expected to participate in the full range of faculty responsibilities, including service on committees, and maintained scholar research.

**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, 1 beginning in fall, 2000. We are looking for geoscientists who can conduct a vigorous research program and teach both the undergraduate and graduate levels. We are particularly interested in candidates who have interests in theSZEBRAG Ready-Fill 16 oz, Case of 12, 45017-0162CPACD

**SOUTHERN CONNECTICUT STATE UNIVERSITY**

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 UNIVERSITY OF IDAHO**

is an equal opportunity/affirmative action employer.

**PLANETARY SCIENTIST**

**SMITHSONIAN INSTITUTION**

**NATIONAL MUSEUM OF NATURAL HISTORY**

The Smithsonian Institution, National Air and Space Museum, Center for Earth and Planetary Studies (CEPS) is seeking a full-time scientific staff position. The incumbent will be expected to develop an active program of scholarship in education technologies and K-12 teaching experience. The position 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 field, laboratory, and computer laboratories. Interested applicants should send the department web site for additional information (www.mines.uidaho.edu/geology). Hydrogeologists who have significant experience in groundwater flow models, remote sensing, and the application of computer technologies in hydrogeology are encouraged to apply.

**THE UNIVERSITY OF IDAHO**

is an equal opportunity/affirmative action employer.

**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 in both research and education. Applicants must be expected 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 topics course for non-majors (without laboratory). He or she will also be expected to participate in the full range of faculty responsibilities, including service on committees, and maintained scholar research.

**SAINT LOUIS UNIVERSITY**

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HYDROGEOLOGIST
FLORIDA INTERNATIONAL UNIVERSITY

The department of Geology at Florida International University invites nominations and applications for an assistant professor who will provide leadership in the teaching, research, and service of the Groundwater Hydrogeology division. A Ph.D. in Geology or a related discipline is required. The candidate must have demonstrated excellence in teaching, research, and service and the ability to establish a successful research program involving undergraduates. Application materials will include a CV, a statement of research and teaching interests, and the names and addresses of at least three references to: Dr. Michael Gross, Search Committee Chair, Department of Geology, Florida International University, Miami, FL 33199 USA.

Closing date: January 15, 2000.

APPLICATIONS WILL BE CONSIDERED UNTIL THE POSITION IS FILLED.

ASSOCIATE DEAN FOR THE DIVISION OF ENVIRONMENTAL SCIENCES — UC DAVIS

The College of Environmental Design at the University of California invites applications for the position of Associate Dean for the Division of Environmental Sciences. The Associate Dean will serve as an academic leader for the Division and is expected to maintain an active research program. Further information about the position and instructions on application procedures may be obtained from our web site: http://www.ced.ucdavis.edu. Applications should be received by January 21, 2000. Salary commensurate with qualifications and experience.

ASSOCIATE DEAN POSITION IN SEDIMENTARY GEOLOGY
UNIVERSITY OF SOUTHERN CALIFORNIA

The Department of Earth Sciences, University of Southern California is currently searching for an Associate Dean. The Associate Dean is a 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 mineralogy, linking global paleoenvironmental and ecological change through study of the stratigraphic record. Interests in land-based field research, carbonate systems, and the ability to interact 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 palaeoclimatology. 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. 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. Botter, Department of Earth Sciences, University of Southern California, Los Angeles, CA 90089-0740 (e-mail: dbotter@earth.usc.edu).USC is an equal opportunity/affirmative action employer.

APPLICATIONS ARE INVITED AND SHOULD BE RECEIVED BY JANUARY 21, 2000.

DIRECTOR, MUSEUM OF GEOLOGY
ST. CLOUD STATE UNIVERSITY, ST. CLOUD, MINNESOTA

The University of Minnesota—St. Cloud, 1215 West Dayton Street, Madison, WI 53706. Application must be received by January 21, 2000. Applicants must submit 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.

DIRECTOR, MUSEUM OF GEOLOGY
SOUTH DAKOTA STATE UNIVERSITY (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 a Ph.D. in a relevant biological, physical, or social science and must qualify for a tenure appointment at the Full Professor level. The Associate position will be an 11-month appointment for a five-year term (renewable). The Associate Dean will also have an academic appointment in a departmental program in the College, and is expected to maintain an active research program. 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 Paleoontology, including participation in guidance of students and delivery of the curriculum. An earned doctorate in paleontology, geology or a related field, or the equivalent. CANDIDATES SHOULD HAVE SIGNIFICANT LEADERSHIP EXPERIENCE IN A COLLEGIATE SETTING, A STRONG PROFESSIONAL RECORD, REFERENCES FROM AN ACADEMIC ORGANIZATION, INCLUDING DEMONSTRATED SUCCESS IN MANAGING PROGRAMS, PERSONNEL, AND FINANCES. Teaching and research experience are desirable. Ability to develop a 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. SDSMT is an EEO/AA/ADA employer & provider.

LECTURER/UNIVERSITY OF PITTSBURGH

The Department of Geology at the University of Pittsburgh invites applications for a faculty position at the level of Lecturer in Geology and Geophysics. This position is open until filled, but to ensure consideration, applications must be received by January 21, 2000.

Applications deadline: February 15, 2000. For additional information, see our web site: http://www.geology.pitt.edu. The University of Pittsburgh is an Equal Employment Opportunity/Affirmative Action employer. Women and members of underrepresented minority groups are especially encouraged to apply.
Deformation, Dinosaurs, and Darwin
Salta, Argentina • July 23–August 12, 2000 • 21 days, 20 nights

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 National 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 Aconcagua; 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
$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; waterproof 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.
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.

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 Paleogene 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 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.

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 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.

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.

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.

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<th>Deposit per Person</th>
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Credit Card #: __________________________ Exp. Date
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☐ I’ve enclosed no deposit, but I’m interested. Please send information.

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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, Portland, 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 relates to geologic resources and the genesis of mineral deposits, (2) mineral-resource evaluations, and (3) environmental issues related to mineral deposits and mining activities. 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 research beyond the Ph.D. and demonstrated ability in science management, combined with an innovative, visionary approach to interdisciplinary studies of mineral resources or she will have a distinguished record of 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 agencies, 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.

For detailed announcement, including specific qualification requirements, see www.usgs.gov/ohr. Refer to Vacancy Number CH-00760-00 for information concerning travel, relocation, and pay and benefits.

For further information contact Jim Butler at (208) 426-3639, or e-mail: gof broth@baylor.edu. Application deadlines for the above opportunities are Tuesday, May 2, 2000.
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).

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