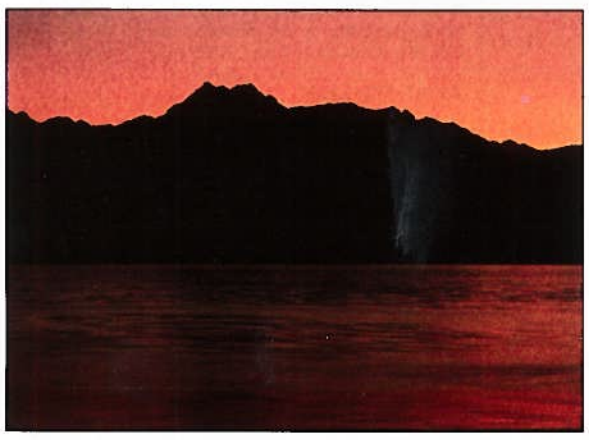
Vol. 4, No. 6 June 1994

GSA TODAY

A Publication of the Geological Society of America

Abstracts Due July 6

Preregistration must be received by September 16



Top: *North face of Mt. Olympus (left) taken from the summit of Mt. Carrie, Olympic Mountains, Washington. Photo by Richard J. Stewart.*
Inset: *Seattle skyline. Photo courtesy of Seattle–King County Convention and Visitors Bureau.*
Lower right: *Slackwater deposits (Touchet beds) of the Lake Missoula catastrophic floods on the Columbia Plateau, Burlingame Canyon near Walla Walla, Washington. Photo by Glenn Thackray.*
Lower left: *The Brothers, Hood Canal, and Olympic Mountains, Scenic Beach State Park, Washington. Photo by John Karachewski.*

Seattle

at the leading edge

1994 ANNUAL MEETING

SEATTLE, WASHINGTON • OCTOBER 24–27

Geology *At the Leading Edge* is the scientific theme of the Seattle meeting. The theme puts emphasis on both the geographical position of Seattle, situated on the leading edge of a convergent plate margin, and the application of "leading edge" theoretical approaches and technological advances to the elucidation of geological problems. Theme sessions and symposia will be offered not only on aspects of Pacific Rim and convergent margin geology, but also on a wide range of contemporary environmental and hydrogeological topics. An outstanding program of scientific sessions, field trips, continuing education courses, and exhibits is organized around this theme.

Seattle: The Emerald City—Seattle is a city of splendid views. No matter which direction you travel, there are mountains, forests, or stretches of salt and fresh water. Flanked by the Cascade Range to the east and the Olympic Mountains to the west, the city occupies an isthmus between Puget Sound, an 80-mile-long arm of the Pacific Ocean, and freshwater Lake Washington. Seattle is known these days for its rich and active cultural life, delicious foods and fresh-roasted coffees, and strong ties to the Pacific Rim. Seattle has changed a lot since the last time GSA was here, in 1977. Join us in the Northwest this October and experience the appeal of this unique destination. On behalf of the Annual Meeting Committee, we look forward to seeing you in Seattle.

Darrel S. Cowan
General Chairman

Geological Society of America

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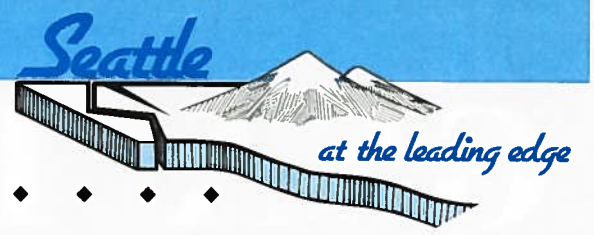

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MEETING INFORMATION

For Abstract Forms:

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Society of Vertebrate Paleontologists

* Representatives serve on the 1994 Joint Technical Program Committee

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Vol. 4, No. 6

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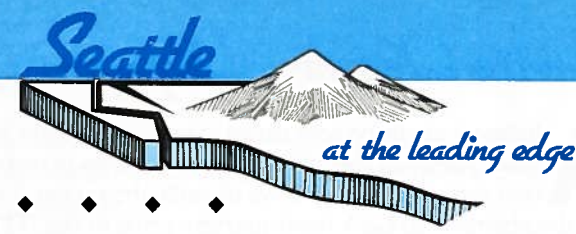
TECHNICAL PROGRAM



Call for Papers and Announcement of Symposia and Theme Sessions

ABSTRACT DEADLINE: JULY 6

JOINT TECHNICAL PROGRAM COMMITTEE: AUGUST 5–6. The JTPC selects abstracts and determines the final session schedule. Speakers will be notified within 14 days following that meeting.

The JTPC consists of approximately 40 geoscientists representing each of the associated societies and GSA divisions participating in the technical program. The JTPC chairs, nominated by the Seattle Annual Meeting Committee and approved by the GSA Council, also serve a four-year term on GSA's ongoing Program Committee, which oversees all technical program activities.

DAILY TECHNICAL SESSION SCHEDULE: SEPTEMBER ISSUE OF *GSA TODAY.*

If you are not a member, please call, fax, E-mail, or write us, and we will gladly send you the schedule after September 1.

At the Leading Edge: Scientific Theme for Seattle

Geology *At the Leading Edge* is the scientific theme of the Seattle meeting. The theme puts emphasis on both the geographical position of Seattle, situated on the leading edge of a convergent plate margin, and the application of "leading edge" theoretical approaches and technological advances to the elucidation of geological problems. Theme sessions and symposia will be offered on aspects of Pacific Rim and convergent margin geology, with particular emphasis on the utilization of new technology.

The 1994 Annual Meeting Committee is sponsoring the Keynote Symposium entitled *The Birth and Death of a Plate* which will include invited talks on topics such as arc volcanism, kinematics of plate motion, accretionary wedges, and evolution of ocean ridge spreading centers. Speakers will illuminate these issues with results from remote sensing, geodesy, seismic imaging, experimental studies of geologic materials, and computational advances in modeling geologic systems. The 1994 Program Committee will have several informal sessions aimed at bringing attendees up-to-date on new techniques such as GPS (Global Positioning System), and computer imaging of field trips. The 1994 GSA Annual Meeting in Seattle promises an exciting opportunity to discuss important geological questions in a nontraditional way.

GSA's Institute for Environmental Education

Crucial Environmental Issues: Fear and Loathing at the Leading Edge. *Sunday, October 23, 1:30 p.m. to 5:30 p.m.; Washington State Convention and Trade Center.* Cosponsored by the *GSA Geology and Public Policy Committee.*

IEE will sponsor its third Annual Environmental Forum. The forum will examine the sometimes conflicting science, policy, economic, and legal issues surrounding earthquakes and earthquake prediction; habitat loss and modification; low-level radioactive waste disposal; and contamination of ground water. See symposia list S25, page 153, for a list of speakers.

Earthquakes are arguably the natural disaster that most fascinates and frightens the public. The desire for reliable earthquake prediction creates both problems and opportunities for geological scientists. The causes and rates of species decline are widely debated, but the ability to make effective decisions on endangered species protection and land use depends on properly defining the debate. What should the geoscientist's role be in this process? The debate over disposal sites for low-level radioactive waste can lead to an inflamed and fearful public. Geoscientists can help educate the public about key assumptions that affect site selection. Ground-water contamination is a major concern throughout the world. Yet, serious questions face the geoscientist and engineer that affect the cost and effectiveness of proposed solutions.

In addition to the Forum, IEE is cosponsoring with GSA divisions and the Geology and Public Policy Committee several technical programs. These are identified with the global symbol IEE

MSA Mineralogical Society of America 75th Anniversary

GSA congratulates its colleagues at MSA on 75 years of serving the geosciences, and has noted the MSA sessions with a special logo. MSA and the local program committee are cosponsoring a symposium in honor of this anniversary. Speakers will focus upon the current advances and changing trends in mineralogical research. Additional special events and programs in celebration of the anniversary are planned.

Abstract Submittal Guidelines

1994 Abstract Forms Availability

- Abstracts Coordinator at GSA headquarters
- Conveners of symposia
- Advocates of theme sessions
- Geoscience departments of most colleges and universities
- Main federal and state survey offices

The required 1994 abstract form will be used as camera-ready copy for publication. Abstracts are limited to 250 words with a minimum 10-point font size. Please read the instructions on the abstract form. Your abstract may be rejected if the instructions are not followed.

Only ONE Volunteered Abstract May Be Submitted

Submit only one volunteered abstract as speaker or poster presenter for discipline and/or theme sessions. Multiple submissions as speaker-presenter for volunteered abstracts may result in rejection of ***all*** abstracts. Note that this limitation does not apply to, nor does it include, invited contributions to symposia.

Presentation Modes

Oral Mode—This is a verbal presentation before a seated audience. The normal length of an oral presentation is 15 minutes, including time for discussion. Projection equipment consists of two 35 mm projectors, one overhead projector, and two screens.

Poster Mode—Each poster session speaker is provided with three horizontal, free-standing display boards approximately 8' wide and 4' high. The speaker must be present for at least two of the four presentation hours.

Papers for discipline sessions may be submitted in either oral or poster mode. However, because of the homogeneous topic, papers for theme sessions are to be submitted only in the mode noted in the theme description. If the abstract is submitted in the incorrect mode, the abstract will NOT be considered for the theme session, but will automatically be considered for a discipline session instead.

Presentation Formats

Format	*Abstracts*
◆ Symposia	Invited by the convener
◆ Theme Sessions	Volunteered for a topic announced *before* the abstracts deadline
◆ Discipline Sessions	Volunteered for a specific scientific discipline, and organized by topic *during* the JTPC meeting

Invited Papers (Symposia)

Abstracts are to be sent directly to the convener by July 6. The convener who extended the invitation to speakers is responsible for obtaining two independent reviews of each abstract and for sending the reviews and the abstracts to GSA headquarters prior to the JTPC meeting.

The day and time shown after each symposium are tentative. The final schedule will be available after August 6 and will appear in the September issue of GSA Today.

S1. **Keynote Symposium: Birth and Death of a Plate.**
Monday, October 24, 8:00 a.m. to 12:00 noon. *1994 GSA Annual Meeting Committee.* George W. Bergantz and Kenneth C. Creager, University of Washington.

Douglas R. Toomey, University of Oregon
Magma Generation at Oceanic Ridges

Ronald M. Clowes, University of British Columbia
Geophysical Character of the Cascadia Margin

Xavier Le Pichon, Ecole Normale Supérieure
Sediment and Fluid Budgets at Continental Margins

E. Wesley Hildreth, U.S. Geological Survey, Menlo Park
Arc Magmatism

Julie D. Morris, Washington University, St. Louis
Time Scales and Geochemical Signatures of Arc Magmas

Leigh H. Royden, Massachusetts Institute of Technology
Mountain Building: Mechanics of Upper Plate Deformation

Larry J. Ruff, University of Michigan
Megathrust Earthquakes and Environmental Considerations

Kenneth C. Creager, University of Washington
Fate of the Subducted Slab

S2. **Plate Motion and Displacement Partitioning in the Circum-Pacific Orogenic Belts.**
Monday, October 24, afternoon. *International Division.* Basil Tikoff and Christian Teyssier, University of Minnesota; John Oldow, Rice University.

S3. **New Frontiers in Active Tectonics Science.**
Wednesday, October 26, all day. *Structural Geology and Tectonics* and *Geophysics Divisions.* George H. Davis, University of Arizona; J. Bernard Minster, Scripps Institution of Oceanography, San Diego.

S4. **Tectonic Geomorphology, Depositional Processes, and the Depositional Record.**
Tuesday, October 25, afternoon. *Sedimentary Geology Division.* Douglas Burbank, Massachusetts Institute of Technology.

S5. **Geology and the Postindustrial Society.**
Tuesday, October 25, all day. *1994 GSA Annual Meeting Committee.* George DeV. Klein, New Jersey Marine Science Consortium, Fort Hancock.

S6. **Meyer Symposium: Maintaining Compatibility of Mining and the Environment.**
Tuesday, October 25, all day. *Society of Economic Geologists* and *1994 GSA Annual Meeting Committee.* George Brimhall and Lewis Gustafson, University of California, Berkeley.

S7. **Advances in Silica Geochemistry.**
MSA
Monday, October 24, afternoon. *Mineralogical Society of America.* Peter J. Heaney, Princeton University; Patricia Dove, Georgia Institute of Technology.

S8. **Mineralogical Society of America 75th Anniversary Symposium.**
MSA
Wednesday, October 26, afternoon. *Mineralogical Society of America* and *1994 GSA Annual Meeting Committee.* W. Gary Ernst, Stanford University.

S9. **Frontiers of Mineral Surface Geochemistry: A Symposium in Memory of Andrew J. Gratz (1962–1993).**
MSA
Wednesday, October 26, morning. *Mineralogical Society of America* and *Geochemical Society.* Michael F. Hochella, Jr., Virginia Polytechnic Institute and State University.

S10. **The Dreiss Symposium: Recent Trends in Studies of Coupled Hydrodynamic, Tectonic, and Thermal Processes.**
Monday, October 24, afternoon. *Hydrogeology Division.* Mark Person, University of Minnesota; Ken Belitz, Dartmouth College.

S11. **Hydrology and Active Volcanism: At the Leading Edge.**
Wednesday, October 26, afternoon. *Quaternary Geology and Geomorphology Division.* John E. Costa and Richard Waitt, U.S. Geological Survey, Vancouver, Washington.

S12. **Regional Economic Geology of the Northern Cordillera.**
Sunday, October 23, all day. *Society of Economic Geologists.* Eric S. Cheney, University of Washington.

S13. **Historical Investigations of Extraterrestrial Events and Causes in Earth History.**
Wednesday, October 26, morning. *History of Geology Division.* Joanne Bourgeois, University of Washington; Mott T. Greene, University of Puget Sound.

S14. **Cataclysms and Catastrophes: The Planetary Perspective.**
Tuesday, October 25, morning. *Planetary Geology Division.* Odette B. James, U.S. Geological Survey, Reston.

S15. **Evolutionary Paleobiology.**
Tuesday, October 25, morning. *Paleontological Society.* Douglas H. Erwin, National Museum of Natural History, Smithsonian Institution.

S16. **Military Geology in War and Peace.**
Wednesday, October 26, morning. *Engineering Geology Division.* James R. Underwood, Jr., Kansas State University; Peter L. Guth, U.S. Naval Academy.

S17. **Pyrolysis Techniques for Source Rock Evaluation—Twenty Years Later.**
Sunday, October 23, all day. *Organic Geochemistry Division* of the *Geochemical Society.* Colin Barker, University of Tulsa; Steven Larter, University of Newcastle upon Tyne.

View southeast from Obstruction Peak Ridge, Olympic National Park, Washington. Photo by John Karachewski.

S18. **Origin of Compositional Characteristics in Tertiary Coals: Paleoecology, Paleobotany, and Palynology.**
Monday, October 24, morning. *Coal Geology Division*. Thomas D. Demchuk, Amoco Production Co., Houston, Texas; Timothy A. Moore, Geological Survey of Wyoming, Laramie; Jane C. Shearer, Foundation for Research in Science and Technology, Wellington, New Zealand.

S19. **The Late Cretaceous Marine and Continental Record of Global Climate Change.**
Wednesday, October 26, morning. *Cushman Foundation*. Enriqueta Barrera, University of Michigan; Brian T. Huber, Smithsonian Institution.

S20. **Use of Archaeology for Dating Geologic Events.**
Tuesday, October 25, afternoon. *Archaeological Geology Division*. Margaret J. Guccione, University of Arkansas.

S21. **Changing Gateways: The Impact of Technology on Geoscience Information Exchange.**
Tuesday, October 25, morning. *Geoscience Information Society*. Barbara E. Haner, University of California, Riverside.

S22. **Recent Advances in Geoscience Education—The Leading Edge of Undergraduate Instruction and Research.**
Tuesday, October 25, morning. *National Association of Geology Teachers* and *National Science Foundation*. John C. Palmquist, Lawrence University.

S23. **Marine Trace-Element Biogeochemistry and the Sedimentary Record.**
Sunday, October 23, all day. *Geochemical Society*. Lee R. Kump and Michael A. Arthur, Pennsylvania State University.

S24. **The Geological Profession's Response to National Priorities in Science Education.**
Thursday, October 27, morning. *Geoscience Education Division*. Robert Ridky, University of Maryland at College Park.

S25. **Annual Environmental Forum: Crucial Environmental Issues: Fear and Loathing at the Leading Edge.**
Sunday, October 23, 1:30 p.m. to 5:30 p.m. *GSA Institute for Environmental Education* and *GSA Geology and Public Policy Committee*. Patrick L. Abbott, San Diego State University; Fred A. Donath, Institute for Environmental Education.

William Dietrich
Seattle Times
The Role of Geologists in Society

Ian P. Madin
Oregon Department of Geology and Mineral Industries
Earthquake Hazards in the Pacific Northwest

Charles G. Groat
Director, Center for Coastal, Energy, and Environmental Resources, Louisiana State University
Management of Natural Coastal Systems

David R. Montgomery
Quaternary Research Center, University of Washington
Endangered Species, Ecosystem Management, and the Geological Sciences

William Otterson
Director, CONNECT, University of California, San Diego
The Low-Level Radioactive Waste Situation: Challenges and Consequences

Fred A. Donath
Executive Director, GSA Institute for Environmental Education
The Low-Level Radioactive Waste Situation: Storage or Disposal?

R. Allan Freeze
Consulting Hydrogeologist, White Rock, British Columbia, Canada
Ground-Water Contamination: The Interdisciplinary Milieu and its Ethical Conundrums

Richard R. Parizek
Department of Geosciences, Pennsylvania State University
Ground-Water Contamination: Past, Present, and the Future

The formal presentations will be followed by a panel and audience discussion.

S26. **SGE Student Research.**
Tuesday, October 25, afternoon. *Sigma Gamma Epsilon*. Charles J. Mankin, Oklahoma Geological Survey. POSTER.

S27. **Where Geology Matters: Past, Present, and Future.**
Monday, October 24, afternoon. *GSA Committee on Geology and Public Policy*. Emery T. Cleaves, Maryland Geological Survey; Donald C. Haney, Kentucky Geological Survey.

Volunteered Papers

This format includes all abstracts that are not specifically invited for a symposium. Each paper will have a minimum of three reviews. Two types of sessions are available:

1. Discipline Sessions

Papers are submitted to ONE scientific discipline. The JTPC representatives organize the papers in sessions focused on this one discipline, e.g., hydrogeology, geochemistry, geophysics.

2. Theme Sessions

Papers are submitted to a specific *pre-announced* title and to ONE scientific category. Theme sessions are interdisciplinary; each theme may have as many as three categories from which authors may choose ONE. After each theme description below, the categories are identified by name and number as they appear on the 1994 Abstract Form.

Theme submissions must include:

Item	*Example*
◆ Theme number	T18
◆ Key words of the theme title	Methods for Quantifying Unsaturated Permeability
◆ One category	Environmental Geology—#6 on abstract form
◆ Mode for the session	Poster

Submit only in mode indicated in the description

If the abstract is submitted in the incorrect mode, the abstract will NOT be considered for the theme session, but will automatically be considered for a discipline session instead.

Role of theme advocate

Each theme session has been proposed by an advocate. *Advocates may not invite speakers; however, advocates may encourage colleagues to submit abstracts, with the understanding that there is no guarantee of acceptance.*

All abstracts will be evaluated by three appropriate JTPC reviewers in the discipline for which they are submitted; a fourth review will be provided by the theme advocate. During the August 5–6 JTPC meeting, the designated JTPC representative (in consultation with the theme advocate) will organize theme sessions from the abstracts approved for presentation.

Theme Topics

Please check the correct mode of the theme session—poster or oral. If the abstract is submitted inaccurately, it will be transferred automatically to a discipline session.

T1. **Liquefaction Hazard Mapping and Mitigation.**
W. Paul Grant, Shannon & Wilson, Inc., Seattle, Washington. Engineering Geology (5), Geoscience Information (11).

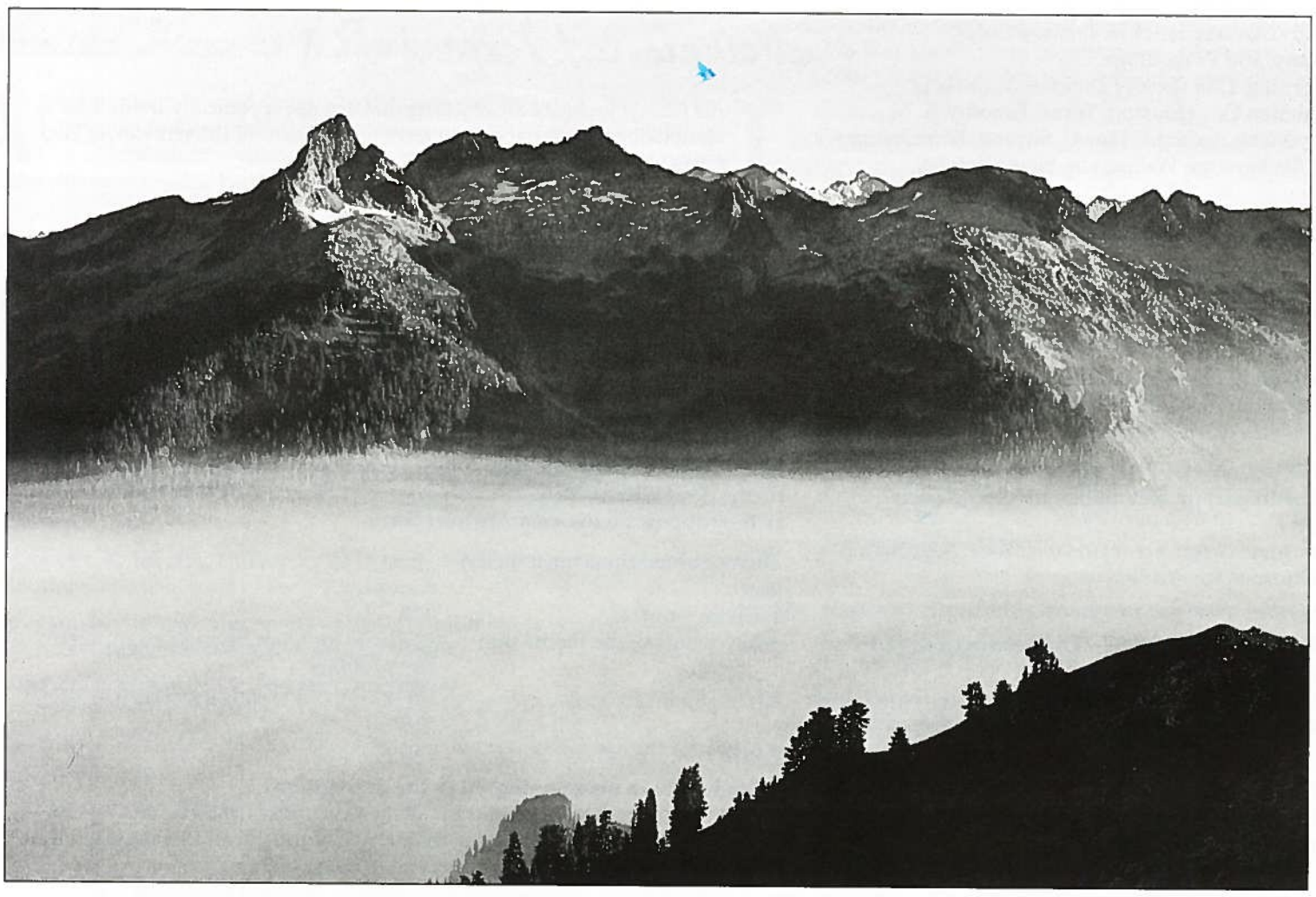
T2. **Speciation, Mobility, and Bioavailability of Metals in Mining Wastes.**
Mineralogical Society of America. David Frank and Roseanne M. Lorenzana, U.S. Environmental Protection Agency, Seattle, Washington. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Mineralogy/Crystallography (16).

T3. **The Role of Geology in Characterization, Contaminant Transport, and Remediation of Hazardous Waste Sites.**
GSA Institute for Environmental Education. Daniel Clayton and Kathy Goetz Troost, Shannon & Wilson, Inc., Seattle, Washington. Engineering Geology (5), Environmental Geology (6), Hydrogeology (13).

T4. **Surprises for Society.**
GSA Geosphere Alliance Committee. Susan Kieffer, University of British Columbia. Environmental Geology (6), Hydrogeology (13), Quaternary Geology/Geomorphology (25).

T5. **The Geological Basis of Wild Salmon Ecology.**
GSA Institute for Environmental Education. David R. Montgomery and Thomas Dunne, University of Washington. Environmental Geology (6), Quaternary Geology/Geomorphology (25).

T6. **Environmental Geology: The Voice of Warning.**
GSA Geology and Public Policy Committee and *GSA Institute for Environmental Education*. Monica E. Gowan, GeoLogic, Bellingham, Washington. Engineering Geology (5), Environmental Geology (6), Hydrogeology (13).



Glacier Peak Wilderness, North Cascades, Washington. Photo by John Karachewski.

T7. **Environmental Geology: The Voice of Reason.**
GSA Geology and Public Policy Committee and *GSA Institute for Environmental Education*. Monica E. Gowan, GeoLogic, Bellingham, Washington. Engineering Geology (5), Environmental Geology (6), Hydrogeology (13).

T8. **Geochemistry of Contaminant Transport.**
L. Edmond (Ted) Eary, Sciences International, Inc., Kennewick, Washington; George R. Holdren, Battelle Pacific Northwest Labs, Richland, Washington. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13).

T9. **Urban, Suburban, and Rural—Environmental Geology at the Leading Edge.**
Quaternary Geology and Geomorphology Division and *GSA Institute for Environmental Education*. Duncan Foley, Pacific Lutheran University, Tacoma, Washington. Engineering Geology (5), Environmental Geology (6), Quaternary Geology/Geomorphology (25).

T10. **The Management of Contaminated Sites in Near-shore Marine and Estuary Environments.**
Theresa Henson, Shannon & Wilson, Inc., Seattle, Washington. Environmental Geology (6), Hydrogeology (13), Marine Geology (14).

Please check the correct mode of the theme session—poster or oral. If the abstract is submitted inaccurately, it will be transferred automatically to a discipline session.

T11. **Stable Environmental Isotope Application in Ground-water Systems.**
Hydrogeology Division. Noel C. Krothe, Indiana University; Roy F. Spalding, University of Nebraska. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13).

T12. **Hydrothermal Systems Evolution in the Cascade Range.**
Hydrogeology Division. Lisa Shevenell, Nevada Bureau of Mines and Geology, University of Nevada at Reno; Jules Friedman, U.S. Geological Survey, Denver. Geophysics/Tectonophysics (10), Hydrogeology (13), Volcanology (32).

T13. **Relation of Depositional Environments to Chemical and Physical Heterogeneity within Sedimentary Aquifers.**
Hydrogeology Division and *SEPM (Society for Sedimentary Geology)*. Matthew J. Davis, University of New Hampshire; George N. Breit, U.S. Geological Survey, Denver. Geochemistry, Aqueous/Organic (7), Hydrogeology (13), Sediments, Clastic (28).

T14. **Geologic Significance of Microbial Processes.**
Hydrogeology Division. Philip C. Bennett, University of Texas at Austin; Frank Chapelle, U.S. Geological Survey, Columbia, South Carolina. Environmental Geology (6), Geochemistry (7), Hydrogeology (13).

T15. **Computational Hydrology and Data Visualization and Animation.**
Hydrogeology Division. Edward A. Sudicky, Waterloo Centre for Groundwater Research, University of Waterloo, Ontario, Canada; Frank W. Schwartz, Ohio State University. Computers (3), Hydrogeology (13).

T16. **Leading Edge Applications of Earth Science Modeling and Visualization.**
COGEOINFO (Commission on the Management and Application of Geoscience Information). A. Keith Turner, Colorado School of Mines; Frank A. D'Agnese and Claudia C. Faunt, U.S. Geological Survey, Denver. Computers (3), Engineering Geology (5), Hydrogeology (13).

T17. **Integration of Hydraulic and Geochemical Approaches in Vadose Zone Transport Studies.**
Hydrogeology Division and *GSA Institute for Environmental Education*. Scott W. Tyler, Desert Research Institute, Reno, Nevada; Bridget R. Scanlan, Bureau of Economic Geology, University of Texas at Austin. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13).

T18. **Methods for Quantifying Unsaturated Permeability, Retardation, and Other Transport Properties in Rock, Soil, and Sediment.**
Judith Wright, Battelle–Pacific Northwest Labs, Richland, Washington; James L. Conca, Washington State University. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13). POSTER.

T19. **Description and Measurement of Constitutive Relations Governing Fluid Flow in Variably Saturated Media.**
Hydrogeology Division. Martinus Th. van Genuchten, U.S. Salinity Laboratory, Riverside, California; Robert J. Lenhard, Battelle Pacific Northwest Labs, Richland, Washington. Hydrogeology (13).

T20. **Records of Glaciation and Climate Change Along the Leading Edge During the Last Glacial Maximum and the Pleistocene–Holocene Transition (20–8 ka).**
Donald T. Rodbell, Union College, Schenectady, New York; P. Thompson Davis, Bentley College, Waltham, Massachusetts; Geoffrey O. Seltzer, Byrd Polar Research Center, Ohio State University. Quaternary Geology/Geomorphology (25).

T21. **The Last Interglacial: Timing and Environment.**
Daniel R. Muhs, U.S. Geological Survey, Denver; Tom Hamilton, U.S. Geological Survey, Anchorage. Paleoceanography/Paleoclimatology (17), Quaternary Geology/Geomorphology (25).

T22. **Paleoclimate Records from Arctic Lakes and Estuaries.**
Gifford Miller, University of Colorado, Boulder. Paleoceanography/Paleoclimatology (17), Quaternary Geology/Geomorphology (25).

T23. **Correlation of the Marine and Terrestrial Paleoclimatic Record of the Eastern North Pacific and Western United States.**
James V. Gardner, U.S. Geological Survey, Menlo Park; Walter E. Dean, U.S. Geological Survey, Denver. Micropaleontology (15), Paleoceanography/Paleoclimatology (17), Quaternary Geology/Geomorphology (25). POSTER.

T24. **Tectonics and Landforms Around the Pacific Rim.**
Arthur L. Bloom, Cornell University; Thomas Dunne, University of Washington. Quaternary Geology/Geomorphology (25), Tectonics (31).

T25. **The Juneau Icefield: A Half Century of Geoscience Education, Research, and Professional Training in the Alpine and Glacial Environment.**
National Association of Geology Teachers and *Quaternary Geology and Geomorphology Division*. Brian B. Tormey, Pennsylvania State University; P. Jay Fleisher, State University of New York, Oneonta; Ann M. Tallman, Foundation for Glacier & Environmental Research, Richland, Washington. Geology Education (9), Quaternary Geology/Geomorphology (25).

T26. **Quaternary Dating Methods.**
Milan Pavich, U.S. Geological Survey, Reston; Paul Bierman, University of Vermont. Quaternary Geology/Geomorphology (25), Stratigraphy (29).

T27. **Late Quaternary Evolution of the Eastern Aleutian Arc: Volcanoes, Earthquakes, Glaciers, and Shorelines.**
Mark Molinari, Dames and Moore, Seattle, Washington; Lou Gilpin, University of California, Santa Cruz. Geophysics/Tectonophysics (10), Quaternary Geology/Geomorphology (25), Volcanology (32).

Please check the correct mode of the theme session—poster or oral. If the abstract is submitted inaccurately, it will be transferred automatically to a discipline session.

T28. **Learning in Small Groups: Using Collaborative Activities To Teach Geology.**
National Association of Geology Teachers. R. Heather MacDonald, College of William and Mary; Ann Bykerk-Kauffman, California State University at Chico. Geology Education (9).

T29. **Advances in the Geology and Metallogeny of Gold Deposits.**
MSA *Mineralogical Society of America* and *Society of Economic Geologists*. Michael Rasmussen, Echo Bay Exploration, Inc., Spokane, Washington. Economic Geology (4), Geochemistry, Other (8), Petrology, Igneous (21).

T30. **Boron: Mineralogy, Petrology, and Geochemistry in Earth's Crust.**
MSA *Mineralogical Society of America*. Edward S. Grew, University of Maine; Lawrence M. Anovitz, University of Arizona. Geochemistry, Other (8), Mineralogy/Crystallography (16), Petrology, Experimental (20).

T31. **Advances in Silica Geochemistry.**
MSA *Mineralogical Society of America*. Peter J. Heaney, Princeton University; Patricia Dove, Georgia Institute of Technology. Geochemistry, Aqueous/Organic (7), Geochemistry, Other (8), Mineralogy/Crystallography (16).

T32. **Phase Transformations: Mechanisms and Kinetics of Mineral Reactions.**
MSA *Mineralogical Society of America*. Bradley Hacker, Stanford University; Steven R. Bohlen, U.S. Geological Survey, Menlo Park. Geochemistry, Other (8), Geophysics/Tectonophysics (10), Petrology, Experimental (20).

T33. **Magmatic Evolution of Circum-Pacific Arc Systems.**
MSA *Mineralogical Society of America*. Robert J. Stern, Center for Lithospheric Studies, University of Texas at Dallas. Geochemistry, Other (8), Petrology, Igneous (21).

T34. **Volcanic Hazards and Disasters in Human History.**
Archaeological Geology Division. Floyd W. McCoy, Windward College, University of Hawaii; Grant Heiken, Los Alamos National Laboratory. Archaeological Geology (1), Volcanology (32).

T35. **Volatiles and Volcanoes.**
Society of Economic Geologists. Robert Symonds, U.S. Geological Survey, Vancouver, Washington. Environmental Geology (6), Geochemistry, Other (8), Volcanology (32).

T36. **Geological Mapping of Terrestrial Planets: Use (and Abuse?) of Remotely Sensed Data.**
Planetary Geology Division. George E. McGill, University of Massachusetts. Planetary Geology (23), Remote Sensing (26).

T37. **Impacts and Extinctions.**
Paleontological Society. Peter Ward, University of Washington. Paleontology/Paleobotany (18), Planetary Geology (23), Stratigraphy (29).

T38. **New Perspectives on Faunal Stability in the Fossil Record.**
Paleontological Society. Kenneth M. Schopf and Linda C. Ivany, Museum of Comparative Zoology, Harvard University. Micropaleontology (15), Paleontology/Paleobotany (18), Stratigraphy (29).

T39. **Tectonic and Climatic Influences on the Neogene Paleobiology of West-Central Nevada.**
Howard E. Schorn, Museum of Paleontology, University of California, Berkeley; Scott W. Starratt, U.S. Geological Survey, Menlo Park. Paleoceanography/Paleoclimatology (17), Paleontology/Paleobotany (18), Tectonics (31).

T40. **Evolution of Reef Biotas Along Active Plate Margins.**
Paleontological Society. Constance M. Soja, Colgate University; Rodney Watkins, Milwaukee Public Museum. Paleontology/Paleobotany (18), Sediments, Carbonates (27), Tectonics (31).

T41. **Teaching Paleontology.**
Paleontological Society and *National Association of Geology Teachers*. Carl V. Mendelson, Beloit College; H. Allen Curran, Smith College. Geology Education (9), Paleontology/Paleobotany (18). POSTER.

T42. **Educating Paleontologists for the Next Millennium: Evolution and Revolution.**
Paleontological Society. Gary D. Rosenberg, Indiana University/Purdue University, Indianapolis; Donald Wolberg, Paleontologist, Socorro, New Mexico. Geology Education (9), Paleontology/Paleobotany (18).

T43. **Pliocene Climates—Sea Levels and Ice Volumes.**
Detlef A. Warnke, California State University at Hayward. Marine Geology (14), Paleoceanography/Paleoclimatology (17), Stratigraphy (29). POSTER.

T44, T45. **Scientific Results of the Continental Drilling Program: Creede Caldera, Newark Rift Basin, Manson Impact Structure.**
Philip M. Bethke, U.S. Geological Survey, Reston; Dennis V. Kent and Paul E. Olsen, Lamont-Doherty Earth Observatory; David J. Roddy, U.S. Geological Survey, Flagstaff. Geochemistry, Other (8), Geophysics/Tectonophysics (10), Sediments, Clastic (28).
T44: ORAL, T45: POSTER.

T46. **Teaching Structural Geology.**
Structural Geology and Tectonics Division and *National Association of Geology Teachers*. Jan Tullis, Brown University. Geology Education (9), Structural Geology (30).

T47. **Quantitative Analysis of Joints and Faults: New Approaches to Field, Laboratory, and Modeling Studies of Rock Fracture.**
Michael R. Gross, Florida International University. Geophysics/Tectonophysics (10), Structural Geology (30), Tectonics (31).

T48. **Cascadia Subduction Zone.**
Harvey Kelsey, Humboldt State University, Arcata, California; Robert Schuster, U.S. Geological Survey, Denver; Brian Atwater, U.S. Geological Survey, University of Washington. Quaternary Geology/Geomorphology (25), Stratigraphy (29), Tectonics (31).

Global Positioning System

Thursday, October 27, morning
Washington State Convention and Trade Center

The University Navstar Consortium (UNAVCO) will demonstrate the use of the Global Positioning System (GPS) for precision surveying and positioning. UNAVCO supports National Science Foundation and National Aeronautics and Space Administration investigators using GPS for applications in active tectonic problems. Ongoing investigations range from measuring plate tectonic motion to crustal deformation associated with earthquakes and volcanoes. Other applications include mapping and navigation. GPS receivers and field techniques will be demonstrated by a UNAVCO field engineer.

T49. **Cascadia Convergent Margin: Forearc Tectonics.**
J. Casey Moore, University of California, Santa Cruz; Roy Hyndman, Pacific Geoscience Centre, Geological Survey of Canada. Marine Geology (14), Geophysics/Tectonophysics (10), Tectonics (31).

T50. **Puget Sound–Georgia Strait Region: 140 Million Years of Tectonics.**
James W. H. Monger, Geological Survey of Canada; Samuel Y. Johnson, U.S. Geological Survey, Denver. Geophysics/Tectonophysics (10), Structural Geology (30), Tectonics (31).

T51. **Tilt vs. Translation and the Late Cretaceous Tectonics of Western North America.**
George Gehrels and Bob Butler, University of Arizona. Geophysics/Tectonophysics (10), Structural Geology (30), Tectonics (31).

T52. **Baja British Columbia: Evaluation of Large-scale Northward Transport of the Northern Cordillera in Late Cretaceous to Early Tertiary Time.**
Paul J. Umhoefer, Northern Arizona University; Ted Irving, Pacific Geoscience Centre, Geological Survey of Canada. Geophysics/Tectonophysics (10), Tectonics (31).

T53. **Convergent and Transform Processes at the Leading Edge of the Northern Pacific Rim.**
Sarah Roeske, University of California, Davis; Jinny Sisson, Rice University; Terry Pavlis, University of New Orleans. Petrology, Igneous (21), Sediments, Clastic (28), Tectonics (31).

T54. **Geophysical Studies of the Continental Margin, Western North America.**
Walter D. Mooney, U.S. Geological Survey, Menlo Park. Geophysics/Tectonophysics (10), Marine Geology (14), Tectonics (31). POSTER.

T55. **Late Mesozoic Basins in the North American Cordillera: Constraints on Terrane Accretion and Translation.**
Sedimentary Geology Division. J. Brian Mahoney, University of British Columbia; John Garver, Union College, Schenectady, New York; Ralph Haugerud, U.S. Geological Survey, University of Washington. Sediments, Clastic (28), Stratigraphy (29), Tectonics (31).

Mt. Rainier and sailboat on Seattle's Elliott Bay. Photo by Bob Peterson, courtesy of Seattle–King County Convention and Visitors Bureau.

T56. **Geology of the Coast Ranges of Oregon and Washington: New Discoveries.**
Richard J. Stewart, University of Washington. Stratigraphy (29), Structural Geology (30), Tectonics (31).

T57. **Birth and Life of an Island Arc at a Leading Edge—The Geologic Development of Japan.**
International and *Structural Geology and Tectonics Divisions*, and *Geological Society of Japan*. Tim Byrne, University of Connecticut; Asahiko Taira, University of Tokyo. Marine Geology (14), Tectonics (31), Volcanology (32).

T58. **Active Arc-Continent Collision in Taiwan.**
Structural Geology and Tectonics Division. Neil Lundberg, Florida State University; Louis Teng, National Taiwan University; Donald Fisher, Pennsylvania State University; Jean Crespi, University of Connecticut. Geophysics/Tectonophysics (10), Structural Geology (30), Tectonics (31).

T59. **Geologic Evolution of the Tian Shan Orogenic System, Central Asia.**
Stephan Graham, Stanford University; An Yin, University of California, Los Angeles. Geophysics/Tectonophysics (10), Structural Geology (30), Tectonics (31).

T60. **Rheological and Structural Evolution of Contractional Orogenic Belts.**
Phyllis Camilleri, University of Wyoming. Petrology, Metamorphic (22), Structural Geology (30), Tectonics (31).

T61. **Dating Deformation.**
William J. Dunlap, University of California, Los Angeles; Jerry F. MacLoughlin, University of Michigan. Geochemistry, Other (8), Structural Geology (30), Tectonics (31).

T62. **Precambrian and Phanerozoic Terrane Accretion: Contrasts and Similarities.**
Kent C. Condie, New Mexico Institute of Mining and Technology; Peter J. Coney, University of Arizona. Precambrian Geology (24), Tectonics (31).

T63. **Precambrian Orogens: Tectonic Setting and Crustal Architecture.**
Ben A. van der Pluijm, University of Michigan; Timothy M. Kusky, Boston University. Precambrian Geology (24), Structural Geology (30), Tectonics (31).

T64. **Relations Between Diagenesis and Deformation.**
Sedimentary Geology Division. Richard Behl, University of California, Santa Barbara. Sediments, Carbonates (27), Sediments, Clastic (28), Structural Geology (30). POSTER.

T65. **Perspectives on Desert Surface Processes.**
Planetary Geology Division. Ted A. Maxwell, National Air and Space Museum, Smithsonian Institution; Leslie M. McFadden, University of New Mexico. Planetary Geology (23), Remote Sensing (26), Sediments, Clastic (28).

Please check the correct mode of the theme session—poster or oral. If the abstract is submitted inaccurately, it will be transferred automatically to a discipline session.

T66. **Cenozoic Sequences on Passive Margins: A Triad of Processes.**
Sedimentary Geology Division. Kenneth G. Miller, Rutgers, The [New Jersey] State University; Gregory S. Mountain, Lamont-Doherty Earth Observatory. Marine Geology (14), Paleoceanography/Paleoclimatology (17), Stratigraphy (29).

T67. **West Coast Salt Marshes: Stratigraphy, Sea-Level Change, and Seismic Events.**
Roger Byrne, University of California, Berkeley; Scott W. Starratt, U.S. Geological Survey, Menlo Park. Environmental Geology (6), Quaternary Geology/Geomorphology (25), Stratigraphy (29).

T68. **Evolution on the Atlantic Coastal Plain—Sedimentology, Stratigraphy, and Hydrogeology.**
Marylin P. Segall, University of South Carolina. Environmental Geology (6), Sediments, Clastic (28), Stratigraphy (29).

T69. **Geologic Hazards Education for K–12 Students.**
Center for the Study of Active Volcanoes (University of Hawaii). Stephen R. Mattox, University of Hawaii. Geology Education (9), Geophysics/Tectonophysics (10), Volcanology (32).

FIELD TRIPS

Seattle
at the leading edge

Trips start and end in Seattle unless otherwise indicated. With lower airfares on Saturday night stay-overs, you can pay for a pre- or postmeeting field trip with the savings! If you register for ***only*** a field trip, you must pay a $25 nonregistrant fee in addition to the field trip fee. This fee may be applied toward meeting registration if you decide to attend the meeting.

The trips are technical in nature and can be physically rigorous. Students and guests are strongly encouraged to attend.

Trip fees include transportation during the trip and a guidebook. Other services such as meals and lodging are noted by the following symbols: B—breakfast, L—lunch, D—dinner, and ON—overnight lodging. The mode of transportation follows overnight lodging information.

Cancellation deadline is September 23. No refunds will be given after this date. If GSA must cancel a field trip because of logistics or if minimum registration requirements are not met, a full refund will be issued to you after the meeting. Be aware of cancellation penalties imposed by the airlines. Plan alternatives in advance should the trip you are registered for be canceled.

For further information or if you have special needs, contact the individual trip leader or 1994 Field Trip Chair Don Swanson, U.S. Geological Survey, c/o Dept. of Geological Sciences, AJ-20, University of Washington, Seattle, WA 98195, (206) 553-5587 (both voice and fax), E-mail: donswan@geology.washington.edu, or Co-Chair Ralph Haugerud, at the same address, (206) 553-5542 (voice), 206-553-8350 (fax), E-mail: rah@geology.washington.edu.

Premeeting

1. **Island and Coastal Hydrogeology of Hawaii.**
Monday, October 17 (evening) through Saturday, October 22 (morning). Clifford I. Voss, U.S. Geological Survey, 431 National Center, Reston, VA 22092, (703) 648-5885; and Frank L. Peterson, University of Hawaii, Honolulu. Minimum: 14. Maximum: 26. Cost: $690, exclusive of airfare to and from Hawaii. Special airfare available on United Airlines (5B, 4L, 3D, 5ON, van).

This trip starts in Hilo and ends in Honolulu; one free day (October 22) before flying to Seattle. Big Island (Hawaii): two nights at Volcano House at edge of Kilauea Caldera: explore active volcano, possible live lava flow, east-rift geothermal plant, hydrogeology from Volcano to Kona via South Point. Oahu: three nights at Kaimana Beach Hotel. Visits into local wells: shaft tunnel to ground-water table in coastal aquifer; lateral tunnel to water-filled dike compartment. Tours of Oahu hydrology. **Note: Because of hotel reservation deadlines, those interested in this trip were required to submit a $50 deposit to GSA by April 29. Contact Becky Martin at GSA, (303) 447-2020, ext. 164, to see if spaces are still available.**

2. **Geomorphology and Stratigraphy of the Great Last-Glacial Missoula Floods in Central Washington and the Columbia River Gorge.**
Tuesday, October 18 (evening) through Sunday, October 23. Cosponsored by *Sedimentary Geology Division.* Richard B. Waitt, U.S. Geological Survey, 5400 MacArthur Blvd., Vancouver, WA 98661, (206) 696-7558; and Jim E. O'Connor, same address. Minimum: 18. Maximum: 43. Cost: $350 (0B, 5L, 0D, 5ON, van). Trip starts in Seattle or Spokane and ends in Seattle.

The features in the alluvial landscapes to be visited throughout the flooded system are: (1) diverse scabland deposits and landforms—giant channels and dry cataracts, great bars and giant current ripples, enormous boulders—revealing cataclysmic discharges 200–>1000 ft deep; (2) pristine ice-margin features and relation to the floods; (3) rhythmic stratigraphy showing that the behemoth floods numbered 100 and varied in discharge by two orders of magnitude.

3. **Late Cretaceous and Early Tertiary Orogeny in the North Cascade Range.**
Wednesday, October 19 (late afternoon) through Sunday, October 23. Ralph Haugerud, U.S. Geological Survey, Dept. of Geological Sciences, AJ-20, University of Washington, Seattle, WA 98195, (206) 553-5542; Rowland Tabor, U.S. Geological Survey, Menlo Park, California; E. H. Brown, Western Washington University; Bryan Kriens, California State University, Dominguez Hills; and Michael McGroder, Exxon Production Research. Minimum: 17. Maximum: 33. Cost: $370 (0B, 4L, 4D, 4ON, van). NOTE: Participants should be prepared for wet, cold weather and short hikes through difficult terrain.

Late Cretaceous and early Tertiary orogeny in the North Cascades, including extensive thrusting, strike-slip faulting, plutonism, Barrovian regional metamorphism, and syntectonic sedimentation. Join us to examine these features and discuss the relative importance of thrust and magma loading as the cause of regional metamorphism, whether dominant transport was normal or parallel to regional strike, a possible 25-km-thick section through magmatic arc crust, and the extent and causes of early Tertiary tectonism.

4. **Volcanic, Sedimentary, and Structural Evolution of the Oregon-Idaho Graben, Southeast Oregon and Southwest Idaho.**
Thursday, October 20 through Sunday, October 23. Michael Cummings, Dept. of Geology, Portland State University, P.O. Box 751, Portland, OR 97207-0751, (503) 725-3022; Jim Evans, U.S. Geological Survey, Spokane; and Mark Ferns, Oregon Department of Geology and Mineral Industries, Baker City, Oregon. Minimum: 12. Maximum: 30. Cost: $360 (3B, 4L, 3D, 3ON, 4-wheel-drive vehicles). Trip starts in Boise, Idaho and ends in Seattle.

The Oregon-Idaho graben evolved between 15.5 and 10.5 Ma by east-west extension in a region that had undergone widespread tholeiitic volcanism between 17 and 15.5 Ma. The field study examines the evolution of the graben and its western margin and relations among concurrent volcanism, sedimentation, geothermal systems, and faulting.

5. **Sedimentary, Volcanic, and Tectonic Framework of Tertiary Marine Forearc Basins and the Mist Gas Field, Northwest Oregon.**
Thursday, October 20 through Sunday, October 23. Cosponsored by *Sedimentary Geology Division.* Alan R. Niem, Dept. of Geosciences, Oregon State University, Corvallis, OR 97331-5506, (503) 737-1233; Brian McKnight, University of Wisconsin, Oshkosh; H. Jack Meyer, Oregon Natural Gas Development Corporation, Portland; and Kathy Campbell, University of Southern California, Los Angeles. Minimum: 11. Maximum: 33. Cost: $292 (0B, 4L, 0D, 3ON, van).

This trip examines Eocene to Miocene marine siliciclastic and volcanic sequences, emphasizing sedimentary structures and lithofacies of storm-dominated deltas, beach, shelf, slope, and submarine canyon head deposits. Focus on interaction of sedimentary and volcanic processes, including spectacular invasive sills, dikes, and peperites. Development of forearc basins and adjacent subduction zone discussed using seismic reflection profiles.

6. **Quaternary Stratigraphy, Tectonic Geomorphology, and Fluvial Evolution of the Western Olympic Peninsula, Washington.**
Friday, October 21 through Sunday, October 23. Cosponsored by *Sedimentary Geology Division.* Frank Pazzaglia, Dept. of Earth and Planetary Sciences, University of New Mexico, Albuquerque, NM 87131, (505) 277-4204; and Glenn Thackray, University of Washington, Seattle. Minimum: 11. Maximum: 33. Cost: $275 (2B, 3L, 2D, 2ON, van).

This trip will investigate the Quaternary stratigraphy and tectonics of the western Olympic Peninsula. We will examine glacial-interglacial stratigraphy and coastal tectonic deformation in sea cliffs near Kalaloch, and observe fluvial terraces and soil stratigraphy in the Clearwater drainage basin, discussing how terraces are used to understand uplift in this tectonic setting.

7. **Pluton Emplacement During Mid-Cretaceous Contraction: Mount Stuart Batholith, North Cascades.**
Friday, October 21 through Sunday, October 23. Robert B. Miller, Dept. of Geology, San Jose State University, San Jose, CA 95192-0102, (408) 924-5025; and Scott Paterson and Lawford Anderson, University of Southern California, Los Angeles. Minimum: 21. Maximum: 42. Cost: $285 (2B, 3L, 2D, 2ON, van).

The midcrustal Mount Stuart batholith intruded country rock that records ophiolite obduction, multiple deformation, and complex metamorphism

Low-tide outcrop along Columbia River east of Astoria, Oregon, with evidence for earthquake-induced subsidence about 300 years ago. Photo by Roger Lewis.

during contraction, loading, and uplift. We will examine: magma petrogenesis and magmatic and subsolidus structures; timing of emplacement, country rock deformation, and metamorphism; diverse emplacement mechanisms; and tectonic implications for arcs, utilizing rates, *P-T-t* paths, and paleomagnetic data.

8. **Vents and Basalt Flows of the Columbia River Basalt Group.**
Thursday, October 20 (evening) through Sunday, October 23. Stephen P. Reidel, Geosciences, Westinghouse Hanford Company, MSIN H6-06, P.O. Box 1970, Richland, WA 99352, (509) 376-9932; Terry L. Tolan, Consultant, Kennewick, Washington; and Marvin H. Beeson, Portland State University, Portland. Minimum: 20. Maximum: 33. Cost: $175 (0B, 3L, 0D, 3ON, van). Trip starts in Richland, Washington, but vans will be available to transport participants from Seattle, leaving mid-afternoon October 20, if desired.

The Columbia River Basalt Group is one of the best preserved flood-basalt provinces in the world. This trip will examine several flows, tracing them from their vent areas to their distal margins. The characteristics and composition of the flows, features used for recognition, and emplacement time and histories will be emphasized.

9. **Sequence Stratigraphy of the Eocene-Oligocene Transition: Examples from the Nonmarine, Volcanically Influenced John Day Basin.**
Friday, October 21 through Sunday, October 23. Cosponsored by *Sedimentary Geology Division*. Erick A. Bestland, Dept. of Geological Sciences, University of Oregon, Eugene, OR 97403, (503) 345-3470; and Gregory J. Retallack, same address. Minimum: 19. Maximum: 28. Cost: $160 (1B, 2L, 1D, 2ON, van). Trip starts in Portland and ends in Seattle.

Stepwise climatic changes are superbly recorded in the nonmarine volcaniclastic deposits of the late Eocene–early Miocene Clarno and John Day Formations of central Oregon. In the Painted Hills area, large-scale truncation surfaces separate otherwise conformable packages of paleosols and tuffs and are interpreted as sequence stratigraphic boundaries that correlate with global climatic events.

10. **Earth, Water, Trees, and Fish: Geomorphology and Land-Use Problems in the Forested Mountains of the Pacific Northwest.**
Friday, October 21 through Sunday, October 23. Matthew J. Brunengo, Washington Dept. of Natural Resources, Division of Geology, P.O. Box 47007, Olympia, WA 98504-7007, (206) 902-1423; and Dan Miller, University of Washington. Minimum: 18. Maximum: 40. Cost: $245 (0B, 3L, 2D, 2ON, van).

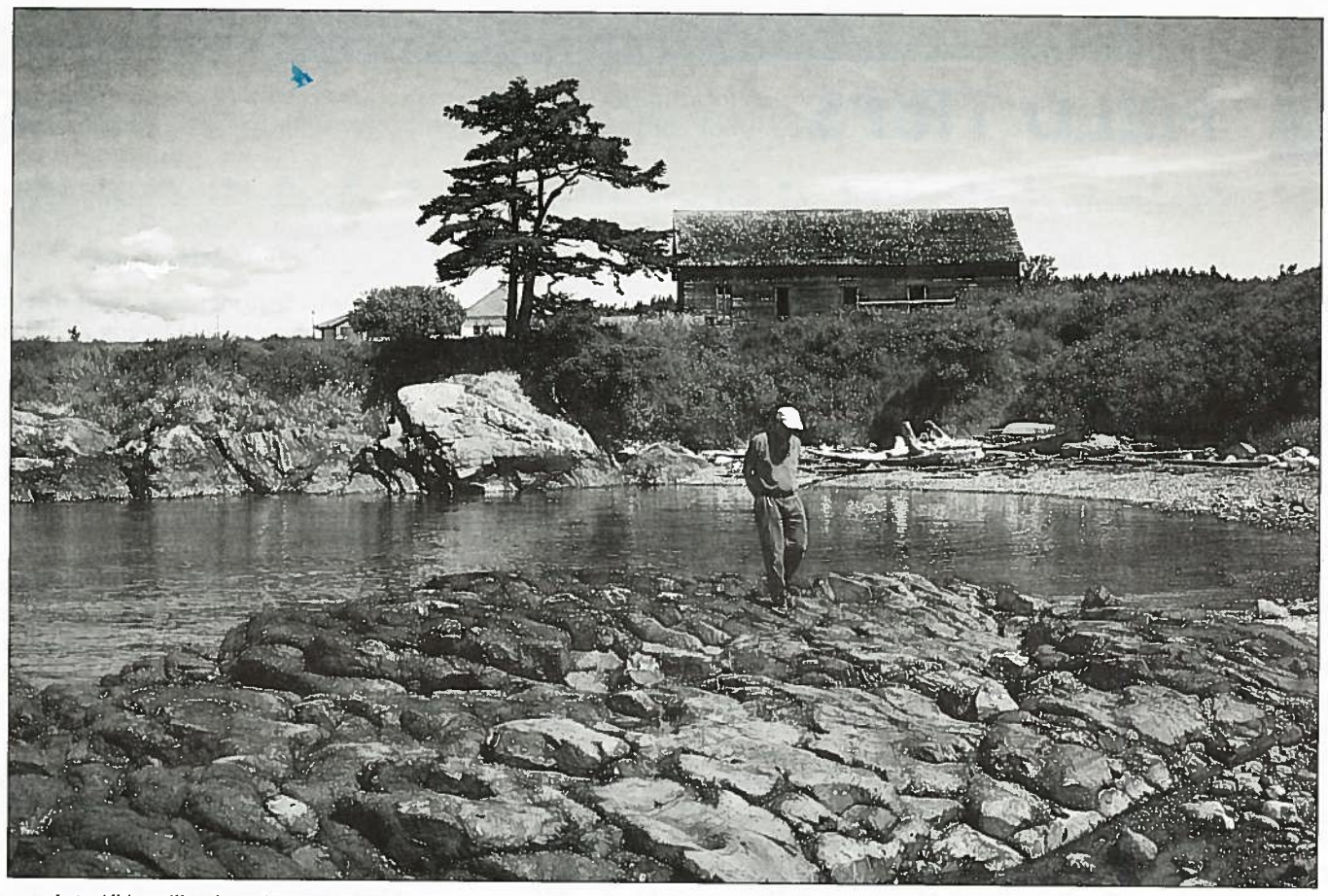
Forested mountainous terrain in the Northwest supports an assortment of land uses, but there are increasing conflicts between extraction and protection of various resources. We will attempt to understand the natural geomorphic and biologic systems, how they have been altered since Euro-American settlement, and how land-use practices are being redesigned to better protect the environment of the region.

11. **Tectonostratigraphy of the Crescent Terrane and Related Rocks, Olympic Peninsula, Washington.**
Friday, October 21 through Sunday, October 23. Christopher Suczek, Dept. of Geology, Western Washington University, Bellingham, WA 98225, (206) 650-3581; and Scott Babcock and Dave Engebretson, same address. Minimum: 22. Maximum: 34. Cost: $280 (2B, 3L, 1D, 2ON, van).

Examine one of the thickest basalt sections in the world, along with overlying, underlying, and coeval Tertiary marine sediments. Highlights include cruising on the fjordlike waters of Hood Canal, a visit to the spectacular rocky cliffs of Cape Flattery, and an ascent to the alpine meadows of Hurricane Ridge.

12. **Mid-Tertiary Volcanism East of Mount Rainier: Fifes Peaks Volcano-Caldera and Bumping Lake Pluton–Mount Aix Caldera.**
Saturday, October 22 through Sunday, October 23. Paul E. Hammond, Dept. of Geology, Portland State University, P.O. Box 751, Portland, OR 97207-0751, (503) 725-3387; and Keith A. Brunstad and John F. King, same address. Minimum: 11. Maximum: 22. Cost: $173 (1B, 2L, 1D, 1ON, van). NOTE: Some rugged walking with loose footing in wilderness areas.

Investigation of closely situated Bumping Lake pluton–Mt. Aix caldera and Fifes Peaks volcano. Emplacement mechanisms and chemical evolution of a rare granite pluton in the Cascade arc, its relationship to the Mt. Aix caldera and the tuffs erupted in the formation of the caldera; and the evolution of Fifes Peaks volcano and its cored-out caldera; framed in their tectonic setting.



Late Albian pillow lavas in Lopez Structural Complex, Richardson, Lopez Island, Washington. Photo by Martin G. Miller.

13. **Mount Rainier, A Decade Volcano.**
Saturday, October 22 through Sunday, October 23. Patrick Pringle, Washington Dept. of Natural Resources, Division of Geology, P.O. Box 47007, Olympia, WA 98504-7007, (206) 902-1433; Tom Sisson, U.S. Geological Survey, Menlo Park; and Jim Vallance, Michigan Technological University. Minimum: 11. Maximum: 33. Cost: $165 (0B, 2L, 0D, 1ON, van).

This trip circumnavigates majestic Mount Rainier and gives an overview of the volcano's underpinnings and geologic and glacial history. We will look at new petrologic and stratigraphic evidence of past behavior, inspect deposits of the enormous debris flows that inundated valleys draining the volcano, and discuss the extreme glacial dissection and alteration that make Mount Rainier vulnerable to future catastrophic failure.

14. **Holocene Tectonics in Western Washington.**
Saturday, October 22 through Sunday, October 23. Robert C. Bucknam, U.S. Geological Survey, Federal Center, Box 25046, Denver, CO 80225, (303) 273-8566; and Brian F. Atwater, U.S. Geological Survey, Seattle. Minimum: 29. Maximum: 43. Cost: $155 (0B, 2L, 0D, 1ON, bus). NOTE: Rainsuits and hip waders required (inexpensive stocking-foot waders will suffice); canoes will be used for part of the trip.

On this trip to coastal sites on the Pacific Coast and in the Puget Sound region, we will examine both geomorphic and stratigraphic evidence of late Holocene tectonic deformation. The deformation is the result of slip on the interface between the North America and Juan de Fuca plates and on shallow faults within the North America plate.

15. **Tertiary Coals of Western Washington.**
Saturday, October 22 through Sunday, October 23. Michael Brownfield, U.S. Geological Survey, Denver Federal Center, Box 25046, Denver, CO 80225, (303) 236-7767; and Ronald Affolter, Samuel Johnson, and Romeo Flores, all U.S. Geological Survey, Denver. Minimum: 18. Maximum: 44. Cost: $130 (0B, 2L, 0D, 1ON, van). NOTE: Hard hat, steel-toed boots, and safety glasses required if participants want to leave mine bus while in coal mines.

This excursion will examine Eocene coal-bearing rocks of western Washington. It includes visits to two coal mines, the Centralia and John Henry No. 1. We will emphasize depositional setting and sedimentology of the coal-bearing sediments. Data on chemistry and mineralogy of the coals will be discussed.

16. **Geoarcheology of Sites on San Juan Island, Washington.**
Saturday, October 22. Cosponsored by *Archaeology Division*. Julie K. Stein, Burke Museum DB-10, University of Washington, Seattle, WA 98195, (206) 685-2282. Minimum: 20. Maximum: 33. Cost: $97 (1B, 1L, 1D, 0ON, van).

Two areas will be examined in San Juan Island National Historic Park: Cattle Point, a 5000-year-old historic site, exhibiting artifacts exposed in blowouts on beach terraces in coastal lagoons; and British Camp, a 2000-year-old historic shell midden site, where exposed stratigraphy will show effects of sea-level changes on middens and the stratigraphic signature of northwest coast plank houses.

Postmeeting

17. **Geology and Tectonic Evolution of the Southern Coast Belt, B.C.**
Thursday, October 27 (evening) through Saturday, October 29. James W. H. Monger, Cordilleran Division, Geological Survey of Canada, 100 West Pender, Vancouver, B.C. V6B 1R8, Canada, (604) 666-6743; and J. Murray Journeay, same address. Minimum: 29. Maximum: 40. Cost: $190 (2B, 2L, 2D, 2ON, bus). Trip starts in Seattle and ends in downtown Vancouver, British Columbia, and its airport. Cost does not include post-trip overnight in Vancouver. NOTE: Papers required for border crossing.

This trip emphasizes stratigraphic, plutonic, and structural elements of the southern Coast Belt (or former Coast Plutonic Complex) that bear on its evolution. On day 1 we will follow the Fraser River along the physiographic boundary between the Coast and North Cascade mountains. On day 2 we will cross the entire Coast Belt from Lillooet to Vancouver.

18. **The 1980 (Mostly) and Earlier Explosive Eruptions of Mount St. Helens Volcano.**
Thursday, October 27 (evening) through Sunday, October 30. Richard B. Waitt, U.S. Geological Survey, 5400 MacArthur Blvd., Vancouver, WA 98661, (206) 696-7558; and Thomas C. Pierson, same address. Minimum: 18. Maximum: 42. Cost: $230 (0B, 3L, 0D, 3ON, van).

Photogenic effects of the 1980 eruptions include the world's largest historic debris avalanche, catastrophic lahars, a huge pyroclastic surge (the "blast") that leveled mature forest in high-relief terrain over an amazing several hundred square miles, and local tsunami that swept hundreds of feet upslope, as well as startling eyewitness accounts; prehistoric tephra and lahars; post-eruption hazard mitigation.

19. **Geologic Transect Across the Tertiary Cascade Volcanic Arc, Southern Washington.**
Thursday, October 27 (evening) through Sunday, October 30. Donald A. Swanson, U.S. Geological Survey, Dept. of Geological Sciences, AJ-20, University of Washington, Seattle, WA 98195, (206) 553-5587; and Russell C. Evarts, U.S. Geological Survey, Menlo Park, California. Minimum: 12. Maximum: 24. Cost: $210 (0B, 3L, 0D, 3ON, van).

More than 5 km of late Eocene to middle Miocene volcanic and intrusive rocks are exposed on the west flank of the Cascades at the latitude of Mount St. Helens. We will traverse this section, west to east, examining important stratigraphic, structural, and intrusive relations and discussing the development of the arc in the context of recent 1:24,000-scale mapping of much of the area.

20. **Engineering Geology of Seattle and Vicinity.**
Friday, October 28 through Saturday, October 29. Richard W. Galster, Consulting Engineering Geologist, P.O. Box 908, Edmonds, WA 98020, (206) 542-2596; William T. Laprade, Shannon and Wilson, Seattle; and Brian Beaman, GeoEngineers, Redmond, Washington. Minimum: 29. Maximum: 42. Cost: $92 (0B, 2L, 0D, exclusive of overnight expenses in Seattle, bus).

This trip will visit typical exposures and engineered projects in the Seattle area to discuss the impact of geology on development of the city and suburbs, and on project planning, construction, and operation. Examples of engineering geology considerations include landsliding, seismically induced liquefaction, coal-mine subsidence, soft-ground foundation and tunneling problems, surface-water management, coastal erosion, construction-material sources, and waste disposal.

21. **Fault-Zone Structures and Solution—Mass-Transfer Cleavage in Late Cretaceous Nappes, San Juan Islands.**
Friday, October 28 through Saturday, October 29. Darrel S. Cowan, Dept. of Geological Sciences, AJ-20, University of Washington, Seattle, WA 98195, (206) 543-4033; and Mark Brandon and Jeffrey Feehan, both Yale University, New Haven, Connecticut. Minimum: 22. Maximum: 22. Cost: $174 (1B, 2L, 1D, 1ON, van).

Rocky shorelines in the scenic San Juan Islands afford world-class exposures of mesoscopic structures developed during mid-Cretaceous contractional deformation. We will examine folds and composite Riedel structures developed in large-slip (>30 km) brittle fault zones, and a solution–mass-transfer cleavage, responsible for removal of approximately 50% of rock volume, that was superposed on fault rocks and bounding thrust sheets.

22. **Paleogene Cold Seeps and Macroinvertebrate Faunas in Forearc Sequences of Oregon and Washington.**
Friday, October 28 through Saturday, October 29. Elizabeth Nesbitt, Geology Dept., Thomas Burke Memorial Museum, University of Washington, Seattle, WA 98195, (206) 543-1856 or 6776; and Kathleen Campbell, University of Southern California, Los Angeles. Minimum: 17. Maximum: 30. Cost: $175 (1B, 2L, 1D, 1ON, van).

On this trip to selected Paleogene marine fossil localities in southwestern Washington and northwestern Oregon, we will collect macroinvertebrate fossils from a variety of depositional environments within the forearc sequence. These include an unusually well preserved, high-diversity, near-shore fauna, a unique intertidal micromollusk fauna, and two cold methane-seep limestone deposits with characteristic tube worms, sponges, gastropods, and chemosymbiotic bivalves.

23. **Geohydrologic Setting of the Hanford Site, South-Central Washington.**
Thursday, October 27 (evening) through Saturday, October 29. Kevin A. Lindsey, Geosciences, Westinghouse Hanford Company, MSIN H6-06, P.O. Box 1970, Richland, WA 99352, (509) 376-9932; and Stephen P. Reidel and Karl R. Fecht, same address. Minimum: 16. Maximum: 33. Cost: $165 (0B, 2L, 0D, 2ON, van). Trip ends in Richland, Washington, with easy access to Tri-Cities airport in Pasco. Vans will return to Seattle on Saturday night for those participants not flying from Pasco. NOTE: U.S. citizenship required.

We will discuss the main geohydrologic controls on ground-water flow and contaminant transport at the Hanford Site. At the field trip stops we will examine (1) major regional and structural geologic features, (2) the basalt geology of the deep aquifer systems, and (3) the sedimentary geology of the shallow aquifer systems and the vadose zone.

24. **Migmatites to Fault Gouge: Fault Rocks and the Structural and Tectonic Evolution of the Nason Terrane, North Cascade Mountains.**
Friday, October 28 through Saturday, October 29. Jerry F. Magloughlin, Dept. of Geological Sciences, 1006 C.C. Little Building, University of Michigan, Ann Arbor, MI 48109-1063, (313) 747-0664. Minimum: 15. Maximum: 33. Cost: $170 (1B, 2L, 0D, 1ON, van).

This trip will explore the Nason terrane, an exposed Cretaceous orogenic core in the Cascade Mountains. We will examine in detail a suite of fault rocks developed during unroofing of the terrane, including migmatitic syntectonic intrusive rocks, medium-grade gneiss, mylonitic plutonic and ultrabasic rocks, cataclasite, pseudotachylyte, and fault gouge.

25. **Stratigraphy and Chronology of Early to Late Pleistocene Glacial and Interglacial Sedimentary Deposits in the Puget Lowland.**
Friday, October 28 through Sunday, October 30. Don J. Easterbrook, Dept. of Geology, Western Washington University, Bellingham, WA 98225, (206) 650-3583; Derek Booth, King County Basin Planning, Seattle; Cynthia Carlstad, EHI, Redmond, Washington; and David Dethier, Williams College, Williamston, Massachusetts. Minimum: 29. Maximum: 43. Cost: $215 (0B, 3L, 0D, 2ON, bus).

Participants will examine paleomagnetic and laser-argon–dated, 1.6-m.y.-old early Pleistocene glacial and interglacial sedimentary rocks; 1-m.y.-old Lake Tapps tephra; thermoluminescence, radiocarbon, and amino acid–dated 70 to 250 ka glacial and interglacial sedimentary deposits; deglaciation of the Cordilleran ice sheet; depositional environments of glaciomarine drift; and evidence for repeated submergence and emergence of the lowland between 13 and 11.5 ka and the Sumas Stade readvance about 11.5 ka.

26. **Character of Landslides in Western Washington and Oregon.**
Friday, October 28 through Sunday, October 30. Tom Kuper, David J. Newton Associates, Suite 400, 1201 S.W. 12th Avenue, Portland, OR 97205, (503) 228-7718; Scott Burns, Portland State University, Portland; Dorian Kuper, David J. Newton Associates, Portland; and Anne MacDonald, PTI Environmental Services, Seattle. Minimum: 17. Maximum: 30. Cost: $245 (1B, 3L, 1D, 2ON, van).

We will examine a variety of landslides in volcanic, volcaniclastic, and glacial and sedimentary deposits. Featured will be very large, possibly coseismic rockfalls on the Olympic Peninsula west of Seattle, landslides in the Columbia River Gorge and Portland areas, and the lower part of the debris avalanche from the 1980 eruption of Mount St. Helens.

27. **Chelan Migmatite Complex, North Cascades: Mafic Magmatism Spanning Crustal Anatexis and Protodiapiric Intrusion.**
Friday, October 28 through Sunday, October 30. Clifford Hopson, Dept. of Geological Sciences, University of California, Santa Barbara, CA 93106-9630, (805) 893-3471; and James Mattinson, same address. Minimum: 11. Maximum: 27. Cost: $210 (2B, 3L, 2D, 2ON, van).

The Chelan Migmatite Complex, a Cretaceous batholith-scale tonalitic-migmatitic intrusive mass, records recurrent mafic magmatism before, during, and following crustal anatexis and protodiapiric rise of anatectic basement into the middle crust. The complex will be examined in roadcuts and on a four-hour foot traverse through Chelan River gorge.

Future Annual Meeting Sites

New Orleans	November 6–9	1995
Denver	October 28–31	1996
Salt Lake City	October 20–23	1997
Toronto	October 26–29	1998
Denver	October 25–28	1999

Sponsored by Society of Economic Geologists

For information contact the trip leader. Send payment in U.S. dollars to A. James Macdonald, SEG Field Trip Chairman, c/o MDRU, Dept. of Geological Sciences, University of British Columbia, 6339 Stores Road, Vancouver, BC V6T 1Z4, Canada, (604) 822-4563 or 822-9653. Costs reflect differential in SEG member/nonmember rates and include transportation from beginning to end of trip.

Gold Deposits of the Republic Graben, Washington.
Thursday, October 20 through Saturday, October 22. Byron R. Berger, U.S. Geological Survey, MS 973, Box 25046, Federal Center, Denver, CO 80225, (303) 236-5533. Limit: 20. Cost: $275/$300. Trip begins and ends in Spokane, Washington.

We will visit regional detachment and other faults, the Shasket Creek alkalic Au prospect, the Knob Hill epithermal Au mine, Lamefoot volcanogenic magnetite-gold mine, and Crown Jewell Au skarn.

Porphyry Ore Deposits of Southern British Columbia.
Thursday, October 20 through Saturday, October 22. William McMillan, B.C. Geological Survey Branch, Ministry of Energy, Mines, & Petroleum Resources, Fifth Floor, 1810 Blanshard St., Victoria, B.C. V8V 1X4, Canada, (604) 952-0444; and Clifford Stanley, MDRU/UBC, Vancouver, (604) 822-3514. Limit: 25. Cost: $200/$225. Trip begins and ends in Vancouver, British Columbia.

We will visit southern Quesnellia and the porphyry ore deposits of the Guichon Creek batholith (Highland Valley), Copper Mountain, Afton, and Ajax.

Cannon Epithermal Au-Ag Mine, Wenatchee, Washington.
Friday, October 28 through Saturday, October 29. Jacob Margolis, Homestake Mining Company, 1375 Greg Street, Sparks, NV 89431, (702) 358-5609; and Don Cameron, Asamera, Wenatchee. Limit: 24. Cost: $155/$175. The trip begins and ends in Seattle.

We will visit the Liberty and Wenatchee areas and have surface tours of the Cannon and Lovitt underground epithermal Au mines.

Mineral Deposits of Vancouver Island, British Columbia.
Thursday, October 27 through Monday, October 31. Tim J. Barrett, MDRU, Dept. of Geological Sciences, University of British Columbia, 6339 Stores Road, Vancouver, B.C. V6T 1Z4, Canada, (604) 822-9653; and Andre Panteleyev, BC GSB-MEMPR, Victoria, (604) 952-0407. Limit: 16. Cost: $700/$730. The trip begins at SeaTac International Airport (Seattle) and ends at both Vancouver, British Columbia and SeaTac.

We will visit Island Copper (porphyry Cu-Mo-Au), a nearby high-level porphyry/epithermal prospect, Westmin (Myra Falls) vocanogenic massive sulfide, a magnetite skarn, and the active Quinsam underground coal mine.

GSA Continuing Education Notes For Sale

Limited supplies of the following short-course manuals or notes remain available from the Cincinnati and Boston Annual Meetings. These may be ordered, while supplies last, through GSA Publication Sales 1-800-472-1988.

1993

SCN020: *GIS and the Geosciences*, by Richard L. Bedell, Jr. ..... $16.50 net

SCN021: *Asia: A Continent Built and Assembled Over the Past 500 Million Years*, by Kevin Burke and A. M. Celal Şengör ..... $27.75 net

SCN022: *Contaminant Hydrogeology: Practical Monitoring, Protection, and Cleanup*, by Christopher M. Palmer and Jeffrey L. Peterson ..... $27.75 net

SCN023: *Fracture Mechanics of Rock*, by Terry Engelder, Michael R. Gross, and Mark P. Fischer ..... $22.75 net

SCN024: *Alternative Pedagogies in Geological Sciences: A Workshop*, by Ann Bykerk-Kauffman, Lauret E. Savoy, and Jill Schneiderman ..... $13.50 net

SCN025: *Application of Sedimentological Information to Hydrogeological Problems*, by Erik K. Webb ..... $11.50 net

SCN026: *Computer Mapping at Your Desk that Really Works*, by Russell A. Ambroziak, Grant R. Woodwell, and Renee E. Wicks ..... $16.50 net

SCN027: *Environmental/Engineering Geology and Land-Use Planning—An Interface Between Science and Regulations*, by Charles W. Welby, Jerome V. DeGraff, and Rhea L. Graham ..... $16.50 net

Prices include shipping and handling; GSA Member discount does NOT apply on 1993 editions. Prepayment is required (check, major credit card, or money order in U.S. funds on U.S. bank).

1992

SCN002: *Paleosols for Sedimentologists*, by Greg H. Mack and Calvin James $18.75

SCN004: *Phase I Preliminary Site Assessments*, by Jeffrey L. Peterson $18.75

Prices include shipping and handling; GSA Members deduct member discount. Prepayment is required (check, major credit card, or money order in U.S. funds on U.S. bank).

PROFESSIONAL HORIZONS

Seattle at the leading edge

GSA-Sponsored Continuing Education Courses

Would you like to learn something new, brush up on the latest, or refresh your knowledge of the basics? GSA's continuing education courses will be held immediately before the Annual Meeting in Seattle and are open to members and nonmembers.

A course *only* fee of $25 is required if you are not attending the meeting. This fee may be applied to a full meeting registration if you decide to attend. Preregistration is recommended; on-site is $30 additional. You may register for GSA courses on the Annual Meeting Preregistration Form.

NEW: Continuing Education Unit (CEU) Service

Some continuing education courses sponsored by GSA offer CEUs. To obtain CEUs from these courses, you will fill out a CEU form at the course and give it to the GSA representative on-site.

A CEU is defined as 10 contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction, and qualified instruction. A contact hour is defined as a typical 60-minute classroom instructional session or its equivalent. Ten instructional hours are required for one CEU.

PREREGISTRATION DEADLINE: SEPTEMBER 16

Cancellation Deadline: September 23

For More Information Contact Edna Collis, ext. 134
GSA Continuing Education Coordinator

1. **Computer-aided Plate Tectonic Modeling Techniques.**
Saturday, October 22 and Sunday, October 23, 8:00 a.m. to 5:00 p.m.; University of Washington, Cosponsored by *Structural Geology and Tectonics Division.*

This course will provide hands-on experience with plate tectonic and paleoclimate modeling software. The course will also provide a forum to review and evaluate the latest plate tectonic model of the PALEOMAP Project. Macintosh, DOS, and Unix-based software has been written to capture, manipulate, analyze, and display plate tectonic, paleogeographic, and paleoclimatic maps illustrating the evolution of the continents and ocean basin during the past 800 m.y. A series of computer exercises will be conducted that demonstrate the methods of geographic data compilation, as well as the techniques that are used in building digital plate models.

Who Should Attend—Researchers who are working on plate tectonic and paleoclimate-related problems and teachers who wish to develop material for plate tectonic lessons and laboratory exercises.

Recommended Background of Attendees—Attendees are expected to be computer literate, but no programming experience is required. Attendees are also expected to have a background in plate tectonics.

What You Will Learn—By the end of the course, attendees will have a working knowledge of the latest computer techniques for capturing, manipulating, generating, and displaying plate tectonic, paleogeographic, and paleoclimatic data.

Faculty: **Christopher R. Scotese,** Dept. of Geology, University of Texas at Arlington; Ph.D., University of Chicago. **Malcolm I. Ross,** Ph.D. candidate, Rice University; M.S., University of Texas at Austin.

Limit: 16. Fee: $260, students $240; includes course manual, software, atlas of reconstructions, slide set, videotapes of plate tectonic animations, digital data files, and lunch both days.

2. **GPS Geodesy and Active Tectonics.**
Saturday, October 22 and Sunday, October 23, 8:00 a.m. to 5:00 p.m.; University of Washington. Cosponsored by *Structural Geology and Tectonics Division.*

Global Positioning System (GPS) geodesy is the most important technological innovation in the field of precise surveying in this century. It enables scientists, surveyors, and others to determine the relative position of a suite of monuments with a horizontal accuracy typically of an order of 3–10 mm, and a vertical accuracy that is typically 10–25 mm. This course focuses on the application of crustal motion geodesy. By making repeated measurements of a network of monuments, it is possible to monitor the motions and deformations produced by active tectonic processes. GPS geodesy has demonstrated its usefulness in a variety of tectonic settings, including oceanic and continental subduction zones, continental collision regimes, and broad plate boundary zones such as southern California. This course will provide an overview of the essential technical and organizational aspects of GPS geodesy, including a review of the equipment and field support services provided by the University Navstar Consortium (UNAVCO) funded by NSF. Participants will experience hands-on practical training with GPS receivers.

Who Should Attend—Geologists interested in active tectonic processes who seek an in-depth introduction to GPS geodesy as a tool for monitoring crustal motion and deformation.

Recommended Background of Attendees—No formal requirements. Some knowledge of UNIX would be helpful for that part of the course focused on GPS data processing (but is not essential).

What You Will Learn—Attendees will learn how to design and implement a GPS experiment, how to select and monument stations, how to operate a GPS receiver, and how to take advantage of UNAVCO field and equipment support services and what sytem performance trends are. They will get an introduction to how GPS data are processed.

Faculty: **Michael G. Bevis,** Dept. of Marine, Earth and Atmospheric Sciences, North Carolina State University; Ph.D., Cornell University. **Charles M. Meertens,** University Navstar Consortium (UNAVCO) and Dept. of Geology and Geophysics, University of Utah; Ph.D., University of Colorado.

Limit: 50. Fee: $245, students $225; includes course manual and lunch both days.

3. **Phase I Environmental Site Assessments.**
Saturday, October 22 and Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Engineering Geology Division.*

ATTENTION STUDENTS: The Engineering Geology Division will SUBSIDIZE THE FIRST FIVE STUDENTS WHO ARE VALID DIVISION MEMBERS. The students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Engineering Geology Division.

This course will present an overview of all aspects of performing a Phase I Environmental Site Assessment, including the purposes and objectives of the investigation, a discussion of all appropriate environmental regulations, appropriate sources of information, how to conduct the assessment, and environmental liability. We will review the regulatory basis for the assessments and cover the resources available to assist in the performance of the assessments. *Optional Exam*—This course is endorsed by the National Registry of Environmental Professionals (NREP) and will offer the NREP exam. A passing grade on this exam, together with a college degree, and professional experience will qualify you for the title of Registered Environmental Property Assessor (REPA). Credentials such as these are needed to perform Phase I Assessments in some states. Attendees not having the educational or professional requirements needed for the REPA designation may be certified as an Associate Environmental Property Assessor until the additional requirements are fulfilled.

Who Should Attend—Geoscientists (students to professionals) who are involved or interested in the performance of Phase I Environmental Assessments. This is a quickly growing area for professional geologists and, as such, should prove to be an important topic for students and teachers as well. This course will serve as a review prior to the certification exam for more experienced professionals, while at the same time providing detailed information for those less experienced.

Nisqually Glacier icefall on Mt. Rainier. Photo by Stephen C. Porter.

Recommended Background of Attendees—Attendees should have a basic knowledge of environmental regulations. Some experience in performing environmental or geological assessments would also be helpful, but it is not required.

What You Will Learn—Attendees will learn how to perform a Phase I Environmental Assessment based on NREP and ASTM standards. They will also learn where to obtain the data needed to perform an assessment and how to interpret those data.

Faculty: **Raymond C. Kimbrough,** Environmental Geologist, Tom Joiner and Associates, Inc., Tuscaloosa; B.A., University of Alabama. **David R. Gillespie,** Staff Geologist, Desert Research Institute, Water Resources Center, Las Vegas; M.S., University of Arkansas.

Limit: 40. Continuing Education Units: 1.6. Fee: $285, students $265; includes course manual and lunch both days. *Optional Exam Fee: $90, paid on-site. Optional NREP Study Guide will be available on-site for $45.*

Washington State Ferry on Puget Sound. Photo by Bob Peterson, courtesy of Seattle–King County Convention and Visitors Bureau.

4. **Quantitative Sedimentary Basin Modeling.**
Saturday, October 22 and Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Sedimentary Geology Division.*

ATTENTION STUDENTS: The Sedimentary Geology Division will SUBSIDIZE ALL STUDENTS WHO ARE VALID DIVISION MEMBERS. Students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Sedimentary Geology Division. To be reimbursed, students must apply in writing to Gordon S. Fraser, Indiana Dept. of Natural Resources, Geological Survey Division, 611 North Walnut Grove, Bloomington, IN 47405.

Revised and updated from previous presentations, the course will begin by introducing researchers to the concepts and methods of constructing and modeling basin subsidence histories in various tectonic settings including thermal processes and flexural modeling. Analyzing and modeling basin subsidence can be a powerful tool for understanding how, when, and why basins form and, thus, complement other basin analysis techniques.

The second part of the course deals conceptually and quantitatively with the interaction of basin subsidence, sediment supply, and sea level in the development of clastic basin-filling stratigraphy. Comparison of observed stratigraphy with synthetic stratigraphic models of basin sequences can be used to help determine whether, and to what degree, basin deposition is controlled by tectonics, eustatics, and climate. Both parts of the course will show the essential math involved in basin modeling and provide an overview of much of the recent literature on quantitative basin analysis.

Who Should Attend—Graduate students and researchers familiar with traditional basin analysis approaches who want an introduction to the literature and techniques of basin subsidence analysis and stratigraphic modeling.

Recommended Background of Attendees—This course is aimed at those with a background in sedimentary geology, but with little experience in modeling. A basic undergraduate level background in mathematics is assumed. Calculators should be brought to class.

What You Will Learn—The first part of the course begins with an overview of why basins form and subside. We will then discuss how to analyze basin subsidence histories, including the techniques of geohistory analysis, compaction corrections, and backstripping. We will briefly discuss and analyze thermal subsidence mechanisms with respect to extensional basins and lithospheric loading and basin flexure especially with regard to thrust belts and foreland basins. This part will be summarized by discussing the state of knowledge about basin subsidence mechanisms in various tectonic settings. The second part of the course will discuss the development of basin filling sequences generated by the interaction of subsidence, sediment supply, sea-level changes, and other controls from a conceptual and modeling point of view. We will discuss theoretical considerations, modeling approaches, and specific model results. Because models are useful only to the degree they help interpret real-world geology, we will discuss how models can be applied to observed sedimentary successions with examples from specific basins.

Faculty: **Paul L. Heller,** Dept. of Geology and Geophysics, University of Wyoming; Ph.D., University of Arizona. **Christopher Paola,** Dept. of Geology and Geophysics, University of Minnesota; Sc.D., Massachusetts Institute of Technology and Woods Hole Oceanographic Institution.

Limit: 50. Continuing Education Units: 1.6. Fee: $280, students $260; includes course manual and lunch both days.

5. **Soil and Ground-water Remediation.**
   Saturday, October 22 and Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Engineering Geology Division.*

ATTENTION STUDENTS: The Engineering Geology Division will SUBSIDIZE THE FIRST FIVE STUDENTS WHO ARE VALID DIVISION MEMBERS. The students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Engineering Geology Division.

The costs associated with remediating contaminated sites can be staggering. However, technical approaches to a contamination problem can be implemented. This course will emphasize a practical approach, covering technical requirements and procedures, consultant responsibilities, the client-consultant relationship, the consultant-regulatory agency relationship, legal considerations, design criteria, and technology options designed to reduce remediation expenditures and meet regulatory goals.

Who Should Attend—This course is intended for geologists, hydrogeologists, engineering geologists, engineers, and environmental scientists who are newcomers to the field of soil and ground-water remediation. Scientists who are interested in entering the environmental field or those who wish to broaden their environmental knowledge will benefit from this course.

Recommended Background of Attendees—Attendees should have a degree in geology, hydrogeology, engineering, or environmental science. The course presents basic concepts, ideas, and procedures related to site remediation. It is *not* intended for those professionals who are experienced in the environmental field and remediation design and implementation.

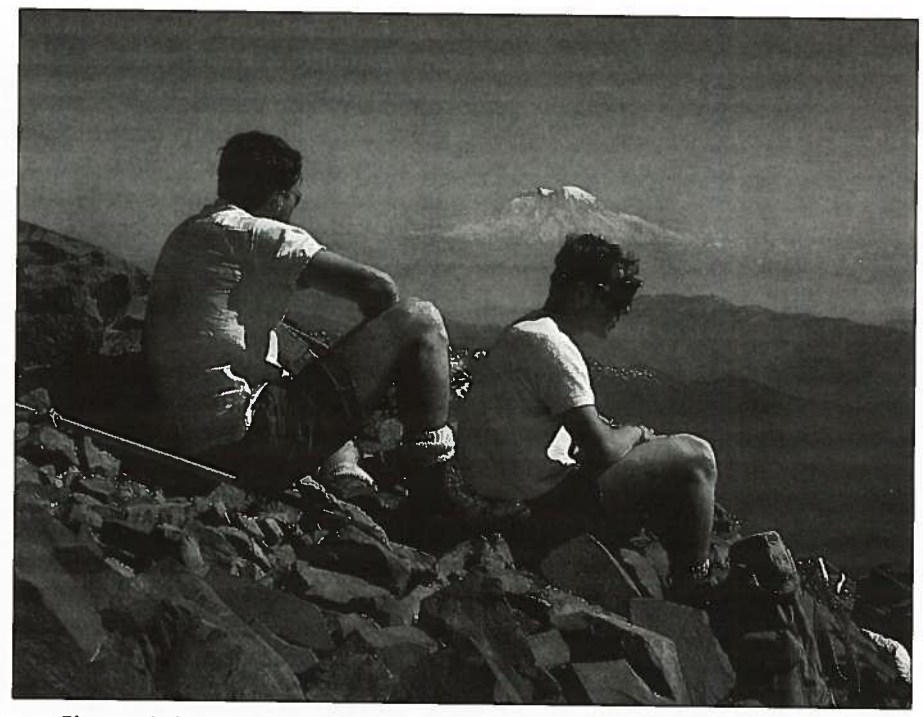
What You Will Learn—Attendees will learn the basic fundamentals of contaminant hydrogeology, fate and transport of contaminants in soil and ground water; soil and ground-water clean-up technologies; how to screen, select, and implement the proper clean-up technology; preparation of remediation action plans; remediation system designs and specifications; and regulatory interaction prior to and during site remediation. Case studies will be presented.

Faculty: **Jeffrey L. Peterson,** Principal Hydrogeologist, Enviros, Inc., Sonoma, California; M.S., California State University. **Diane M. Lundquist,** Senior Engineer, Enviros, Inc., Sonoma, California; B.S., Valparaiso University.

Limit: 40. Fee: $280, students $260; includes course manual and lunch both days.

6. **Applied Ground-water Flow Modeling: Conceptualizing Hydrogeologic Systems and Calibrating Models.**
   Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Hydrogeology Division.*

ATTENTION STUDENTS: The Hydrogeology Division will SUBSIDIZE THE FIRST STUDENT WHO IS A VALID DIVISION MEMBER. The student MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Hydrogeology Division.



Photographed in 1964, the view of Mt. Adams from pre-1980 summit of Mount St. Helens. Photo by Stephen C. Porter.

This course will assist model users in refining their approach to conceptualizing and simulating ground-water flow systems. The assignment of boundary conditions and translating the conceptual model to the numerical model will be emphasized. The model calibration process and issues surrounding model conformation will be presented. No computers are used as part of this course.

Who Should Attend—Graduate students in geology, engineering, and environmental sciences, and practicing hydrogeologists who have some previous experience with ground-water flow models.

Recommended Background of Attendees—Participants should have taken an introductory ground-water modeling college course or short course, or have practical experience in using flow models such as MODFLOW and PLASM.

What You Will Learn—This course will present a modeling protocol and emphasize techniques used to build conceptual models, set boundary conditions, perform calibrations, and assess calibration.

Faculty: **Mary P. Anderson,** Dept. of Geology and Geophysics, University of Wisconsin; Ph.D., Stanford University. **William W. Woessner,** Dept. of Geology, University of Montana; Ph.D., University of Wisconsin—Madison.

Limit: 50. Continuing Education Units: 0.8. Fee: $245, students $225; includes course manual and lunch.

7. **Computer Applications in Undergraduate Geoscience Courses for the Macintosh.**
   Sunday, October 23, 8:00 a.m. to 5:00 p.m.; University of Washington. Cosponsored by *Geoscience Education Division.*

Rapid advances in computer software and hardware have made available numerous products that are directly applicable to enhancing geoscience instruction. In this course, we seek to aquaint participants with new instructional tools and to provide an opportunity for participants to directly experience a broad spectrum of relevant computer software. Participants will have a hands-on opportunity to use software in a Macintosh computer laboratory. Developers of some of the software will be available to assist participants. Participants will be provided with course notes, some free software programs, and information on how to obtain copyright programs.

Who Should Attend—Geoscience teachers who are interested in learning about and using a broad spectrum of computer applications for instruction or the development of their own instructional materials, including presentational and tutorial software, image acquisition and manipulation software, Internet access software, and the use of CD-ROMs and laser disk videos.

Recommended Background of Attendees—Attendees should have a basic familiarity with the Macintosh computer.

What You Will Learn—Participants will have the opportunity to view and manipulate computer-assisted teaching software and some tools for preparing such software. A single day is not adequate for complete familiarization with that software. However, participants will receive resource materials (including both course notes and software) that will allow them to more thoroughly review and experiment with noncopyrighted programs that are most suitable for their individual teaching situations. Methods of Internet access will be demonstrated via one of the on-line commercial services available to anyone via modem. Software tools (with printed step-by-step instructions) for Internet use will be provided.

Faculty: **Dorothy L. Stout,** Physical Sciences, Cypress College; Ph.D., Claremont Graduate School. **Philip A. Sandberg,** Dept. of Geology, University of Illinois; Ph.D., University of Stockholm.

Limit: 16. Fee: $200, students $180; includes course manual, software, and lunch.

8. **Computer Mapping at Your Desk That Really Works.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center.

This course will introduce participants to the use of a set of software called geological information visualization (GIV) tools, which were developed within the U.S. Geological Survey for the display of geologic data and the creation of computer maps on desktop computers. Each registrant will be supplied with a set of the GIV software and a U.S. Geological Survey CD-ROM which contains a variety of maps produced by GIV. The morning session of the course will provide a background to the software development and its applications and will be presented by lecture and computer demonstration. Most of the class time will be arranged to allow registrants to participate in making their own geological map using the GIV tools. Each participant will have ample opportunity to practice the various aspects of creating a new computer map and prepare it for printing. The goal of the course is that each participant will take away sufficient skills to make effective immediate use of the software. Attendees will also be exposed to a variety of available digital data in GIS format which may be successfully converted for use in the GIV system.

Who Should Attend—Anyone who uses, or wants to use, digital mapping as a tool but does not want to become a professional computer scientist or cartographer. The software is ideal for students as well as researchers. Products produced by GIV may be used for educational purposes, publication of maps, and the visualization of several sets of geologic data.

Recommended Background of Attendees—Attendees must have a basic familiarity with IBM-compatible computers (MS-DOS or PC-DOS operating systems).

What You Will Learn—Attendees will learn how to enter their own map linework into the computer as well as how to import existing digital material from standard sources such as the U.S. Geological Survey Digital Line Graphs. Participants will be able to edit existing lines, customize map colors, assign the colors to appropriate polygons within the map, and prepare linework or symbols to appear as an overlay on a base map. Registrants will also learn how to contour arrays of data, such as elevation points, and create three-dimensional images. All of the maps produced may be prepared for printing as raster images.

Faculty: **Russell A. Ambroziak,** U.S. Dept. of the Interior, U.S. Geological Survey, Reston; Ph.D., University of Delaware. **Grant R. Woodwell,** Dept. of Environmental Science and Geology, Mary Washington College; Ph.D., Yale University. **Christine A. Cook,** U.S. Geological Survey, Reston; B.S., College of William and Mary.

Limit: 30. Continuing Education Units: 0.8. Fee: $345, students $325; includes course manual and lunch.

9. **GIS and the Geosciences.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center.

Geographic Information Systems (GIS) are crucial for today's geoscience research and projects. The volume of data readily available, new methods in effective field data input, analytical techniques, and the low cost of software and hardware make GIS a cost-effective—if not compelling—geoscience tool. Legislation is requiring digital data in government projects, and the volumes of data one must analyze in today's competitive industries require a thorough understanding of GIS technology. One thing is certain: no one GIS does it all. This course will address the technology from a geoscience applications viewpoint. The problem thus dictates the technology and not vice versa. The course will implement a multiplicity of systems, including Arc/Info, Genasys, IDRISI, AutoCAD, and others.

Who Should Attend—Any geoscientist interested in GIS as a tool.

Recommended Background of Attendees—This course accommodates entry-level people, as well as geoscientists who work with the technology, and particularly those who have learned from using one or two systems.

What You Will Learn—Attendees will learn data availability and format, field input, data models, rectification, map projections, georeferencing, analytical methods in GIS, geostatistics, and trends in GIS.

Faculty: **Richard L. Bedell, Jr.,** Senior Geologist, Computer Applications for the World Exploration Generative Team, Homestake Mining Company, Sparks, Nevada; M.Sc., GIS and Remote Sensing, University of London; M.Sc., Geology, University of Toronto.

Limit: 75. Continuing Education Units: 0.8. Fee: $145, students $125; includes course manual and lunch.

10. **Geology in Cultural Resource Management.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Archaeological Geology Divsion.*

The objective of this course is to bring to the attention of geologists the interactions, opportunities, concerns, and strategies at the interface between archaeologists and geologists. To make reasoned interpretations and evaluations of the archaeological record, archaeologists are realizing that former landscapes and environments, and their evolution through geomorphic processes, must be understood as a prerequisite. This course will cover a broad range of interdisciplinary issues in cultural resource management. Course topics will be covered through lectures with slides, discussions, and case examples spanning the country, from the files of the course instructors and their colleagues. A brief videotape will be shown that documents the geoarchaeological approach taken on one project. Course notes will include numerous maps, diagrams, and tables illustrating key points, and appendices with additional readings and sources of information.

Who Should Attend—Geologists who have been approached by an archaeologist for assistance, perceive the potential symbiotic character of relationships with archaeologists, perceive potential business opportunities in geoarchaeology, or would like to develop a course in geoarchaeology with practical applications but feel a lack of either knowledge or confidence in working with archaeologists.

Recommended Background of Attendees—This course is designed for nonspecialists and is open to anyone interested. A familiarity with Quaternary geology, geomorphology, and soils would be helpful, but anyone with a basic understanding of stratigraphy is welcome.

What You Will Learn—Participants will learn what cultural resource management is, how it has evolved, laws governing it, organizations requesting and conducting it, different phases of work (survey, testing, and mitigation), and the traditional archaeological goals, tasks, and concerns of these different phases. Also covered will be the role and responsibilities of geology and geologists in cultural resource management including rationale for geological work, timing, and integration of geology relative to phases of resource management work, and interacting with archaeologists. The course will focus on typical research questions, approaches, concepts, methodologies, issues of scale and issues of balancing cost effectiveness, efficiency, and scientific results for each phase of cultural resource management investigation.

Faculty: **E. Arthur Bettis III,** Research Geologist, Iowa Department of Natural Resources, Geological Survey Bureau; ABD, University of Iowa. **Edwin R. Hajic,** Research Associate, Illinois State Museum; Ph.D., University of Illinois.

Limit: 40. Fee: $215, students $195; includes course manual and lunch.

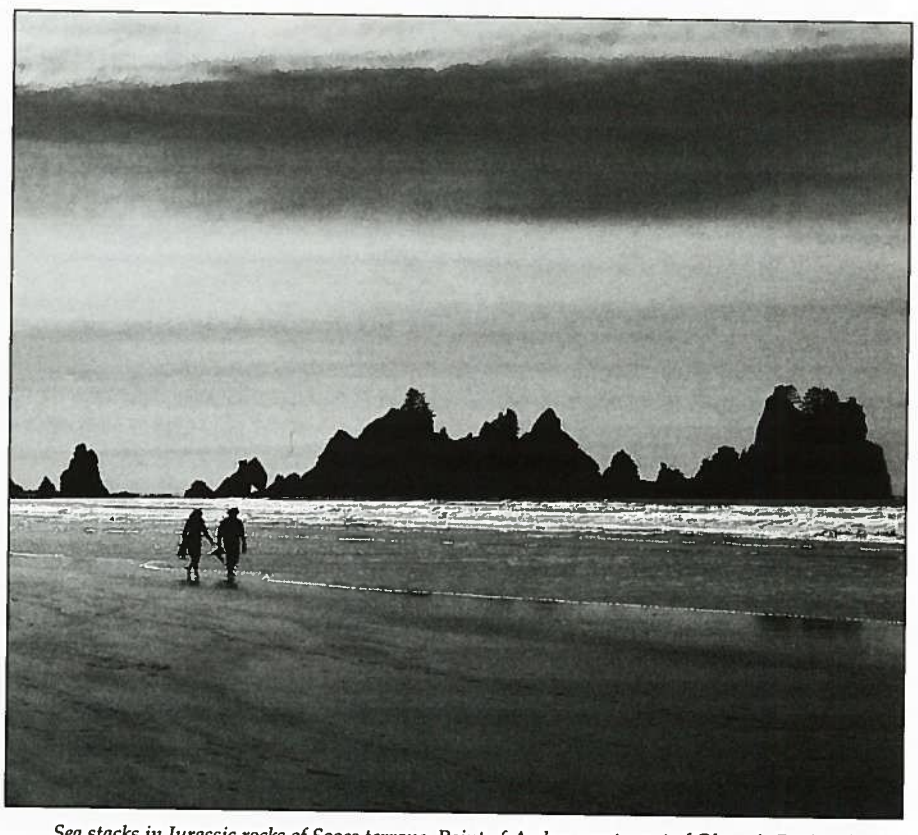
11. **Geomorphic Applications of In Situ–Produced Cosmogenic Isotopes.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Quaternary Geology and Geomorphology Division.*

Nuclides produced in rock by cosmic rays, such as ^{3}He, ^{10}Be, ^{26}Al, and ^{36}Cl, have been used to date lava flows, estimate moraine ages, better determine rates of bedrock erosion, and learn more about the variability of Earth's magnetic field. Interest in cosmogenic nuclides and their application to geologic problems has increased dramatically as analytic capabilities have expanded and cosmogenic nuclide systematics have become better constrained. This course will consider the application of cosmogenic nuclides to geologic problems. We will review the physics of nuclide production, the models used for interpreting nuclide abundance, and the determination and uncertainty of nuclide production rates. Using examples from the literature, we will illustrate the geological applications of in situ–produced cosmogenic nuclides and the attendant pitfalls. At the end of the day, we will demonstrate the equipment and techniques needed to prepare samples for analysis and discuss the facilities capable of making accelerator mass spectrometric measurements.

Who Should Attend—Geoscientists from a wide variety of disciplines who are interested in using cosmogenic nuclides to estimate rates of landscape change and/or date Quaternary landforms such as lava flows, terraces, alluvial fans, and moraines.

Recommended Background of Attendees—Attendees should have a general background in the geological sciences and be comfortable with basic concepts in physics, chemistry, and mathematics.

What You Will Learn—As a participant in this course, you will learn enough to judge whether cosmogenic nuclides could be a useful tool for solving research problems in your field. We will teach you the sampling strategies that we have employed and review the options for sample preparation and



Sea stacks in Jurassic rocks of Sooes terrane, Point of Arches, west coast of Olympic Peninsula, Washington. Photo by Eric S. Cheney.

Photo by J. Coats, courtesy of Seattle–King County Convention and Visitors Bureau.

analysis. You will be cognizant of the assumptions underlying interpretive models and the uncertainties inherent in cosmogenic dates and erosion rate estimates. The course will include a full set of notes, graphics, and computer files, which will enable you to evaluate specific scenarios in your own work and that of others.

Faculty: **Paul R. Bierman,** Dept. of Geology, University of Vermont; Ph.D., University of Washington. **Alan R. Gillespie,** Dept. of Geological Sciences, University of Washington; Ph.D., California Institute of Technology.

Limit: 40. Fee: $185, students $165; includes course manual, computer files, and lunch.

12. **Isotope Hydrology.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Hydrogeology Division.*

ATTENTION STUDENTS: The Hydrogeology Division will SUBSIDIZE THE FIRST STUDENT WHO IS A VALID DIVISION MEMBER. The student MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Hydrogeology Division.

This course will focus on *practical* applications of environmental isotopes for gaining a better understanding of hydrologic systems. Because a thorough understanding of the fundamentals is a critical prerequisite to successfully applying the methods, the systematics of isotope fractionation and the distributions of selected isotopes in natural systems will be discussed briefly. However, the main focus of the class will be on *applications* of isotopes, emphasizing applications where isotopes can be an especially cost-effective tool for tracing waters and solutes in hydrologic systems. Several case studies presented in class will introduce the attendees to data analysis and interpretation, and there will be time for group discussions.

Who Should Attend—Students and practicing geologists, hydrologists, and engineers.

Recommended Background of Attendees—Those with a senior undergraduate or graduate background in physical science who wish to apply isotope techniques to their work.

What You Will Learn—Participants will learn the fundamentals of isotope geochemistry (terminology, equilibrium, and kinetic fractionations, effects of open and closed systems on fractionations, etc.); applications of oxygen and hydrogen isotopes to tracing water sources; the application of solute isotope tracers (such as carbon, nitrogen, and sulfur isotopes) to determining pollutant sources and geochemical reaction paths; age-determination techniques using tritium and carbon-14; how to design and implement a field project (including sampling strategies, collection procedures, quality assurance of contract laboratories, and data analysis); and several case studies using a multi-isotope approach.

Faculty: **Carol Kendall,** Research Hydrologist, Water Resources Division, U.S. Geological Survey, Menlo Park; Ph.D., University of Maryland. **Neil L. Ingraham,** Water Resources Center, Desert Research Institute, Las Vegas; Ph.D., University of California, Davis.

Limit: 50. Continuing Education Units: 0.8. Fee: $190, students $170; includes course manual, lunch, and casual postcourse reception.

13. **Recognition, Investigation, and Mitigation of Landslides.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Engineering Geology Division.*

ATTENTION STUDENTS: The Engineering Geology Division will SUBSIDIZE THE FIRST FIVE STUDENTS WHO ARE VALID DIVISION MEMBERS. The students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Engineering Geology Division.

This course will provide attendees with a state-of-the-art view of the techniques needed to recognize, characterize, and mitigate landslide hazards. Topics will include: factors controlling landslide initiation and landslide mechanics, use of maps at various scales (USGS topographic maps to construction grading plans) in identifying and mapping landslides, modern methods of exploring and monitoring landslides, landslide hazard maps and land use regulations, methods used in stabilizing and controlling landslides, the value of various types of imagery and the importance of imagery accumulated from different years, seasons, and times of day, and differentiating easily confused landforms from landslide deposits and vice versa. Discussion will include examples and documentation from actual case histories drawn from the presenters' personal experiences, examples from the United States, Norway, China, Japan, Italy, and New Zealand. A Kodachrome slide set (40 slides) illustrates many of the features, which includes several before, during, and after illustrations, and will be given to each participant.

Who Should Attend—Anyone in academic teaching or learning fields or engineering geology, government workers involved in review of engineering geology reports, and geotechnical consultants.

Recommended Background of Attendees—No special background is necessary. All attendees will benfit from seeing how landslide activities can affect various field interpretations.

What You Will Learn—Attendees will learn the importance of detailed geologic mapping in determining subsurface slip-surface geometry, factors controlling landslide development, mechanics of landslides, techniques of landslide recognition and investigation (surface and subsurface), the difficulty of correcting incorrect geologic mapping, how to distinguish landslides from tectonic shear, consolidation shear, and/or basal shear, features of rocks and terrain where landslides are not expected, techniques of stabilizing landslides, and megaslides, paleoslides, and the geologic record.

Faculty: **Martin L. Stout,** Dept. of Geological Sciences, California State University, Los Angeles; Ph.D., University of Washington. **William R. Cotton,** President, William Cotton and Associates, Inc., Los Gatos, California; M.S., San Jose State University. **Michael W. Hart,** Consulting Engineering Geologist, San Diego, California; M.S., San Diego State University.

Limit: 50. Continuing Education Units: 0.8. Fee: $210, students $190; includes course manual, slide set, and lunch.

14. **Teaching Introductory Earth Systems For Non-Science Majors: An Interactive Approach.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Geoscience Education Division* and *National Association of Geology Teachers.*

This course will provide guidelines for developing a large introductory interdisciplinary earth systems science course and a description of such a course. Over the past three years faculty of the University of Minnesota have been engaged in teaching an introductory course entitled *Our Changing Planet*. The course is interdisciplinary and intended to meet liberal studies requirements at the University of Minnesota. *Our Changing Planet* presents a view of Earth as a set of interacting systems—lithosphere, biosphere, atmosphere, and hydrosphere—that have evolved on a variety of time scales during the past 4.5 b.y. The instructional approach is unique in that students are engaged in an active learning environment during three weekly lectures and one two-hour Active Learning Session. The learning environment is active in that students (1) are assigned to cooperative groups with whom they share the responsibility for each other's learning; (2) are required to interact with each other and the instructor during lectures; and (3) complete all Active Learning Sessions as members of their cooperative group. The lectures and associated readings are intended to provide the information necessary for students to complete the Active Learning Sessions. Each session has students respond to a specific question or solve a specific problem that requires them to apply and integrate the course content.

Who Should Attend—Faculty in geology and geophysics and ecology who are interested in teaching introductory courses and courses for non–science majors, and others who are interested in considering the use of teaching methods that can be used in large introductory courses.

Recommended Background of Attendees—No special background other than interests noted above.

What You Will Learn—Participants will learn what background knowledge the students bring to the course and how understanding that background influenced the development of the course; how the *Our Changing Planet* course content was developed and how it is organized; how the course is taught; how the students are evaluated; results of the course evaluations and how those results are used in making course revisions; and how some administrative issues have been resolved.

Faculty: **Fred N. Finley,** Dept. of Curriculum and Instruction, University of Minnesota; Ph.D., University of Minnesota. **V. Rama Murthy,** Dept. of Geology and Geophysics, University of Minnesota; Ph.D., Yale University.

Limit: 50. Fee: $170, students $150; includes course manual and lunch.

15. **Techniques for Analysis of Rock and Soil Slope Stability.**
Sunday, October 23, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Cosponsored by *Engineering Geology Division.*

ATTENTION STUDENTS: The Engineering Geology Division will SUBSIDIZE THE FIRST FIVE STUDENTS WHO ARE VALID DIVISION MEMBERS. The students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $50 after the GSA meeting by the Engineering Geology Division.

This course will deal with methods of data collection, kinematic analysis, safety factor calculation, and slope design that constitute the detailed examination of rock and soil slopes for stability. Three PC software packages will be used as instructional aids for examining the practical application of slope stability analysis techniques to cuts along highways and railroads, in mining operations, and in general construction. ROCKPACK II will be demonstrated to illustrate how stereonet plots, kinematic analysis of plane, wedge, and topple failures, factor of safety analysis, and use of artificial support apply to rock slopes. The Colorado Rockfall Simulation Program (CRSP) will be used to demonstrate trajectories of falls and identify the optimum placement of fences and barriers. Soil slope stability analyses STABL4M and XSTABL will be demonstrated for circular failures using techniques such as the modified Janbu and Bishop Methods. ROCKPACK, CRSP, and STABL4M packages will be given to the participants in the course.

Who Should Attend—Geologists or engineers who analyze or design rock or soil slope excavations or who may find themselves performing such work in the future.

Recommended Background of Attendees—Attendees should have knowledge of basic geologic principles, especially those pertaining to structural geology. In particular, familiarity with stereonet analysis is desirable; however, this topic is reviewed in the course.

What You Will Learn—Introduction to slope stability analysis—classification of slope failures, legal aspects; rock slope analysis—inventories and detailed site investigations, data collection, data display; kinematic analysis of slope stability—stereonet plots, Markland's test for potential plane failure, Markland's test for potential wedge failure, identifying potential toppling failures, methods for capturing or printing computer graphics for reports; discontinuity significance index; safety factor analysis—limiting equilibrium theory, plane and wedge failures, water, ice, surcharge, and seismicity; slope design; ROCKPACK (rock slope analysis computer software); rockfall analysis—rockfall hazard rating system, demonstration of CRSP (Colorado Rockfall Simulation Program), case histories, Colorado Rockfall testing range video; soil slope analysis—method of moments, method of slices, demonstration of STABL4M and XSTABL, case histories.

Faculty: **Chester F. Watts,** Director, Institute for Engineering Geosciences, Radford University; Ph.D., Purdue University. **Robert C. Whisonant,** Chair, Dept. of Geology, Radford University; Ph.D., Florida State University.

Limit: 40. Continuing Education Units: 0.8. Fee: $210, students $190; includes course manual, software, and lunch.

Other Courses, Forums, and Workshops

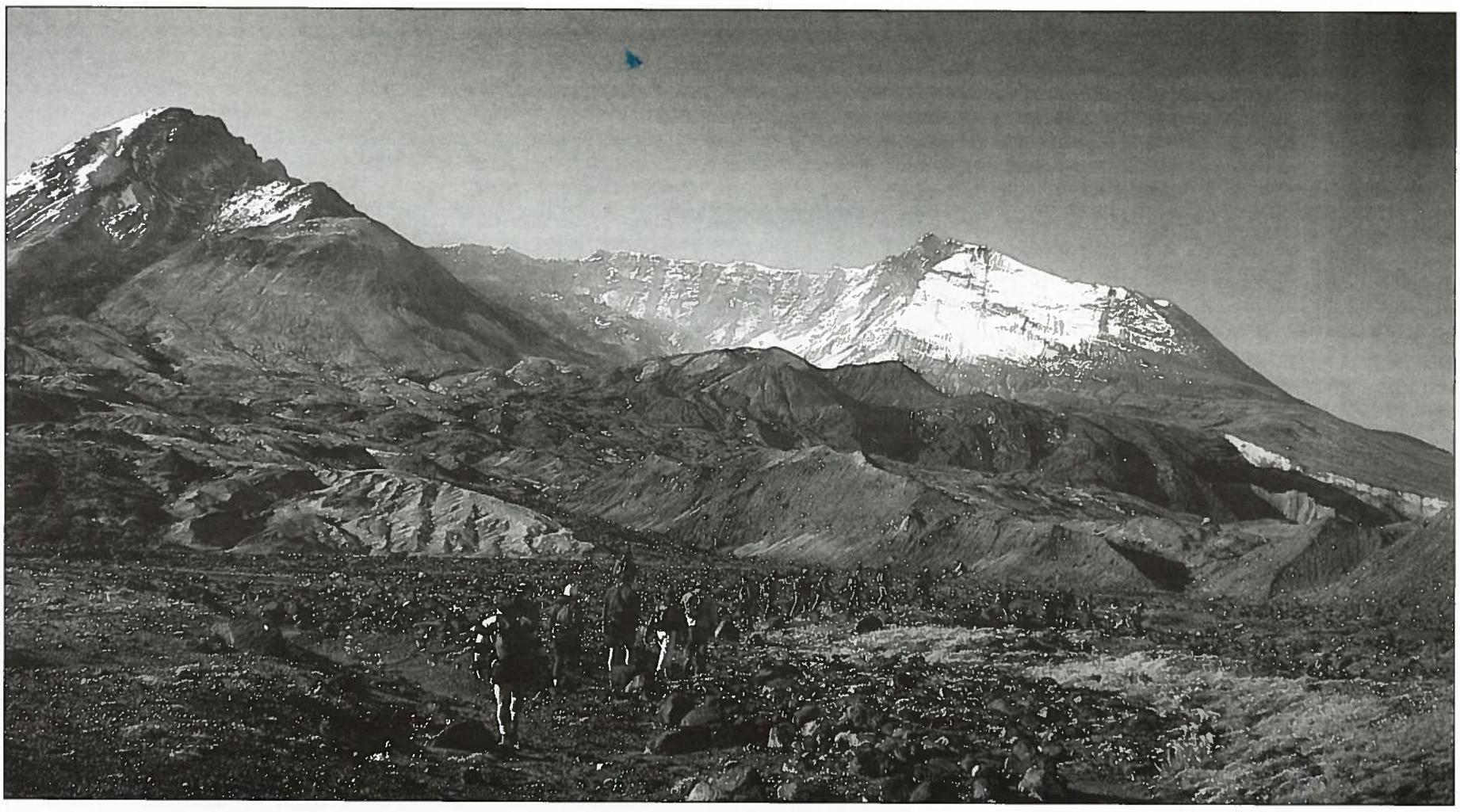
Registration and information can be obtained from the contact person listed after each course.

MSA **Silica: Physical Behavior, Geochemistry, and Materials Applications.**
Friday, October 21 through Sunday, October 23; Pack Forest Conference Center, Eatonville, Washington. Sponsored by *Mineralogical Society of America.*

This short course will explore the silica (SiO_2) system from different perspectives. Some lectures will address the atomic scale behavior of silica minerals at the extreme temperatures and pressures encountered deep within the earth. Others will treat silica as a geological indicator. For example, quartz has been used to detect the proposed meteorite impacts that led to the extinction of the dinosaurs, and the transformation of opal is important in oil exploration. In addition, new applications for silica in the materials sciences will be described, with special emphasis on catalytic silica (zeolites) and tailored low-temperature glasses (sol-gel processing). Finally, the course will treat the potential health effects associated with silica dusts.

Because silica is so prominent in Earth's crust, we believe that this course will elicit an enthusiastic response among geoscientists. Also, silica has been vital in the production of materials ranging from concrete to electronic components to fiber optic glasses. With expanded uses for silica on the horizon, we also expect to draw an audience from the industrial and epidemiological communities. Therefore, the course will expose students not only to active areas of research but to scientists with a broad range of expertise.

Paradise Trail, Mt. Rainier National Park, Washington. Photo by John Karachewski.



Don Swanson leads a University of Washington Geological Sciences field trip into the crater of Mount St. Helens in September 1992. Photo by David Backus.

Topics that will be covered are as follows: crystal structures and phase transitions of the low-pressure silica minerals; silica at ultrahigh pressures; structural characteristics of opaline and microcrystalline silica; stuffed derivatives of the silica polymorphs; thermochemistry of crystalline and amorphous silica; lattice dynamical behavior of anhydrous silica; hydrogen speciation in quartz; character of the Si-O bond; energy calculations of silica structures; high-silica zeolites; advances in sol-gel processing; industrial applications for silica; health effects associated with silica dusts; characteristics of silica gemstones; solubility of silica and kinetics of dissolution; petrogenesis of microcrystalline silica; quartz as a tectonophysical indicator.

Conveners: Peter J. Heaney, Charles T. Prewitt, and Gerald V. Gibbs.

Limit: 100. Fee: $375, students $200. Preregistration required. For information and registration: MSA Business Office, 1130 Seventeenth Street N.W., Suite 330, Washington, DC 20036, (202) 775-4344, fax 202-775-0018.

Geowriting: Guidelines for Writing and Referencing Technical Articles.
Saturday, October 22, 8:00 a.m. to 5:00 p.m.; Sheraton Seattle Hotel. Sponsored by *Geoscience Information Society, American Geological Institute,* and *Association of Earth Science Editors.*

Learn the methods of technical writing and bibliographic research in the geosciences. The morning session will focus on technical report writing, and will use the newly revised book *Geowriting*, published by the American Geological Institute, as a resource and text. Discussion will cover organization, getting started, editing, common grammatical problems, graphic presentation of data, and a brief introduction to common software packages available for word processing and graphics. The afternoon session will focus on library research and referencing: the use of library catalogs and bibliographic databases, compilation of references, and use of software for compiling reference lists and bibliographies.

Limit: 35. Fee: $120 ($140 after August 1), students $99; includes *Geowriting* and other handouts. Preregistration required. For information and registration: Julie Jackson, American Geological Institute, 4220 King Street, Alexandria, VA 22302, (703) 379-2480, fax 703-379-7563; E-mail: lar@aip.org.

Joint Education Initiative (JEI) Workshop.
Saturday, October 22 and Sunday, October 23; Western Washington University, Bellingham, Washington. Sponsored by *Joint Education Initiative.*

To date, much of what has taken place in the science classroom and laboratory has consisted of predetermined, rather routine experiences that all too often have little scientific merit. Through the Joint Education Initiative (JEI), teachers and students have access to vast quantities of critical scientific data on pressing earth and environmental science issues. By the effective use of CD-ROM-based computer technology, JEI helps make science instruction more consistent with the spirit and character of scientific inquiry and values. Workshop participants will use the JEI's CD-ROM-based scientific data sets, application software, and images to investigate important scientific phenomena.

Limit: 24. Fee: Free to selected participants. Preregistration required. Transportation and lodging provided. For information and application forms: Robert W. Ridky, Dept. of Geology, University of Maryland, College Park, MD 20742-3281, (301) 405-4090.

Solar Power Play.
Saturday, October 22, 8:00 a.m. to 12:00 noon; Washington State Convention and Trade Center. Sponsored by *Southwest Educational Development Laboratory* and *GSA's SAGE Program.*

During this half-day workshop with hands-on activities, participants will design and build a renewable energy project to take home. Presenters will assist participants and describe their experiences developing science partnership programs and mentoring students at different grade levels. This workshop is designed for teachers of grades 5–12 and utility representatives, but is open to all interested parties.

Limit: 40. Fee: $15. Preregistration required. For information: Karen Farley, Southwest Educational Development Laboratory, 211 E. Seventh St., Austin, TX 78701-3281, (512) 476-6861.

Effective Teaching: A Workshop for Graduate Students, Assistant Professors, and Anyone Else Interested in Becoming a Better Teacher.
Saturday, October 22, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Sponsored by *GSA's SAGE Program* and *National Association of Geology Teachers.*

Teaching can be a very rewarding experience, but effective teaching requires careful planning, creativity, and hard work. This workshop is designed to give participants practical advice and hands-on experience with the nuts and bolts of college teaching. Participants will learn how to design and deliver effective lectures, and will examine teaching resources (i.e. slide sets, videos, texts, CD-ROMs), non-traditional teaching and assessment methods, and the latest educational research.

Limit: 60. Fee: $15. Preregistration required. For information: Edward E. Geary, GSA headquarters, (303) 447-2020.

Fairly Simple Exercises in Geology Designed for Teachers with Little or No Geology Background.
Saturday, October 22, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center. Sponsored by *GSA's SAGE Program.*

This one-day workshop is based on a revised and retitled edition of *Workbook Exercises in Earth Science for 4–6 Grades and Their Teachers*, a book of exercises that has been used by teachers from fourth grade through college introductory geology courses. The course is for K–12 teachers who feel that they need assistance with teaching geology topics in the classroom and for geoscientists who want to learn effective ways of partnering with K–12 teachers and their classes. Special attention will be given to how teachers should approach a science exercise without fear and how to transmit the excitement of geology to their students.

Emphasis in the exercises is that teachers and their students can have a significant experience in practical geological (scientific) techniques (classification), inquire into geology (mineral identification), explore the latest theories (plate tectonics), or learn a life skill (map reading). All of the experiences presented in the workbook are fun, inexpensive, and easy to do.

Limit: 60. No fee. Preregistration required. For information: John J. Thomas and Barbara R. Thomas, Dept. of Geology, Skidmore College, Saratoga Springs, NY 12866, (518) 584-5000, ext. 2621.

Seismic Sleuths: An Earthquake Curriculum for Grades 7–12.
Saturday, October 22, 1:00 p.m. to 5:00 p.m.; Washington State Convention and Trade Center. Sponsored by *American Geophysical Union, Federal Emergency Management Agency,* and *GSA's SAGE Program.*

When will the next large earthquake strike the Seattle area? What are the risks to you and your students? How can you prepare for this event? This workshop will address these and other questions using a new earthquake curriculum developed for grades 7–12. The curriculum is hands-on, inquiry-based, dynamic, and fun.

Limit: 40. Fee: $15. Preregistration required. For information: Frank Ireton, American Geophysical Union, 2000 Florida Ave. N.W., Washington, DC 20009, (202) 462-6910, ext. 243.

Developing Good Multiple-Choice Test Questions.
Sunday, October 23, 9:00 a.m. to 1:00 p.m.; Washington State Convention and Trade Center. Sponsored by *Educational Testing Services* and *GSA's SAGE Program.*

This workshop will provide you with the guidelines and strategies to develop multiple-choice test questions that go beyond recall, and are efficient and effective in assessing higher-level thinking skills. Writing multiple-choice questions is a creative process that produces a product that must fit into a rather rigid format, and can be valuable in assessing students' mastery of skills and content knowledge. After a brief introduction to question-writing practices and pitfalls, we will write and critique test questions. We will also discuss using test specifications, defining core material, using the multiple-choice question formats, common editing faults, guidelines for reviewing questions, and test validity. This workshop is open to teachers at all levels, and will especially benefit secondary and college teachers. We will focus on questions dealing with geoscience topics, although the methods can apply to any content area.

Limit: 30. No fee. Preregistration required. For information and registration: Mimi Fuhrman, Educational Testing Services, MS 22-P, Rosedale Road, Princeton, NJ 08541, (609) 734-1502.

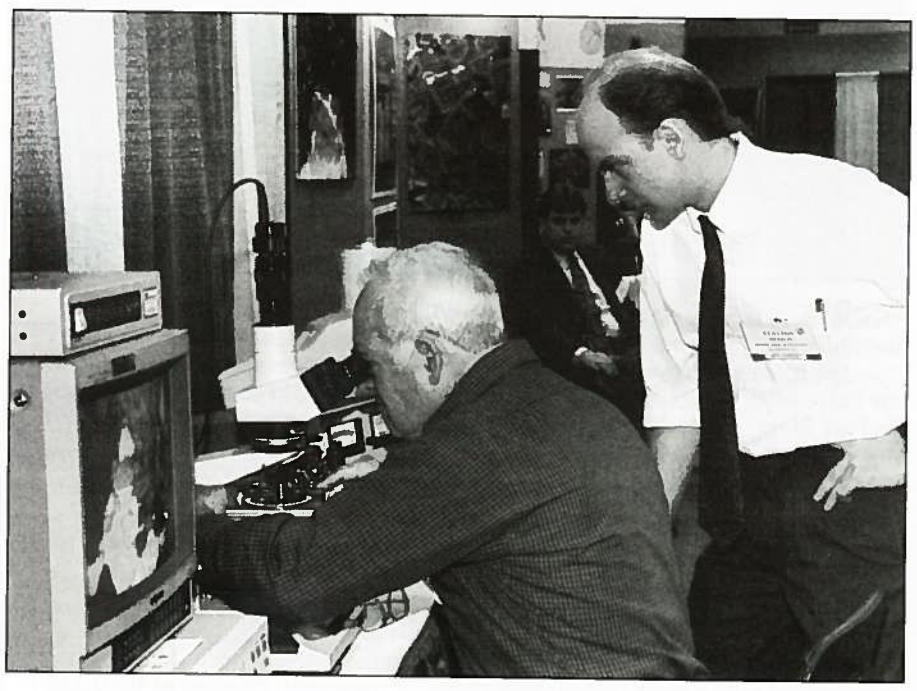
Major Features of Vertebrate Evolution.
Sunday, October 23, 9:00 a.m. to 5:00 p.m.; Sheraton Seattle Hotel. Sponsored by *Paleontological Society* and *Society of Vertebrate Paleontology.*

This course will review the highlights of the vertebrate record for a broad cross section of paleontologists and geologists. It is especially intended for those who teach general paleontology, historical geology, or history of life courses. Because there have already been short courses on dinosaurs and mammals, this course will take a slightly different approach. Emphasis will be placed on the major landmarks in the history of vertebrates: their origins among the deuterostomes, the radiation of fishes, the transition to land and the radiation of amphibians, the origin and radiation of amniotes, and the origin and diversification of birds and mammals. In addition, chordate groups (including conodonts and the "Calcichordata") that have not been previously covered in short courses will be reviewed, important new controversies will be assessed, and topics that were not yet developed at the time of previous short courses will be featured.

Topics and speakers are chosen to reflect new ideas and discoveries that have changed our picture of vertebrate evolution since the last conventional accounts were published. Many popular books and introductory texts continue to show outdated examples or perpetuate obsolete taxa and concepts, largely because the current thinking in vertebrate paleontology is not conveyed to the nonspecialist. Like other Paleontological Society short courses, this session will be particularly useful for those who need to be brought up to date quickly on the latest ideas in vertebrate paleontology.

Faculty: Donald Prothero, Robert Schock, Kevin Peterson, John Maisey, Colin Patterson, Keith Thomson, Michael Fracasso, Jacques Gauthier, John Ostrom, Alan Feduccia, James Hopson, and Michael Novacek.

No fee or registration. Course notes will be available on site for approximately $15. For information: Donald Prothero, Dept. of Geology, Occidental College, Los Angeles, CA 90041, (213) 259-2557, fax 213-259-2704.



Learning from exhibits—1993 Boston Annual Meeting.

GeoRef Intermediate/Advanced Workshop.
Sunday, October 23, 1:00 p.m. to 2:45 p.m.; Sheraton Seattle Hotel. Sponsored by *Geoscience Information Society* and *American Geological Institute.*

Learn how to search AGI's GeoRef database on Windows, including the new features available using WINSPIRS Windows software. Geoscience librarians will share their experience using the new Windows software to search GeoRef on CD-ROM. Questions are welcome, so bring your problem searches for group discussion and response.

No fee or registration. For information: Suzanne Larsen, Earth Sciences Library, Campus Box 184, University of Colorado, Boulder, CO 80309, (303) 492-6133, fax 303-492-2606.

Job Hunting and Career Development Skills for Geoscientists.
Sunday, October 23, 1:00 p.m. to 5:00 p.m.; Sheraton Seattle Hotel. Sponsored by *Association for Women Geoscientists.*

Learn the job-hunting skills necessary to survive in today's changing job market and to plan for future career development in your field, as well as related areas you may not have considered. Topics covered include the following:

- Networking gives access to the hidden job market that provides 85% of available employment but is not advertised. Learn to network through professional organizations as well as casual contacts.
- Résumé writing is a skill that provides the job seeker with the opportunity to get an interview. We are offering an excellent résumé-writing workbook for geoscientists.
- Interviewing skills are more important now than ever, and job opportunities may be unwittingly sabotaged during the interview process. Learn how to market and differentiate yourself from the competition.
- Attitudes for success derive from skills and strengths that job seekers may undervalue or be unaware they have. Revealing these boosts job-seeking efforts and results in successful interviews.

The workshop will include working in groups sharing skills and experiences that provide an interactive exchange, and the opportunity to change attitudes and methods that are no longer effective. The guarantee of future employment depends on the marketing skills of the individual and strategizing and positioning within the evolving job market.

Limit: 60. No fee. Preregistration required. Résumé-writing workbook: $15. For information and registration: Leuren Moret, 962 South G Street, Livermore, CA 94550, (510) 449-7351.

DataBase Forum.
Sunday, October 23, 3:00 p.m. to 5:00 p.m.; Sheraton Seattle Hotel. Sponsored by *Geoscience Information Society.*

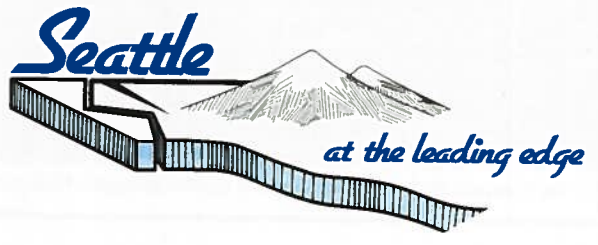
This forum will focus on a variety of formats (including CD-ROM, on-line, and floppy disks) useful to earth scientists and earth science librarians. Representatives of several databases will review the contents and search systems of their respective databases, as well as access for users. At press time, the subjects to be included in this year's forum are paleontology, geographic information systems, and interdisciplinary earth science information. Individuals in most disciplines in the geosciences will find at least one of the databases to be of interest. Producers of databases in these formats interested in participating should contact the organizer.

No fee or registration. For information: Kimberly Parker, Kline Science Library, Yale University, 219 Prospect St., P.O. Box 208111, New Haven, CT 06520-8111, (203) 432-3443, fax 203-432-3049.

Preparing Successful Grant Proposals to Fund Curriculum Innovation in the Geosciences—A Workshop.
Tuesday, October 25, 1:30 p.m. to 5:00 p.m.; Washington State Convention and Trade Center. Sponsored by *National Association of Geology Teachers* and *National Science Foundation.*

Learn about the National Science Foundation programs that fund innovative instructional approaches in the sciences, discover the kinds of ideas that have worked well in the past (and those that have not), understand NSF's review procedures, and learn how to construct a successful proposal. Susan Hixson, Program Director at NSF, will review the programs available through the NSF Division of Undergraduate Education and criteria used to evaluate proposals. Participants will examine actual funded proposals, learning to recognize positive features that characterize outstanding proposals and fatal flaws that kill others. A panel discussion, led by Judith Hannah and featuring successful participants in NSF's educational programs, will solidify understanding of qualities that can make or break a proposal. Bring concerns for necessary improvements in your curriculum, and leave with concrete ideas about how to get the funding you need. This workshop is designed to build upon its companion symposium, S22: Recent Advances in Geoscience Education—The Leading Edge of Undergraduate Instruction and Research.

Limit: 50. Fee: $10. Preregistration required. Send check payable to NAGT Workshop, c/o Judith Hannah, Dept. of Geology, University of Vermont, Burlington, VT 05405-0122, (802) 656-0245, fax 802-656-0045, E-mail: jhannah@moose.uvm.edu.



EXHIBITS

Products and Services At The Leading Edge

Washington State Convention and Trade Center, Level 4, Exhibit Halls 4A and 4B

Don't miss the excitement in the exhibits area. You will not find a wider variety of displays, all geared to the geosciences, than at this meeting. Browse around the 80,000 square feet of exhibits during the Welcoming Party on Sunday evening. But don't worry if you can't see it all then—three more days await you.

The exhibitors will be eager to show you their vast array of products and services. See demonstrations of state-of-the-art computer, instrumentation, microanalysis, camera, and field equipment. Shop for fossils, gemstones, and mineral specimens! Purchase books, learn about the latest projects of governmental agencies, and visit with major universities about their programs.

Convenient Exhibit Hours

Sunday
October 23
5:00 p.m.–8:00 p.m.

Monday
October 24
9:00 a.m.–5:00 p.m.

Tuesday
October 25
9:00 a.m.–5:00 p.m.

Wednesday
October 26
9:00 a.m.–4:00 p.m.

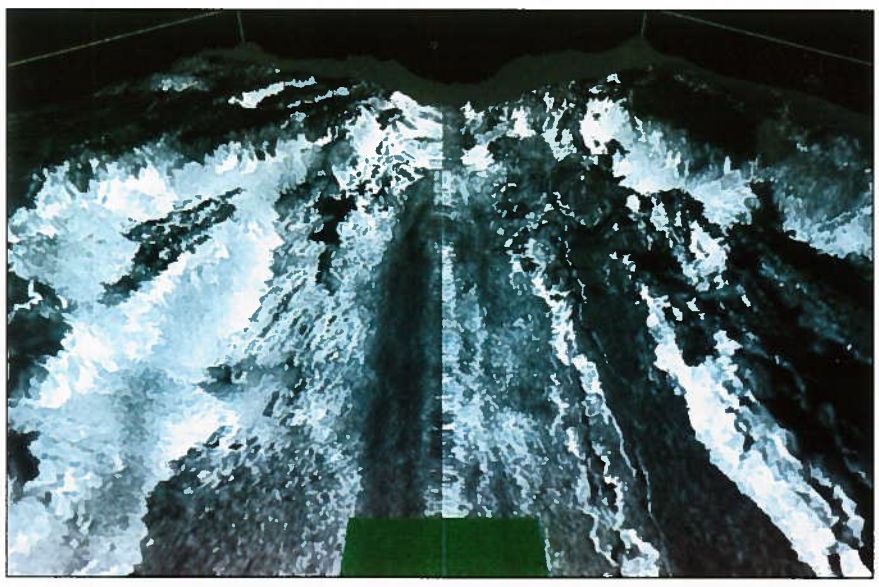
Thursday
October 27
CLOSED

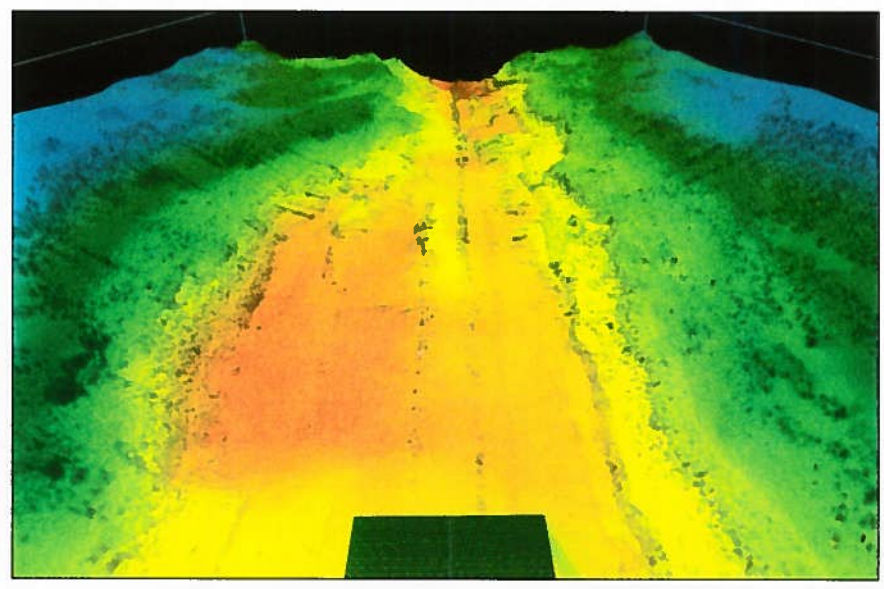
Meeting Exhibitors *(as of 5/16/94)*

Activation Laboratories Limited
American Association of Petroleum Geologists
American Geological Institute
American Geophysical Union
American Institute of Professional Geologists
American Journal of Science
Annenberg/CPB Project
Association of American State Geologists
Association of Engineering Geologists
Association for Women Geoscientists
Ben Meadows Company
Blackwell Scientific Publications, Inc.
Buehler, Ltd.
Bureau of Economic Geology
Cal Graeber Minerals
Cambridge University Press
Cameca Instruments, Inc.
Carolina Biological Supply Company
Chapman and Hall
ChemPet Research—CPR
Colorado School of Mines
Columbia University Press
Crystal Mark
Cushman Foundation for Foraminiferal Research
D.C. Heath & Company
D.J. Minerals, Inc.
Deltech, Inc.
Desert Research Institute
Donald K. Olson Minerals
Earth Magazine
Earth Observation Magazine
Earth'nWare, Inc.
Economic Geology Publishing Company
Elsevier Science Publishing Company, Inc.
Encyclopaedia Britannica North America
ESRI—Environmental Systems Research Institute
Finnigan MAT
Fisons Instruments
Friendship Publications
Front Range Community College
General Supply Corporation
Geochemical Society
Geographics
Geological Society of America—Bookstore
Geological Society of America—Combined Publishers Display
Geological Society of America—Committee on Geology and Public Policy
Geological Society of America—Committee on Minorities and Women in the Geosciences
Geological Society of America—Foundation
Geological Society of America—International Division
Geological Society of America—SAGE Program
Geology Stuff
Geophysical Institute
Geoscience Information Society
Hillquist, Inc.
Howard Minerals
Ikon Mining
JCPDS-ICDD
J.L. Darling Corporation
Jet Propulsion Laboratory
Joint Oceanographic Institutions—U.S. Science Support Program
Kendall/Hunt Publishing Company
Kluwer Academic Publishers
Komodo Dragon
Krueger Enterprises/Geochron Labs
Leco Corporation
Louisiana State University
Lynx Geosystems
McGraw-Hill Book Company
Mineralogical Society of America
Miners, Inc.
MJP Geopacks
Mountain Press Publishing Company
National Association of Geology Teachers
National Earth Science Teachers Association
National Science Foundation
Nature's Own
Oklahoma Geological Survey
Oregon Dept. of Geology & Mineral Industries
Oxford University Press
Paleontological Research Institution
Paleontological Society
Peterson-Scully Studios
Philips Electronic Instruments Inc.
Plenum Publishing Corporation
Premier American Technologies Corporation
Prentice-Hall
Princeton University Press
Raisz Landform Maps
Rigaku/USA, Inc.
Rockware, Inc.
Rocky Mountain Association of Geologists
RST Instruments, Inc.
Saunders College Publishing
Scintag, Inc.
SEPM (Society for Sedimentary Geology)
Sigma Gamma Epsilon
Society of Economic Geologists, Inc.
Society of Vertebrate Paleontologists
Spectrex Corporation
Spex Industries, Inc.
SPI Supplies/Structure Probe, Inc.
Springer-Verlag New York, Inc.
Tasa Graphic Arts, Inc.
THE Company
Trimble Navigation, Ltd.
University of Chicago Press
University of Idaho
University of Wyoming
U.S. Department of Energy—Yucca Mountain Project
U.S. Geological Survey
W.H. Freeman & Company
Washington State University
Wildlife Supply Company
Wiley & Sons, Inc.
William C. Brown Publishers
Williams & Heintz Map Corporation
Woman's Auxiliary of AIME
Worth Publishers, Inc.
X-Ray Assay Laboratories

Virtual Field Trip: Juan de Fuca Ridge

Presentation by John R. Delaney, University of Washington ◆ Thursday, October 27, 9:30 a.m. to 12:00 noon ◆ Washington State Convention and Trade Center





A Virtual Field Trip to the seafloor uses high-end computational and imaging hardware and software systems to operate on the extensive digital data sets collected over the past several years as marine scientists map the seafloor at increasing resolution. Scientists from the University of Washington, NOAA Pacific Marine Environmental Laboratory, and Woods Hole Oceanographic Institution have applied high-resolution acoustic and optical imaging techniques to span the range of mapping scales from kilometers to meters.

The Juan de Fuca Ridge, located several hundred kilometers off the Washington-Oregon coast, has been the focus of intensive studies devoted to understanding the behavior of submarine volcanoes and the complex life forms that they sustain. A critical requirement in the success of this venture involves generation and study of multiscalar data sets collected on the seafloor.

University of Washington scientists from the School of Oceanography have been working with personnel from the Human Interface Technology Laboratory on campus to develop a range of digital imagery that permits a user to view seafloor systems in striking new ways that involve real-time processing of data for fly-through capabilities over a wide range of progressively nested scales and resolutions.

The figures above are an example of some of the work to be presented. They are the result of a 120 Khz sidescan sonar survey of the axial valley on the Juan de Fuca Ridge. The technique allows bathymetry and sonar imagery to be collected in a single pass. The color figure is bathymetry with warm colors deep and cool colors shallow. The figure with gray shades is acoustic backscatter draped on the bathymetry. The trace in the middle is the path of the towed instrument package, and it nearly bisects the valley floor, which is about 300 meters wide (grid in the foreground is 80 meters square). Light gray areas represent reflectance from the talus slopes at the edge of the valley. The fissure on the bench to the right has localized a vigorously active hydrothermal field expressed as low mounds located in the middle distance.

Opportunities for hands-on, fly-through interaction with the data sets will be interspersed with a more formal presentation of the overall program at 10:00 a.m.

Seattle
at the leading edge

Employment Service

Monday, October 24 through Wednesday, October 26, 8:00 a.m. to 5:00 p.m.; Washington State Convention and Trade Center.

Do you need qualified scientists to fill staff needs? Or are you looking for employment in the earth sciences fields? If so, you are invited to participate in the GSA Employment Interview Service.

All interested organizations seeking qualified earth scientists to fill staff needs are urged to submit notices of their vacancies and their requests for computer listings of applicants in advance of the meeting. The minimum fee for a printout of two specialty listings is $150.

Interview booths may be reserved at the meeting in half-day increments for a nominal fee. GSA staff will handle all interview scheduling with Employment Service applicants.

Many job seekers have found the Employment Interview Service critical to their successful search for positions. The one-year registration fee is $30 for GSA Members and Student Associates; $60 for nonmembers. This applicant fee also includes the interview service at the annual meeting.

Applicants who sign up with the Employment Service by August 30, 1994, will be included in the information that employers receive prior to the meeting, so submit your forms early to receive maximum exposure, and remember to indicate on your application form that you would like to interview in October.

Employment Service forms are in the February and July 1994 issues of *GSA Today* or may be obtained by contacting the Membership Services Department at GSA headquarters.

Employment Opportunities in the Geological Sciences Roundtable Discussions

Sunday, October 23, 12:00 noon to 2:00 p.m.; Washington State Convention and Trade Center.

This annual forum on employment opportunities in the geosciences allows valuable one-on-one interaction between panel members and individuals or small groups. Experts in each of the areas listed below will conduct his or her own "mini-roundtable discussion" designed to provide a better opportunity to field both general and specific questions on a more personal, individualized basis.

These roundtable discussions will be in the Employment Service area during the interview registration time; however, YOU DO NOT HAVE TO BE SIGNED UP FOR EITHER THE ANNUAL MEETING OR THE EMPLOYMENT SERVICE TO PARTICIPATE IN THESE DISCUSSIONS.

Everyone—professionals and students—is encouraged to attend, to talk with as many of the experts as you like, and to pick up a free copy of the 1994 booklet "Future Employment Opportunities in the Geological Sciences."

Roundtable discussion leaders from the following areas will be featured: Academic and Educational, Mining, Federal Government, State and Local Government, Petroleum, Consulting, and Federal Legislation and Environmental Restoration.

For further information contact T. Michael Moreland, Membership Services Manager, GSA headquarters.

Graduate School Information Forum

Monday, October 24 through Wednesday, October 26, 9:00 a.m. to 5:00 p.m., Washington State Convention and Trade Center.

Students, this is a great opportunity for you to search for the right graduate school program to suit your interests. Come to Seattle and meet with representatives from your favorite schools without spending the travel time and money to go to each school for information and interviews.

University representatives will be on hand to answer questions and talk to (primarily) undergraduates. Graduate students may also find this service helpful. Individual appointments are not necessary, although students are welcome to contact the schools in advance and schedule a meeting time. A complete list of participating schools with contact names and telephone numbers is available. The deadline for schools to register for the forum is July 15. If you would like to participate or receive the list, please contact Matt Ball, GSA headquarters. Look for a complete schedule in the September *GSA Today*.

GSA Hosts Outstanding Seniors

For the fourth year GSA will be sponsoring a group of outstanding undergraduate seniors during the Annual Meeting. This program has been a great success with the invited students and the faculty of sponsoring universities. GSA has made arrangements to fund housing and registration fees for these select Outstanding Seniors. Travel expenses will be paid by the student's university.

The program exposes the best and brightest of the seniors to the broad range of career opportunities in geology. The students get a chance to meet with professionals in various fields and to learn about the latest research. The students are also given the opportunity to look for a graduate school during the Graduate School Information Forum.

By necessity, this program has been carried out by invitation only. Each North American university with a geology department has been included in a database. Universities that have participated in the past are not included in the invitation list until all universities have had a chance to participate. Schools within 200 miles of the host city are not invited. For 1994, 75 schools have been invited to participate. The first 34 schools to respond will be sending Outstanding Seniors to Seattle.

Funding has been provided by GSA and other sponsors. If you wish to assist with financial sponsorship for these students, please contact Matt Ball, GSA headquarters.

Earth Scientists on the Hill

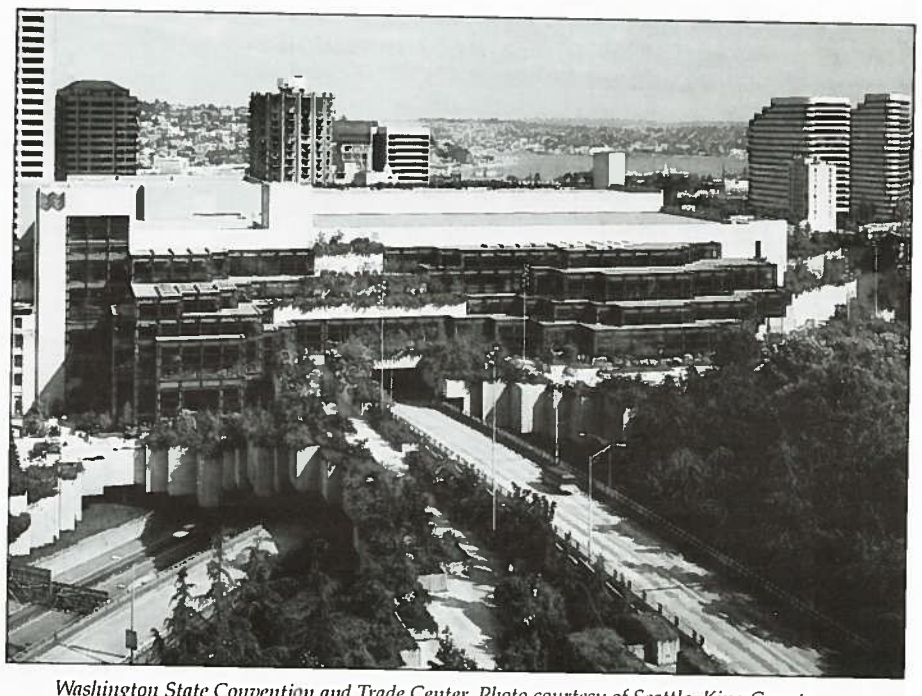
Monday, October 24, 12:00 noon to 1:00 p.m.; Washington State Convention and Trade Center. Sponsored by *GSA Geology and Public Policy Committee.*

The Congressional Science Fellowship program places earth scientists on the staffs of congressional offices. Congressional Science Fellows participate in the drafting of public policy by providing scientific and technical expertise to gain first-hand experience with the federal legislative process. Several of the previous fellows have accepted positions in Washington, D.C., and continue to provide Congress and federal agencies a much-needed perspective of earth sciences.

As GSA's eighth Congressional Science Fellow, Murray W. Hitzman concentrated on environmental and science-technology legislation, specifically the Clean Water Act reauthorization, the National Environmental Technology Act, and the CERCLA (Superfund) reauthorization, while serving on the staff of Senator Joseph I. Lieberman (D-CT).

At this open session, Hitzman will report on his experiences on the Hill and discuss some means by which earth scientists may become more effective in the public policy sphere. Geology and Public Policy Committee members will comment on how scientists can provide expertise to the U.S. Congress, on the role of the GSA Fellow program, and on the process to apply for the fellowship. Previous Congressional Science Fellows will also participate in the session.

Funded by GSA and by a grant from the U.S. Geological Survey, the GSA fellowship demonstrates the value of science-government interaction, and relates the need for informed involvement to the earth science community.



Washington State Convention and Trade Center. Photo courtesy of Seattle–King County Convention and Visitors Bureau.

Educational Programs for K–16 Teachers, Graduate Students, and Scientists

GSA invites K–16 earth science teachers, graduate students, and scientists to Seattle for an exciting program designed around dynamic earth science topics. Workshops and technical sessions especially designed by and for K–16 teachers are offered. Workshops are hands-on and inquiry-based. Teachers are also encouraged to attend other technical program sessions, as well as field trips, and to browse in the exhibits area.

The preregistration fee for K–12 teachers is $25. The on-site registration fee is $35. Appropriate ID is necessary. Preregistration for field trips and limited-enrollment events is required. For registration materials and additional information, contact the Educational Programs Department, GSA headquarters; or Terry Swanson, Dept. of Geological Sciences, MS AJ-20, University of Washington, Seattle, WA 98195.

Detailed information can be found in this announcement as indicated.

Field Trips

(K–12 teachers are encouraged to attend.)

Earth, Water, Trees, and Fish: Geomorphology and Land-Use Problems in the Forested Mountains of the Pacific Northwest
Friday, October 21 through Sunday, October 23. See page 158.

Mount Rainier, A Decade Volcano
Saturday, October 22 and Sunday, October 23. See page 158.

Geoarchaeology of Sites on San Juan Island, Washington
Saturday, October 22. See page 158.

Geoscience Day Field Trip
Wednesday, October 26.
This field trip, sponsored by the GSA Committee on Minorities and Women in the Geosciences, will explore the environmental geology of the Seattle area. Participation is by invitation only. For information: Wes Ward, U.S. Geological Survey, MS 9540, 2255 N. Gemini Drive, Flagstaff, AZ 86001.

Engineering Geology of Seattle and Vicinity
Friday, October 28 and Saturday, October 29. See page 159.

Workshops

Joint Education Initiative (JEI) Workshop
Saturday, October 22 and Sunday, October 23. See page 166.

Solar Power Play
Saturday, October 22, 8:00 a.m. to 12:00 noon. See page 166.

Effective Teaching: A Workshop for Graduate Students, Assistant Professors, and Anyone Else Interested in Becoming a Better Teacher
Saturday, October 22, 8:00 a.m. to 5:00 p.m. See page 166.

Fairly Simple Exercises in Geology Designed for Teachers with Little or No Geology Background
Saturday, October 22, 8:00 a.m. to 5:00 p.m. See page 166.

Seismic Sleuths: An Earthquake Curriculum for Grades 7–12
Saturday, October 22, 1:00 p.m. to 5:00 p.m. See page 167.

Computer Applications in Undergraduate Geoscience Courses for the Macintosh
Sunday, October 23, 8:00 a.m. to 5:00 p.m. See page 162.

Teaching Introductory Earth Systems for Non–Science Majors: An Interactive Approach
Sunday, October 23, 8:00 a.m. to 5:00 p.m. See page 164.

Developing Good Multiple-Choice Test Questions
Sunday, October 23, 9:00 a.m. to 1:00 p.m. See page 167.

Earth Science Information "Share-A-Thon" for K–16 Educators
Sunday, October 23, 4:00 p.m. to 6:00 p.m.; Washington State Convention and Trade Center.
You enjoyed it so much in 1993 that we've decided to offer it again in Seattle! The share-a-thon is designed to promote the sharing of teacher-developed earth science materials and ideas with other educators. Teachers are invited to present earth science activities that they have successfully used in the classroom. Presenters will be stationed so that participants can circulate freely. Each station will have explanatory materials available. *Registration required only for presenters.* To be a presenter, please check the appropriate box on the GSA Registration Form in this issue.

Preparing Successful Grant Proposals to Fund Curriculum Innovation in the Geosciences
Tuesday, October 25, 1:30 p.m. to 5:00 p.m. See page 167.

Symposia and Theme Sessions (See Technical Program)

Symposia and Theme Sessions are subject to scheduling by the Joint Technical Program Committee in August. Consequently, days and times may change. See the September *GSA Today* for the final technical program schedule.

Recent Advances in Geoscience Education—The Leading Edge of Undergraduate Instruction and Research
See Invited Papers, Symposium S22 page 153.

The Geological Profession's Response to National Priorities in Science Education
See Invited Papers, Symposium S24 page 153.

The Juneau Icefield: A Half Century of Geoscience Education, Research, and Professional Training in the Alpine and Glacial Environment
See Volunteered Papers, Theme Topic T25 page 155.

Learning in Small Groups: Using Collaborative Activities To Teach Geology
See Volunteered Papers, Theme Topic T28 page 155.

Teaching Paleontology
See Volunteered Papers, Theme Topic T41 page 155.

Educating Paleontologists for the Next Millennium: Evolution and Revolution
See Volunteered Papers, Theme Topic T42 page 155.

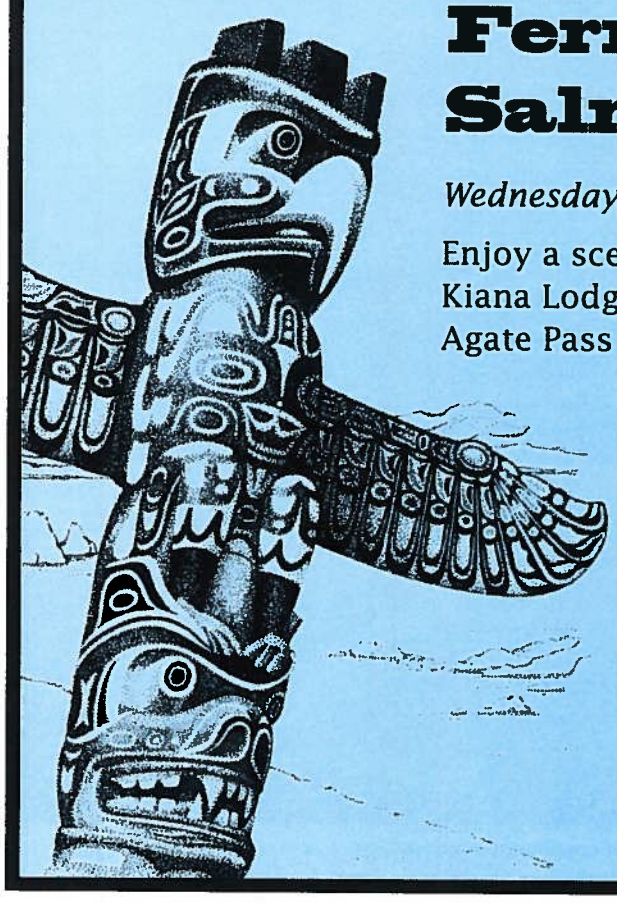
Teaching Structural Geology
See Volunteered Papers, Theme Topic T46 page 155.

Geologic Hazards Education for K–12 Students
See Volunteered Papers, Theme Topic T69 page 156.

Social Events (See Registration Form, page 178)

Geoscience Education Division Breakfast
Monday, October 24, 6:30 a.m. to 8:00 a.m.

NAGT Luncheon
Monday, October 24, 12:00 noon to 1:30 p.m.



Ferry Ride to Kiana Lodge Salmon Bake

Wednesday, October 26, 6:00 p.m. to 11:30 p.m.

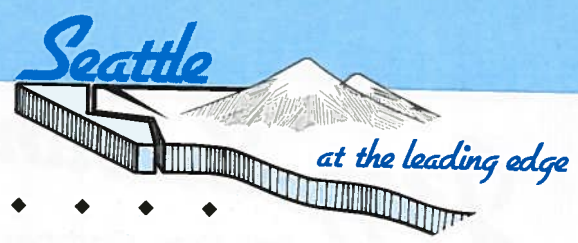
Enjoy a scenic 1¼ hour cruise across Puget Sound before arriving at Kiana Lodge, a beautiful private waterfront retreat on the banks of the Agate Pass Inlet.

Enjoy a delicious Northwest dinner of:
Steamed Clams and Clam Nectar Appetizer
Alder-Roasted Wild Salmon
Small Red New Potatoes
Coleslaw, Fresh Vegetable, Rolls and Butter
Raspberry Shortcake Dessert
Coffee, Tea

Cash Bar aboard ferry and at Kiana Lodge

Cost: $57 (includes round-trip transportation from the downtown hotels, private charter ferry, and dinner). Informal attire and flat shoes recommended.

DIVERSIONS



Guest Program

Seattle lies on Puget Sound in a spectacular setting between the Olympic and Cascade Mountain Ranges. The city experienced its first economic boom during the Alaska Gold Rush and has since grown into a major northwest port and commercial center, the home of Boeing, Microsoft, and the University of Washington. Within walking distance of the Convention Center, its compact downtown offers sightseeing and cultural opportunities. Highlights include the waterfront, historic district, museums, shops, restaurants, and endless outdoor activities. October's blend of autumnal sun and mild rain make this one of Seattle's most beautiful months of the year.

Guests are invited to visit the GSA Hospitality Room, located in the Aspen Room in the Sheraton Hotel. Your hosts will be providing a resource center to help you explore *your interests*. Abundant information on Seattle and surrounding areas will be available, as well as details on GSA tours and seminars. We will be serving light refreshments throughout the day, so please stop by. Remember to wear your GSA badge and to bring your gift coupon, so you can receive your registration gift.

Sunday	1:00 p.m. to 5:30 p.m.
Monday	8:00 a.m. to 4:30 p.m.
Tuesday	8:00 a.m. to 4:30 p.m.
Wednesday	8:00 a.m. to 4:30 p.m.
Thursday	8:00 a.m. to 1:00 p.m.

Guest Welcoming Reception

Sunday, October 23, 4:15 to 5:00 p.m.; Sheraton Seattle Hotel, Aspen Room.

Join us for a special reception to welcome you. Guest registrants, don't forget to bring the coupon enclosed in your registration packet for a complimentary glass of wine or soda. There will be a cash bar available as well. Plan to meet old and new friends in the Hospitality Room. *All* registrants are welcome.

Formal Tours

Tours will leave the Sheraton from the main lobby, Union Street exit. Reservations for all tours will be accepted on a first-come, first-served basis, so please register early. Space is limited and these trips will be popular, so be sure to preregister. Our tour operator requires a guarantee several days in advance, so don't wait until you arrive in Seattle to register for these trips. We hope you will join us.

Because many people will be arriving in Seattle early, we have planned two Sunday tours ideal for getting acquainted with Seattle. **All GSA meeting registrants are welcome to participate in any of the tours offered.**

Bird Watching
Sunday, October 23, 7:00 a.m. to 5:00 p.m.

Back by popular demand, this full-day birding tour of the Puget Sound area will give avid bird watchers a chance to add western species to their "life list." You will want to wear warm clothing and bring binoculars. A local expert will be your guide.

Cost: $30 (includes transportation, box lunch).

Victoria Day Tour (Unescorted)
Sunday, October 23, 7:00 a.m. to 10:00 p.m.
Tuesday, October 25, 7:00 a.m. to 10:00 p.m.

This tour is being offered twice so everyone can enjoy it. Visit the provincial capital of British Columbia, Canada, famed for its Victorian architecture, English flavor, superb anthropological museum, and beautiful protected harbor. Transportation to Vancouver Island is by the Victoria Clipper jet-propelled catamaran. Professional guides will provide you with a map, suggestions, and tips before seeing you off for the day on the clipper. You wil be on your own until that evening when a guide will meet you upon your return. Note: Proof of U.S. citizenship (passport, drivers license with a photo, or birth certificate) is required for all U.S. citizens including minors. Foreign nationals should check possible visa needs for entry into Canada.

Cost: $98 (includes transportation, boat fare).

Seattle City Highlights
Sunday, October 23, 1: 00 p.m. to 4:00 p.m.
Monday, October 24, 9:00 a.m. to 12:00 noon

Again, this tour is being offered twice so everyone can enjoy it. The tour will touch briefly on Seattle's most interesting highlights, beginning with historic Pioneer Square, and will include the International District, the University of Washington, the Government Locks, and residential areas. The tour will end with the famous Pike Place Market. Later you will feel comfortable visiting these places on your own. Use this overview to plan your week.

Cost: $20 (includes professional guide, transportation).

Snoqualmie Falls, Gilman Village, Boehm's Candy
Monday, October 24, 9:30 a.m. to 2:30 p.m.

A short drive to the Cascade Mountains will bring you to scenic Snoqualmie Falls. The next stop is Boehm's Candy Factory. Like no other, Boehm's is an authentic Swiss chalet built by Julius Boehm, and produces exquisite hand-dipped chocolates. The visit also includes a tour of his European art collection. Our last stop will be Gilman Village in Issaquah, nestled in the foothills of the Cascade Mountains. The Village is a restored business district filled with more than 30 early 1900s structures turned into unique specialty shops. Enjoy lunch on your own at one of the charming restaurants.

Cost: $22 (includes professional guide, transportation).

Locks and Seattle Harbor
Tuesday, October 25, 11:30 a.m. to 2:45 p.m.

Sailing through the Hiram Chittenden Locks, you are where saltwater Puget Sound meets fresh-water Lake Union. You will learn about the area history and marine activity, and get an underwater view of the salmon ladder for the seasonal migration. These locks, built early in the century, were as important for Puget Sound as the Panama Canal was for the Western Hemisphere. If the weather cooperates, the scenery surrounding Puget Sound will be spectacular.

Cost: $39 (includes professional guide, harbor and locks cruise, transportation).

Northwest Winery Tour with Lunch at Columbia Winery
Wednesday, October 26, 10:00 a.m. to 3:30 p.m.

Situated on the same latitude as the French wine country, Washington State has an expanding wine industry that is winning prestigious awards throughout the world. We will tour wine cellars, view the wine-making process, then sample wines at two award-winning wineries. The 30-minute ride to the Northwest wine country takes us over one of Seattle's two floating bridges. Columbia Winery will be the first stop, where we will enjoy a tour and tasting, followed by a delicious lunch. Then we will visit Washington's oldest and most famous winery, Chateau Ste. Michelle.

Cost: $41 (includes professional guide, transportation, winery tours, lunch).

Informal Tours

A city with so much to offer makes choices difficult! An attractive feature of Seattle is that it is easy to get around on your own. Many destinations are within a 15-minute walk, and city bus service in the immediate area is free of charge until 7:00 p.m. daily. For those wishing to visit some of Seattle's highlights with a small group, we have scheduled the following informal tours ranging in length from about two to six hours. *You are responsible for all expenses.* All destinations can be reached on foot, or by bus or taxi. Sign-up sheets will be posted in the Hospitality Room. You can, of course, visit any of these destinations on your own at other times.

Monday, October 24

10:00 a.m. — Combine **Pike Place Market,** a colorful display of fresh fish, local fruits and vegetables, and handicrafts with **Seattle Aquarium,** a spectacular exhibit of local marine life.

10:15 a.m. — **Museum of Flight**—View 50 historical planes suspended high above you.

Tuesday, October 25

7:30 a.m. — **Boeing Plant at Everett**—Home of the Boeing 747 and the new Boeing 777.

8:30 a.m. — **Bainbridge Island Ferry Ride**—A scenic trip across Puget Sound and Seattle's greatest tourist bargain. Stroll through Winslow and catch the return ferry or return directly. On the return, browse through **Ye Olde Curiosity Shop & Museum,** a gift shop and a landmark of the Pacific Northwest.

Wednesday, October 26

9:45 a.m. — **Seattle Center**—The legacy of the 1962 Seattle World's Fair. The principal attractions are the **Pacific Science Center** and Seattle's landmark, the **Space Needle.**

10:15 a.m. — **Seattle Art Museum**—Internationally known for its Asian, African, Native American, and modern Pacific Northwest art.

Thursday, October 27

9:30 a.m. — **Pioneer Square**—Seattle's oldest area, rebuilt after the devastating fire of 1889. It now features turn-of-the-century architecture, art galleries, and specialty shops. Take the **Underground Tour** at 11:00 a.m. and then go on to the **International District,** where you will see the amazing Japanese supermarket, Uwajimaya.

Jazz Evening

Saturday, October 22, 6:30–9:00 p.m.

Sheraton Hotel, Cirrus Room on the 35th Floor

Looking for something to do your first night in town? Drop in to meet with friends for a social evening of light jazz with a view.

The Chuck Metcalf Jazz Quintet

Cost: $7. Cash bar provided.

Seminars

All GSA meeting attendees—guest, professional, and student registrants—are invited to attend the following seminars. There is no fee. All seminars will be at the Sheraton Hotel. Stop by the Hospitality Room to find the exact room location.

Welcome to Seattle
Monday, October 24, 8:15 a.m. to 8:40 a.m.
Start the week with an insightful introduction to Seattle, from recommended art galleries to insiders' tips on shopping. Join us for an overview and learn about the exciting tours and seminars GSA has planned for you. Bring your questions. Consider taking the Highlights of Seattle tour immediately following this talk.

Old Growth Forest
Monday, October 24, 3:00 p.m. to 4:00 p.m.
Learn about the conflict between environmental preservation and the logging industry in the Pacific Northwest. This emotional issue has split northwesterners into two intractable camps.

Worldwide Change in the Family and Its Social Impact on Life at the End of the Millennium
Tuesday, October 25, 3:00 p.m. to 4:00 p.m.
Professor Diane Lye of the University of Washington will discuss the effects of the changing family structure, the unavoidable impact of these changes on everyday life, and how you can best meet the personal challenges.

Earthquakes and Faults of the Pacific Northwest
Wednesday, October 26, 8:30 a.m. to 9:30 a.m.
Learn about the recent discoveries of prehistoric faulting and seismic activity in western Washington. The speaker, Brian Atwater, a geologist with the U.S. Geological Survey, has found exciting new evidence for large earthquakes during the past several thousand years.

Tourist Information

Seattle Convention and Visitors Bureau
520 Pike Street, Suite 1300
Seattle, WA 98101
(206) 461-5840

Washington State Tourism Division
General Administration Building
Room G-3, AX-13
Olympia, WA 98504
(206) 586-2102

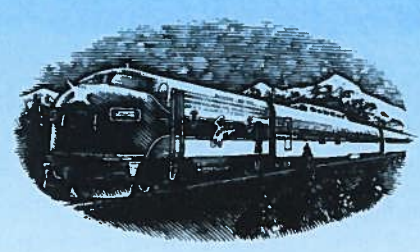
Spirit of Washington Dinner Train

Saturday, October 22, 5:45 p.m. to 11:00 p.m.

Departing from the Renton depot, you will travel 45 miles round-trip aboard vintage railroad cars for this scenic 3½-hour escape into the beautiful countryside. En route to Columbia Winery, enjoy a gourmet three-course Northwest dinner.

Your choice of :
Roasted Prime Rib,
Baked Cherry Smoked Salmon,
Oven Roasted Chicken, or
Roasted Ellensburg Lamb

Cash Bar.
Award-winning wines available.



At Columbia Winery, you will take a tour before visiting the tasting room and gift shop. On the return trip, complete the evening with fresh coffee and a tantalizing dessert tray selection.

Cost: $68 (includes round-trip transportation from the Sheraton Hotel, train ride, dinner, and winery tour).

Special Events

Welcoming Party
Sunday, October 23, 5:00 p.m. to 8:00 p.m.; Washington State Convention and Trade Center.
Come and join your colleagues Sunday evening for the celebration and grand opening of the exhibit hall that kick off the 1994 GSA Annual Meeting! This is the time to meet with new and old friends to plan the next four days of meeting activities. Relax and enjoy the music while viewing the exhibits, eating, and drinking your favorite beverage.

Fun Run
Monday, October 24, 7:00 a.m. to 8:00 a.m.; Sheraton Seattle Hotel.
An informal fun run in Seattle, the running capital of the west. Meet at the Sheraton lobby for a jog through Pike Place Market and Seattle's Waterfront Park. Total distance will be approximately 6 miles. Everyone welcome! Registration not required. This free event does not include t-shirts, snacks, or professional timing.

GSA Presidential Address and Awards Ceremony
Monday, October 24, 5:30 p.m. to 7:30 p.m.; Washington State Convention and Trade Center.
The GSA Presidential Address and Awards Ceremonies will begin with President William R. Dickinson's address, *The Times Are Always Changing: The Holocene Saga*. The GSA Awards Ceremony will follow immediately.

Penrose Medal	Luna B. Leopold
Arthur L. Day Medal	David Walker
Young Scientist Award (Donath Medal)	An Yin
GSA Distinguished Service Award	F. Michael Wahl

Recognition will also be given to newly elected Honorary Fellows François Ellenberger, Francisco Hervé, and Ali Mehmet Celal Sengör.

Alumni Receptions
Monday, October 24, 7:00 p.m. to 9:30 p.m.; Sheraton Seattle Hotel.
Everyone knows someone at the popular Alumni Receptions. Join your former classmates for an evening of memories and fun. More than 80 colleges and universities will be represented. If you would like your university to hold a reception or be part of the Group Alumni Party, have your department chair contact Vanessa George, Events Coordinator, GSA headquarters.

T.A.C. (Thursday Afternoon Club)
Thursday, October 27, 3:30 p.m. to 5:00 p.m.; Washington State Convention and Trade Center.
T.A.C. is for the meeting survivors—for the diehards who last to the end! Come to the Poster Session area and help us say thank you and farewell to Seattle. Beer will be available.

Awards Luncheons and Other Ticketed Meal Functions
Associated societies and GSA divisions invite their members and other interested guests to join them for their annual meal functions, special addresses, and awards ceremonies. You do not need to be registered for the meeting; everyone is welcome. Please use the Registration Form in this issue to order tickets, except for the Association of American State Geologists Breakfast. Location and time will appear on the ticket and in the *Annual Meeting Program*.

Geoscience Education Division Breakfast	Monday, October 24
Geochemical Society Lunch	Monday, October 24
National Association of Geology Teachers Lunch	Monday, October 24
Association for Women Geoscientists Breakfast	Tuesday, October 25
Association of American State Geologists Breakfast	Tuesday, October 25
Geoscience Information Society Lunch	Tuesday, October 25
Hydrogeology Division Lunch	Tuesday, October 25
Mineralogical Society of America Lunch	Tuesday, October 25
Paleontological Society Lunch	Tuesday, October 25
Society of Economic Geologists Lunch	Tuesday, October 25
Coal Geology Division Lunch	Wednesday, October 26
Engineering Geology Division Lunch	Wednesday, October 26
History of Geology Division Lunch	Wednesday, October 26

Latin Cuisine at La Gaviota and Seattle Repertory Theatre

Saturday, October 22, 6:00 to 10:30 p.m.

Enjoy Latin cuisine (paella!) prior to a spectacular performance by a flagship professional theater, which earned a Tony Award in 1990 for outstanding theater. The fall schedule is not available yet, but possible performances include *Dancing at Lughnasa*, *The Sisters Rosensweig*, or *Ain't Misbehavin'*. Although GSA is handling registration on the registration form, this event has been organized by Nancy Adams of Travel to Music. You will receive further information from Nancy after you register. Transportation will not be provided; however, the theater is only a short cab ride. Seats will be assigned in the order received.

Cost: $65. Limit: 50.

Getting To Seattle

By Air. Seattle-Tacoma (SeaTac) International Airport is located 18 miles from the Washington State Convention and Trade Center. It is served by most major airlines. GSA's official travel agent, Cain Travel Group, has negotiated discounted rates with the major Seattle carriers. Cain can also assist you with the special discounts and coupon offerings in your area. **Please see Cain's ad on this page.** Call today for the best availability.

To make a reservation, call Cain Travel and identify yourself as a GSA traveler. Tickets can be paid for by check (payable to Cain Travel), or by major credit card, or invoiced to your company. Final payment must reach Cain Travel no later than 10 days prior to departure to allow for mailing time. All tickets will be mailed via certified mail upon receipt of payment unless requested otherwise. After tickets are issued, you are protected from fare *increases;* if a fare *decreases,* call Cain Travel for adjustment.

As with all airline reservations, please use caution regarding change and cancellation penalties that accompany low-fare tickets. This *especially* applies to field trip participants whose trips may be canceled after the September 16 preregistration deadline. Be sure you understand the restrictions on the type of ticket you purchase.

Cain Travel will have an on-site Customer Service Desk at the Washington State Convention and Trade Center during the meeting.

Make your Seattle reservations through Cain Travel Group and become eligible to win one round-trip ticket on United Airlines anywhere within the contiguous United States. The drawing will be held November 15, 1994. Cain Travel Group, GSA's official travel agent, guarantees the lowest possible fares for the Seattle Annual Meeting.

By Car. Interstate 5 is Seattle's north-south link with Pacific coast cities from Canada to Mexico. Interstate 90 runs east from Seattle to midwestern and eastern United States cities. There is ample, relatively inexpensive parking at the Convention Center.

By Bus, Train. Greyhound Bus Lines connect Seattle with major cities in the United States and Canada and south to Tijuana, Mexico. For Greyhound Bus information, call 1-800-231-2222. The METRO (Municipality of Metropolitan Seattle) is a county-wide bus system with a ride-free zone in Seattle's downtown district. AMTRAK serves Seattle, providing passenger service from major United States locations. For AMTRAK information, call 1-800-872-7245.

Student Travel Grants

The GSA Foundation has awarded matching grants up to a total of $3500 each to the six GSA sections. The money, when combined with equal funds from the Sections, is used to assist GSA Student Associates traveling to Section Meetings and to the Annual Meeting in Seattle. For applications, contact your Section Secretary:

Cordilleran	Bruce Blackerby, (209) 278-2955
Rocky Mountain	Ken Kolm, (303) 273-3932
North-Central	George Hallberg, (319) 335-4500
South-Central	Rena Bonem, (817) 755-2361
Northeastern	Ken Weaver, (410) 554-5532
Southeastern	Mike Neilson, (205) 934-5102

Getting To Your Hotel

Seattle-Tacoma (SeaTac) International Airport is located approximately 18 miles or 30 minutes from the Washington State Convention and Trade Center. Your options for getting to and from downtown include:

Gray Line Airport Express. This bus service is the most economical and convenient for getting to and from downtown. Gray Line operates from 5:00 a.m. to 12:00 midnight daily. Fares are $12 round trip or $7 one way. Tickets can be purchased at the Gray Line booths located at the north and south ends of the baggage claim area in the main terminal, or from the driver. Buses depart from outside the baggage claim level every 30 minutes. Look for their buses and minivans outside the baggage claim level. Gray Line picks up from all major downtown hotels. Your hotel bell captain has information about pick-up and departure times. No reservation is necessary. For information call (206) 626-6088.

Taxicabs. Several taxicab companies serve the city of Seattle. Taxicab service to and from the airport and within the city is easy to obtain and a convenient way to travel. Taxicab stands are located throughout the city, or you can hail a cab on the major streets. Taxicabs cost a minimum of $1.50 and $0.20 for each 1/7 mile thereafter, plus all toll fees and an additional $1 for cabs originating at SeaTac Airport. Approximate cost from the airport to downtown is $30.

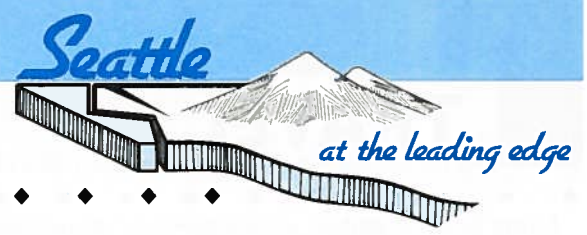
Car Rental. Alamo is the official car rental agency for the meeting. Identify yourself as a GSA delegate by giving Group ID number 85204 and Plan Code GR to get guaranteed, discounted, daily/weekly rates as follows: economy $20/$99; compact $23/$109; midsize $26/$139; full-size $34/$159; luxury $39/$199. An additional convention discount may be available by having your Alamo agent check Rate Code 7G. Rates include unlimited mileage. An Alamo rental counter is located on the baggage claim level at SeaTac International Airport. Look for the blue and yellow Alamo vans. Advance reservations are recommended. Call Alamo at 1-800-732-3232.

Getting Around in Seattle

Although hilly, Seattle is an excellent walking city with a compact downtown and convention area. Take advantage of the reliable county bus system, which offers a free ride zone in the central business district.

GSA will be providing an evening shuttle service to cover activities after 5:00 p.m. It is easy to get around downtown on foot, but you should plan for a vigorous walk from downtown hotels to the **Washington State Convention and Trade Center.** Refer to the hotel descriptions and the map for exact distances. If you have special needs to accommodate a disability, please contact Becky Martin, GSA headquarters.

LODGING



Downtown Seattle offers a wonderful convention setting, and most of the GSA hotels are within walking distance of the Washington State Convention and Trade Center. GSA has booked rooms at 13 properties—six within four blocks of the Convention Center and all, except The Edgewater, within one mile of the Convention Center. The properties include a cross section of lodging that should suit a variety of tastes and budgets.

Activities will take place at the Washington State Convention and Trade Center, as well as GSA's headquarters hotel, the **Sheraton Seattle Hotel & Towers,** and the Stouffer Madison Hotel. The Sheraton is a first-class property within a five-minute walk of the Convention Center. No other hotel in GSA's block matches the Sheraton for accommodations and service.

The key to getting your first choice is to make your reservation **early.** Because October is one of Seattle's busiest months for tourism, we highly recommend that GSA meeting attendees get their reservations in *as early as possible.* Convention hotels will fill quickly. All hotel reservations must be processed by the Seattle Housing Bureau to get the special discounted GSA rate.

To Make Your Hotel Reservation

Fill out the Official Housing Request Form and mail or fax it to the Seattle Housing Bureau at the address shown on the form. Reservations will *not* be accepted by phone. All reservations must be RECEIVED BY FRIDAY, SEPTEMBER 23. From the September 23 deadline until September 30, the Housing Bureau will continue to accept reservations by mail or fax, *but rooms will be on a space-available basis only.* Most properties will be full at this time; therefore, it is important that you make your reservation early. The Housing Bureau will continue to process reservations until September 30.

AFTER Friday, September 30, you should contact the GSA hotel of your choice directly, or you may contact the Housing Coordinator at GSA headquarters for information on hotel availability. Note that most hotels **will be filled** by September 23, and hotels will only be able to offer the special GSA rate on an as-available basis. *Under no circumstance should they be offering a room at a higher rate.*

If you are interested in a suite, please call the hotel of your choice directly for *information.* When you have selected the suite you would like by type and rate, complete the Housing Form and mail it to the Housing Bureau with the suite type and rate written in. Please disregard this procedure for the Plaza Park Suites, since all of their rooms are suites and do not vary. Just complete the Housing Form normally and send it to the Housing Bureau. Suites are also handled on a space-available basis. If a hotel block is full, suites will not be available through the Housing Bureau.

Assignment

Hotel rooms will be assigned on a first-come, first-served basis as requests are received by the Housing Bureau. Please list your first four hotel choices in order of your preference. If the hotels you have chosen are sold out, the Housing Bureau will review your selection preference on the Housing Form. Be sure to mark either (1) proximity to convention center or (2) comparable room rate. You will receive an acknowledgment from the Housing Bureau with your hotel assignment. Check all information carefully for accuracy, including arrival date, departure date, and guarantee information. If you do not receive an acknowledgment within three weeks, contact the Housing Bureau by fax or mail to check the status of your reservation.

Within two weeks from the time you receive the Housing Bureau acknowledgment, you should receive a confirmation from your hotel. This is notice that the hotel has received your reservation from the Housing Bureau and that the reservation has been entered into their system. Please check the confirmation carefully.

Room Deposits and Guarantees

Reservations must be guaranteed. A first night's room deposit will guarantee your reservation, assuring you that no matter what time you arrive on your scheduled arrival day, your room will be held until 6:00 a.m. the following morning.

Deposits can be made by (1) providing credit card information on the Housing Form, or (2) sending payment directly to the hotel once you have received your confirmation. The deposit amount should be the cost of one night's stay plus tax at your assigned hotel. Note that the Housing Bureau will accept ONLY credit cards, **not** checks or cash. When making payment directly to the hotel, be sure to give your confirmed reservation number.

Changes and Cancellations

Changes and cancellations BEFORE Friday, September 30, should be communicated to the Housing Bureau by fax, 206-461-5853, or mail. Please supply your hotel reservation confirmation number. For all last-minute inquiries, cancellations, changes or problems, contact your assigned hotel, or call the Housing Coordinator at GSA headquarters.

AFTER September 30, you should contact the hotel directly with any changes. Please note that a cancellation notice must be received by the hotel AT LEAST 48 hours in advance to receive a refund on your first night's room deposit. The hotel has the right to bill you for one night's housing if you fail to properly cancel a guaranteed reservation. Please show courtesy as a professional by notifying the hotel if your plans change.

Please don't be a No Show. If you must make changes, please call the hotel at least 48 hours before your scheduled arrival. This consideration helps us all.

Special Needs

Barrier-free hotel rooms will be made available to GSA registrants. Those with special needs should specify this on the Housing Form. After inspecting all GSA properties, we recommend that disabled registrants consider staying at the Sheraton, Seattle West Coast Plaza Park Suites, or the Seattle Hilton. These properties are reasonably close to the Washington State Convention and Trade Center. If you have questions, please contact Becky Martin, GSA headquarters.

Student Housing

Just outside of the downtown area, reasonably priced rooms have been reserved at four properties. Walking to Washington State Convention and Trade Center will take approximately 20–25 minutes. For evenings, the GSA Shuttle will stop near all of these properties *except* for the YMCA. **Make your reservation for all of these properties, *except* the YMCA, with the Seattle Housing Bureau on the Housing Request Form. To make reservations at the YMCA, call direct.**

Quality Inn City Center — $49 (1–4 people) — 35 rooms blocked
2224 Eighth Avenue
Seattle, WA 98121
(206) 624-6820
Complimentary continental breakfast, free covered parking, free local calls.

Days Inn Town Center — $58 (1–4 people) — 30 rooms blocked
2205 Seventh Avenue
Seattle, WA 98121
(206) 448-3434
Free parking, Greenhouse Cafe and Lounge in the hotel for meals.

Ramada Inn Downtown Seattle — $72 (1–4 people) — 50 rooms blocked
2200 Fifth Avenue
Seattle, WA 98121
(206) 441-9785
Parking $9.50 for 24 hours with in and out privileges, coffee makers in all rooms, Ramada's Slipknot Cafe serves breakfast, lunch, and dinner.

Travelodge, Downtown — $49 (1–4 people) — 30 rooms blocked
2213 Eighth Avenue
Seattle, WA 98121
(206) 624-6300
Free parking, free local calls, coffee makers in all rooms, 24-hour restaurant next door.

Seattle Downtown YMCA — Single $34–$36, Double $38–$41
909 Fourth Avenue — Triple $43–$45, Quad Not Available
Seattle, WA 98104 — (rates above include tax)
(206) 382-5000
Common bathroom facilities, full use of athletic facilities.

Alternative Lodging

Beating the high cost of lodging is a priority for GSA staff and the 1994 Annual Meeting Committee.

- Check your library copy of the *Hotel and Motel Redbook,* which lists metro properties. Because of the hundreds of properties in the area, GSA cannot provide a complete list.
- Call 1-800-555-1212 or check the Yellow Pages to learn the 800 number for your favorite hotel chains, such as Super 8 Motel or Comfort Inn, which have properties outside the downtown area. You will need to provide your own transportation.
- After September 30, the Seattle Housing Bureau offers a Seattle Hotel Hotline, 1-800-535-7071, 8:30 a.m. to 5:00 p.m. Pacific Standard Time, Monday through Friday. They will do their best to help you find what you need. GSA convention hotels will most likely be full.

GSA Convention Rates

	Single	Double	Triple	Quad
Sheraton Seattle Hotel & Towers	$128	$142	$162	$182
Stouffer Madison	$122	$132	n/a	n/a
Pacific Plaza	$ 69	$ 69	n/a	n/a
Holiday Inn Crowne Plaza	$112	$112	$112	$112
Seattle Hilton	$103	$113	$123	$133
Plaza Park Suites	$112	$122	$132	$142
The Roosevelt	$ 99	$ 99	$ 99	$ 99
WestCoast Camlin	$ 66	$ 76	$ 86	$ 96
Mayflower Park	$ 94	$ 94	n/a	n/a
WestCoast Vance	$ 68	$ 68	$ 78	$ 88
Sixth Avenue Inn	$ 68	$ 68	$ 80	$ 92
The Warwick	$ 89	$ 89	$104	$119
Edgewater—city view/water view	$108/123	$108/123	$108/123	$108/123

	Single	Double	Triple	Quad
Student Housing				
Quality Inn City Center	$ 49	$ 49	$ 49	$ 49
Days Inn Town Center	$ 58	$ 58	$ 58	$ 58
Ramada Inn	$ 72	$ 72	$ 72	$ 72
Travelodge, Downtown	$ 49	$ 49	$ 49	$ 49
Seattle Downtown YMCA	$34–$36	$38–$41	$43–$45	n/a

HOUSING FORM

Seattle
at the leading edge

GSA Annual Meeting, October 24–27, 1994

Complete this form and mail *or* fax to:

Mail to: GSA HOUSING BUREAU
520 Pike Street, Suite 1300
Seattle, WA 98101

or

Fax to: 1-206-461-5853

Housing Deadline: September 23

Do not mail *and* fax this form as it may result in a duplicate reservation. Please read all hotel information prior to filling out this form. Reservations are processed on a first-come, first-served basis. If more than one form is required, this form may be photocopied. Confirmations will be sent by mail only. Be sure to keep a copy for your records.

Name of Occupant

First Name M.I. Last Name

Company Name

Street Address or P.O. Box Number

City State U.S. ZIP Code

Country Area Code Daytime Phone Number

Arrival Date:_____ Time: _____a.m./p.m. **Departure Date**: _____ Time:_____a.m./p.m.

Type of Accommodation: (Please check required room type)

☐ **Single** 1 person, 1 bed
☐ **Double** 2 people, 1 bed
☐ **Double/Double** 2 people, 2 beds
☐ **Triple** 3 people, 2 beds
☐ **Quad** 4 people, 2 beds
☐ **Suite** 1 or 2 bedrooms (please circle one)

Special Needs: ☐ Non-smoking Room
☐ Special Room Requirements _____
☐ Suite Type and Rate _____

Hotel Preference:

1. _____ 2. _____ 3. _____
4. _____ 5. _____ 6. _____

If all six requested hotels are unavailable, please process this reservation form according to:
☐ Comparable Room Rate ☐ Proximity to Convention Center

Room Reservation Guarantee:

All reservations must be guaranteed. You may guarantee your reservation by providing credit card information below, or by mailing a check directly to your assigned hotel after you have received your housing acknowledgment.

Name as it appears on card _____

Card Type _____ Card No. _____ Exp. Date _____

Authorized Signature _____

Roommates: (Name all other occupants and give their addresses)

Name _____ Address _____

Name _____ Address _____

Name _____ Address _____

Do NOT send checks or cash with this form.

GSA Hotels

Please make your reservation with the Seattle Housing Bureau.
Note: All rooms are subject to a 15.2% hotel and sales tax.

1 Sheraton Seattle Hotel & Towers (Headquarters)

1400 Sixth Avenue, Seattle, WA 98101; (206) 621-9000
1/2 block from the Convention Center
Single $128, Double $142 (550-room block)

Within minutes of the Convention Center, the Sheraton could not be more convenient. The building's triangular shape gives each room a sweeping view of the city, Puget Sound, or the mountains. The hotel boasts the largest permanent collection of original contemporary Northwest artwork in the Pacific Northwest, with more than 2000 beautifully placed pieces throughout the hotel. You can also expect excellent Sheraton service, convenience, and comfort. For a casual breakfast, lunch, or dinner, try Banner's restaurant. Or enjoy the fine Northwest cuisine and fresh seafood in award-winning Fuller's. Andiamo Presto is another option, with dine-in or take-out Italian deli selections. The hotel offers two additional lounges. Complete with a view, the health club on the 35th floor includes a pool, sauna, whirlpool, exercise equipment including a treadmill, stair climber, rowing machine, and bikes. Self and valet parking are available for $13 and $15 respectively. For an added touch, a Sheraton Tower Room (on floors 32 to 34) is available for $165 single and $185 double. The Tower Club offers separate check-in, a private lounge, concierge, free continental breakfast daily, and other special services. Check-in time is 3:00 p.m. Check-out time is 12:00 noon.

2 Stouffer Madison Hotel

515 Madison Street, Seattle, WA 98109; (206) 583-0300
6 blocks from the Convention Center
Single $122, Double $132 (325-room block)

This AAA four-diamond deluxe high-rise hotel is Seattle's newest luxury hotel, offering beautiful views of Elliott Bay. As with all Stouffer hotels, enjoy complimentary coffee and a newspaper with your wake-up call. Dine on northern Italian cuisine at Prego, or for more casual fare, try Maxwell's Cafe, open for breakfast, lunch, and dinner. In the evening, visit the Lobby Court Lounge. Maintain a healthy life style in the hotel's health club, which includes a pool, jacuzzi, and exercise equipment. Within walking distance to Pike Place Market. Covered self parking is $12. Check-in time is 3:00 p.m. Check-out time is 1:00 p.m.

3 Pacific Plaza

400 Spring Street, Seattle, WA 98104; (206) 623-3900
3 blocks from the Convention Center
Single $69, Double $69 (100-room block)

A classic value in downtown Seattle, with a great location and reasonable price. Built in 1928, the hotel has a European flavor with updated decor and furnishings. They offer a complimentary continental breakfast daily. Off the hotel lobby is a casual restaurant serving lunch, dinner, and cocktails. The Pacific Plaza considers itself one of Seattle's "best little secrets." Self parking is $9 per day with in and out privileges. Check-in time is 4:00 p.m. Check-out time is 11:00 a.m.

Downtown Seattle

4 Holiday Inn Crowne Plaza
1113 Sixth Avenue, Seattle, WA 98101; (206) 424-1980
3 blocks from the Convention Center
Single $112, Double $112 (150-room block)

With only 15 rooms per floor, you are assured of maximum privacy in this modern 34-story hotel. All rooms have panoramic views and in-room movies. Other services include a health club with jacuzzi, sauna, and exercise equipment; the forget-something program; room service 6:00 a.m. to 12:00 midnight; and lobby concierge. The hotel restaurant, Seneca Square Cafe, offers American cuisine for breakfast, lunch, and dinner. There is also the Parkside Lounge for relaxing. Valet parking is available for $13 per day. Check-in time is 4:00 p.m. Check-out time is 12:00 noon.

5 Seattle Hilton
Sixth and University, Seattle, WA 98101; (206) 624-0500
2 blocks from the Convention Center
Single $103, Double $113 (150-room block)

Nine stories above the street, the Hilton lobby is the welcome beginning to 29 floors of spectacular views. The decor throughout is modern and oriental. Macaulay's Restaurant offers friendly casual service for breakfast and lunch beginning at 6:00 a.m. daily. For dinner you will want to visit The Top of the Hilton, the hotel's rooftop lounge and dining room featuring Northwest cuisine. The hotel has easy access to shopping in Rainier Square via an underground concourse. This concourse also will take you to the Convention Center. There is ample self parking at $9.50 per day. Check-in time is 3:00 p.m. Check-out time is 12:00 noon.

6 Plaza Park Suites
1011 Pike Street, Seattle, WA 98101; (206) 682-8282
1 block from the Convention Center
Single $112, Double $122 (75-room block)

Downtown Seattle's only all-suite hotel features fully-equipped kitchens and a spacious living and dining area. Each suite is serviced daily by housekeeping. You will feel at home enjoying the complimentary full continental breakfast served in their comfortable hospitality lounge, with a library and big-screen televison. After a long day, stop by the exercise room with stair climber, Lifecycle, and Universal gym, or visit the heated outdoor pool and jacuzzi. This new hotel also offers free in-town shuttle service, laundry, and grocery shopping service. Secured valet parking for $9 per day. Check-in time is 2:00 p.m. Check-out time is 12:00 noon.

7 The Roosevelt
1531 Seventh Avenue, Seattle, WA 98101; (206) 621-1200
2 blocks from the Convention Center
Single $99, Double $99 (100-room block)

While the building's facade and main interior reflect the hotel's grand past, the newly renovated guest rooms have all the modern conveniences. After a full day, stop by the fitness center, complete with a Universal gym. Be sure to visit the lobby to listen to jazz piano played nightly. Sample the Northwest cuisine in Von's Grand City Cafe, a local favorite, with friendly service and reasonable prices. Secured valet parking is available for $9.75 per day. Check-in time is 2:00 p.m. Check-out time is 12:00 noon.

8 WestCoast Camlin Hotel
1619 Ninth Avenue, Seattle, WA 98101; (206) 682-0100
2 blocks from the Convention Center
Single $66, Double $76 (100-room block)

An older European-style hotel offering tastefully renovated rooms, many larger than average. Dining is available at Seattle's first roof-top restaurant, The Cloud Room. Located on the eleventh floor, The Cloud Room features Northwest cuisine, while providing a spectacular view of downtown. Enjoy live music at the piano bar in the lounge. Self parking is $9 per day. Check-in time is 2:00 p.m. Check-out time is 12:00 noon.

9 Mayflower Park Hotel
405 Olive Way, Seattle, WA 98101; (206) 623-8700
5 blocks from the Convention Center
Single $94 Double $94 (125-room block)

Built in 1927, the hotel sparkles with crystal chandeliers and gleaming brass. High ceilings, tall windows, and fresh flowers contribute to the feeling of Old World charm and the ambiance of a small European-style hotel. Fine dining is available in the award-winning restaurant Clippers. Oliver's provides a quiet setting for casual breakfast, lunch, or cocktails. It's located just beside the Westlake Center giving you direct access to fine shopping, restaurants, the Monorail Terminal, and Underground bus tunnel. Valet parking is $8. Check-in time is 3:00 p.m. Check-out time is 12:00 noon.

10 WestCoast Vance Hotel
620 Stewart Street, Seattle, WA 98101; (206) 441-4200
4 blocks from the Convention Center
Single $68, Double $68 (100-room block)

Built in the 1920s, this restored hotel has preserved much of the lobby's original rich wood accents, stained glass windows, and marble details. Guest rooms are comfortable, and each one is slightly different. For breakfast, lunch, or dinner you will want to drop by Salute in Cittá Ristorante for tantalizing southern Italian specialties in a casual atmosphere. The hotel offers complimentary coffee service in the lobby 5:00 a.m. to 9:00 a.m. daily, laundry, and on-command video library. Covered valet parking is $9 per day. Check-in time is 2:00 p.m. Check-out time is 12:00 noon.

11 Sixth Avenue Inn
2000 Sixth Avenue, Seattle, WA 98101; (206) 441-8300
8 blocks from the Convention Center
Single $68, Double $68 (85-room block)

This motor-lodge-style hotel combines economy and comfort, offering pleasant, spacious guest rooms. The Sixth Avenue Bar and Grill serves Northwest favorites for breakfast, lunch, and dinner at value prices, beginning at 6:30 a.m. weekdays, 7:00 a.m. weekends. In the evening enjoy the fireplace lounge, with free popcorn and big-screen television. Parking is free for hotel guests. Check-in time is 2:00 p.m. Check-out time is 12:00 noon.

12 The Warwick Hotel
401 Lenora Avenue, Seattle, WA 98121; (206) 443-4300
7 blocks from the Convention Center
Single $89, Double $89 (150-room block)

A luxury AAA four-diamond hotel offering a restaurant and lounge, room service, concierge, laundry, and a health club with a pool, jacuzzi, sauna, and exercise room. The hotel restaurant, The Liaison, features Northwest cuisine and is open for breakfast, lunch, and dinner. You might want to visit The Lounge, with live piano music on weekends. Enjoy the warm hospitality and personal service in the Warwick tradition. Parking is $10.50 per day. Check-in time is 3:00 p.m. Check-out time is 1:00 p.m.

13 Edgewater Inn
2411 Alaskan Way, Seattle, WA 98121; (206) 728-7000
12 blocks from the Convention Center
City View $108 Single or Double, Water View $123 Single or Double (50-room block)

Located on Pier 67, the Edgewater Inn is downtown Seattle's only waterfront hotel. Built in 1962, this local landmark has been renovated to create the relaxing atmosphere of a Pacific Northwest bayside resort, complete with pine vaulted ceilings. The hotel lounge and Ernie's Bar and Grill restaurant provide sweeping views of Elliott Bay to go with their regional cuisine. In the evening, relax next to the fireplace and watch the ferries glide through the water. Self parking is $8 per day. Check-in time is 3:00 p.m. Check-out time is 12:00 noon.

Seattle's lively waterfront. Photo courtesy of Seattle–King County Convention and Visitors Bureau.

REGISTRATION

Seattle — at the leading edge

New For Registrants—Badges and tickets will be mailed to you on October 7.

Preregistration Deadline: Must be received no later than September 16, 1994

All registration forms received at GSA by September 16 will be processed by a new registration system. If you preregister, you will not have to wait in long registration lines to pick up materials in Seattle because badges will be *mailed* to you around October 7. We hope this will make the registration process more convenient for you. Save yourself time and money—preregister today!

1. **There is a $15–$30 savings in fees if you register before the preregistration deadline!** Advance registration is suggested for many of the special activities because of participation limits. Use the preregistration form provided in this announcement.
2. Badges must be worn for access to ALL activities, 10:00 a.m. Sunday through 5:00 p.m. Thursday.
3. Registration discounts are given to both GSA and Associated Society members. Associated Societies that qualify for this discount are indicated on the registration form. Please indicate your affiliation(s) and register using the member rates. Nonmembers who become GSA members by October 1, 1994, can register at the member rate.
4. Full payment MUST accompany registration. Unpaid purchase orders are NOT accepted as valid registration. Charge cards are accepted as indicated on the preregistration form. If using a charge card, please recheck the card number given. Errors will delay your registration. The confirmation card will be your receipt for charge-card payments. No other receipt will be sent.
5. Register one professional or student per form. Copy the form for your records.
6. Guest registration is required for those attending guest activities, technical sessions, or the exhibit hall. Guest registrants MUST be accompanied by either a professional or student registrant. A guest is defined as a non-geologist spouse or friend of a professional or student registrant.
7. Students must show a CURRENT student ID in order to obtain student rates. Students not having a current student ID when registering on-site will be required to pay the professional fee.
8. Because of GSA's **new registration process,** it is imperative that ALL preregistrations be RECEIVED by the preregistration deadline of September 16. All registrations received after September 16 will be held for on-site processing and charged at the on-site rates.

Cancellations, Changes, and Refunds

All requests for registration additions, changes, and cancellations must be made in writing and received by September 23, 1994. GSA will refund or credit preregistration fees for cancellations received in writing by September 23. 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 according to the card number on the preregistration form. There will be NO refunds for on-site registration and ticket sales.

On-Site Registration Schedule

Saturday, October 22	12:00 noon	to	4:00 p.m.
Sunday, October 23	9:00 a.m.	to	7:30 p.m.
Monday, October 24	7:00 a.m.	to	4:30 p.m.
Tuesday, October 25	7:00 a.m.	to	4:30 p.m.
Wednesday, October 26	7:00 a.m.	to	4:30 p.m.
Thursday, October 27	7:00 a.m.	to	11:00 a.m

Preregistration Form

1994 GSA ANNUAL MEETING
Seattle, Washington • October 24–27

Preregistration must be received by September 16, 1994

Please print clearly. Copy for your records.

Name (last) _____ (first name/nickname as it should appear on badge) _____

Employer/University (affiliation as it should appear on badge) _____

Employer/University mailing address for Employer/University above _____

City _____ State _____ ZIP Code _____

Country (other than USA) _____ Business Phone _____ Fax _____ Home Phone _____

Spouse/Guest Name (last) _____ (first name/nickname as it should appear on badge) _____

City/State _____ Country _____

Circle member affiliations **(for registration discount):**

a) GSA b) AASG c) AGID d) AWG e) CF f) GIS g) GS h) MSA i) NABGG j) NAGT k) NESTA l) PS m) SEG n) SGE o) SVP

PREREGISTRATION FEES

Required for participation in field trips, technical sessions, courses, and exhibits.

GSA member # _____

	Full Week	or	One Day	Qty.	Column A Amount
Professional Member	☐ (1) $180		☐ (2) $105	1	$
Professional Nonmember	☐ (3) $220		☐ (4) $125	1	$
Student Member	☐ (5) $ 65		☐ (6) $ 40	1	$
Student Nonmember	☐ (7) $ 85		☐ (8) $ 50	1	$
K–12 Teacher	☐ (42) $ 25			1	$
Field Trip/Education Course only	☐ (98) $ 25			1	$
Spouse/Guest (fill in name above for badge)	☐ (9) $ 75			—	$

Total Column A $ _____

GUEST ACTIVITIES

		Qty.	Column B Amount
1 Bird Watching	(20) $ 30		$
2 Victoria Day, Sunday	(21) $ 98		$
3 Victoria Day, Tuesday	(22) $ 98		$
4 Seattle Highlights, Sunday	(23) $ 20		$
5 Seattle Highlights, Monday	(24) $ 20		$
6 Snoqualmie Falls, Gilman Vill.	(25) $ 22		$
7 Locks and Seattle Harbor	(26) $ 39		$
8 Northwest Winery	(27) $ 41		$

SPECIAL EVENTS

1 Washington Dinner Train	(40) $ 68		$
2 Seattle Repertory Theater	(41) $ 65		$
3 Jazz Evening	(42) $ 7		$
4 Salmon Bake at Kiana Lodge	(50) $ 57		$

Total Column B $ _____

TICKETED MEAL FUNCTIONS

		Qty.	Column C Amount
1 Geochemical Soc. Lunch	(60) $ 23		$
2 NAGT Lunch	(61) $ 23		$
3 Assoc. Women Geosci. Break.	(62) $ 13		$
4 Geoscience Ed. Div. Break.	(63) $ 13		$
5 GIS Lunch	(64) $ 23		$
6 Hydrogeology Div. Lunch	(65) $ 23		$
7 Minerological Soc. Lunch	(66) $ 23		$
8 Paleontological Soc. Lunch	(67) $ 23		$
9 SEG Lunch	(68) $ 23		$
10 Coal Geology Div. Lunch	(69) $ 23		$
11 Engineering Geol. Div. Lunch	(70) $ 23		$
12 History of Geol. Div. Lunch	(71) $ 23		$

Total Column C $ _____

Total Columns A, B & C $ _____

Please inform us ***by September 16*** of any special considerations that you or your guest require.
☐ I will need special considerations. Please call me.

FIELD TRIPS

		Column D Amount
1 Island & Coastal Hydro., HI	(101) $690	$
2 Missoula Floods	(102) $350	$
3 Orogeny in North Cascades	(103) $370	$
4 Evolution Oregon-Idaho Graben	(104) $360	$
5 Framework Tertiary Forearc	(105) $292	$
6 Quaternary W. Olympic Pen.	(106) $275	$
7 Pluton Emplacement Mt. Stuart	(107) $285	$
8 Vents & Basalt Flows	(108) $175	$
9 Sequence Stratig. John Day	(109) $160	$
10 Earth, Water, Trees & Fish	(110) $245	$
11 Technostratig. Crescent Terr.	(111) $280	$
12 Mid-Tertiary Volc.	(112) $173	$
13 Mt. Rainier, A Decade Volcano	(113) $165	$
14 Holocene Tectonics Western WA	(114) $155	$
15 Tertiary Coals Western WA	(115) $130	$
16 Geoarchaeology San Juan Island	(116) $ 97	$
17 Geology Tectonic Evolution	(117) $190	$
18 Mount St. Helens	(118) $230	$
19 Transect Tertiary Cascade	(119) $210	$
20 Engineering Geology Seattle	(120) $ 92	$
21 Fault-Zone Struct. and Cleavage	(121) $174	$
22 Paleogene Cold Seeps Macroin.	(122) $175	$
23 Geohydro. Setting Hanford Site	(123) $165	$
24 Migmatites to Fault Gouge	(124) $170	$
25 Pleistocene Sediments	(125) $215	$
26 Character Landslides West WA	(126) $245	$
27 Chelan Migmatite Complex	(127) $210	$

K–16 PROGRAMS

1 Solar Power Play	(302) $ 15	$
2 Fairly Simple Exercises	(303) $ n/c	$
3 Effective Teaching	(304) $ 15	$
4 Seismic Sleuths	(305) $ 15	$
5 Share-a-thon Presenter	(306) $ n/c	$

Total Column D $ _____

Seattle — at the leading edge

EDUCATION COURSES

		Column E Amount
1 Plate Tectonic Modeling		
Professional	(150) $260	$
Student	(151) $240	$
2 GPS Geodesy and Active Tectonics		
Professional	(152) $245	$
Student	(153) $225	$
3 Environmental Site Assessments		
Professional	(154) $285	$
Student	(155) $265	$
4 Sedimentary Basin Modeling		
Professional	(156) $280	$
Student	(157) $260	$
5 Soil and Ground-water Remediation		
Professional	(158) $280	$
Student	(159) $260	$
6 Ground-water Flow Modeling		
Professional	(160) $245	$
Student	(161) $225	$
7 Computers in Undergraduate Geosci.		
Professional	(162) $200	$
Student	(163) $180	$
8 Computer Mapping at Your Desk		
Professional	(164) $345	$
Student	(165) $325	$
9 GIS and the Geosciences		
Professional	(166) $145	$
Student	(167) $125	$
10 Cultural Resource Management		
Professional	(168) $215	$
Student	(169) $195	$
11 In Situ-Produced Cosmogenic Isotopes		
Professional	(170) $185	$
Student	(171) $165	$
12 Isotope Hydrology		
Professional	(172) $190	$
Student	(173) $170	$
13 Landslides		
Professional	(174) $210	$
Student	(175) $190	$
14 Teaching Intro. Earth Systems		
Professional	(176) $170	$
Student	(177) $150	$
15 Analysis Rock/Soil Stability		
Professional	(178) $210	$
Student	(179) $190	$

Total Column E $ _____

Total Columns A, B, & C $ _____

Total Columns D & E $ _____

GRAND TOTAL REMITTANCE $ _____

Remit in U.S. funds payable to:
1994 GSA Annual Meeting
(All registrations must be prepaid. Purchase Orders are not accepted.)

Payment by: ☐ Check ☐ American Express ☐ VISA/MasterCard

Card Number _____

Signature _____ **Expires** _____

MAIL TO: GSA ANNUAL MEETING
P.O. BOX 9140
BOULDER, CO 80301-9140

FOR OFFICE USE

A____ V____ M____

CK# _____

	DR	CR
Bal. A/R 1233		
Ref. A/P 2006		

Refund Check # _____

Approval _____

Registration Fees:	Advance (by Sept. 16)	On-Site
Professional Member	$180	$210
Professional Member One Day	$105	$105
Professional Nonmember	$220	$250
Professional Nonmember One Day	$125	$125
Student Member	$ 65	$ 80
Student Member One Day	$ 40	$ 40
Student Nonmember	$ 85	$100
Student Nonmember One Day	$ 50	$ 50
Guest or Spouse	$ 75	$ 90
Field Trip or Continuing Ed. Course Only	$ 25	$ 25
K–12 Teachers	$ 25	$ 35

Join GSA Now and Save!

If you're planning to attend this year's Annual Meeting but are not yet a GSA member, now is the time to join. When you do, you'll save $40 on your meeting registration by paying the member rate—almost the same amount you pay to join GSA. That's like joining GSA for free. Likewise, students who pay the basic membership dues of $20 to become a Student Associate will receive a $20 discount on their Annual Meeting registration. Again, like joining GSA for free! These discounts apply only to **full-meeting paid** registrants; not to one-day or complimentary registrations.

The $40 registration discount for members mentioned above applies to professional members of GSA or an Associated Society. The Associated Societies that qualify are listed on the registration form. Save time by joining ***before*** the meeting. Membership applications are available from GSA headquarters. During the meeting, they can be picked up at the Membership Booth in the registration area of the Washington State Convention and Trade Center.

CONVENIENCE INFORMATION

Seattle *at the leading edge*

Accessibility for Registrants with Special Needs

GSA is committed to making the Annual Meeting accessible to all people interested in attending. If you need any auxiliary aids or services because of a disability, check the appropriate box on the registration form. If you have suggestions or need further information, contact Becky Martin, GSA headquarters. Please let us know your needs by September 16.

Child Care

Due to the prohibitive insurance costs and the legal issues that surround child care, daycare service will not be provided by GSA. However, we want to make it as convenient as possible for families to make arrangements. Please call Vanessa George, GSA Meetings Coordinator, if you are interested in the options provided:

- GSA coordinates a family cooperative service in which parents can share responsibilities for caring for their children. Until October 7, GSA will accept names, addresses, and phone numbers of interested parents. You may also include information on your children, and where you plan to stay. The information will be distributed to everyone who has responded. Participants are responsible for contacting one another and making arrangements.
- Seattle has several excellent private child-care agencies. Although GSA cannot endorse any of these agencies, we are happy to give the names and phone numbers to you. You may also call the Seattle Sheraton Hotel concierge, (206) 621-9000, for local child-care services.
- GSA will provide a clean, quiet room at the Convention Center for children and parents to relax together. It will have basic furnishings (no cribs or playpens).

Computer and Office Center

Sunday, October 23 through Thursday, October 27; Washington State Convention and Trade Center.

Kinko's will be on hand to provide registrants and exhibitors with PCs, laser printers, copiers, fax, E-mail, and general office supplies for use on site. There is no need to lug along your heavy laptop computer! This equipment will be available for your use to produce high-quality reports, transparencies, or last-minute fliers. A fee will be charged to use the equipment. We hope you plan ahead to use Kinko's quality services.

Food for the Needy

Excess food from convention food functions will be distributed to Seattle's Table, a homeless shelter sponsored by Food Lifeline Corporation.

Information and Messages

Saturday, October 22 through Thursday, October 27; Washington State Convention and Trade Center and Seattle Sheraton Hotel.

GSA information and message desks will be available to assist you during the meeting. We are happy to take urgent messages on your behalf. Leave the following numbers for your home and office:

Washington State Convention and Trade Center	(206) 447-5064
Seattle Sheraton Hotel	(206) 621-9000

News Room

Sunday, October 23 through Thursday, October 27; Washington State Convention and Trade Center.

The News Room provides information on many topics for release to the news media. Please let us know of material that is noteworthy for the science or general press. The daily newsletter, *Down to Earth*, is published by the News Room staff, and we welcome your suggestions on newsworthy topics that could qualify for publication. Members of the press may receive complimentary registration with appropriate press credentials. In advance of the meeting, contact Sandra Rush, (303) 443-8489, c/o Communications Department, GSA headquarters.

Recycling

To assist nationwide recycling programs and take responsible action in protecting our environment, GSA and the Washington State Convention and Trade Center will be providing designated areas for paper, cardboard, and aluminum recycling. Bins will be available in the exhibit hall and lobby areas for easy access. Please print on recyclable products.

To further GSA's effort in protecting the environment, we will again be offering the "build your own registration kit." By using this system of having fliers available for pickup at the registrant's option, we can considerably reduce the amount of wasted paper generated by the meeting.

Tourist Information

Seattle Convention and Visitors Bureau
520 Pike Street, Suite 1300
Seattle, WA 98101
(206) 461-5840

Washington State Tourism Division
General Administration Building
Room G-3, AX-13
Olympia, WA 98504
(206) 586-2102

Weather

The average daily temperature in Seattle for the month of October is a high of 60°F and a low of 48°F. A jacket and umbrella are recommended for occasional rain showers.

ABSTRACTS WITH PROGRAMS

Seattle — at the leading edge

Advance-Copy Purchase
1994, Volume 26, Number 7

PRICE $22 NET EACH

If you reside in the United States, Canada, or Mexico you may take advantage of the advance-copy purchase option of the Annual Meeting *Abstracts with Programs*. Due to the prohibitive airmail costs and delays for overseas mailings, we regret that we cannot make this offer to everyone. Copies will be mailed about three weeks prior to the meeting. Price includes shipment by first-class mail. ***No additonal discounts may be applied to this offer.***

The volume will also be for sale at the meeting. Note: Your registration does not include a copy of the *Abstracts* volume. Please check to make sure that you have not already purchased a copy on your membership dues statement or through GSA Publication Sales. ***No refunds will be given for duplicate orders.***

TO PLACE YOUR ORDER

Prepayment is required. Check, money order (in U.S. funds, payable on U.S. banks), or major credit cards are accepted. Order directly from GSA Publication Sales by mail, phone, or fax. To assure receipt prior to the meeting, *all orders must be received by Friday, September 9.*

By mail or fax, use the form provided. ***By phone,*** call toll-free 1-800-472-1988, or use our business phone (303) 447-2020 during office hours (8:00 a.m. to 4:30 p.m. MT).

ON-SITE PURCHASE

Copies of *Abstracts with Programs* will be for sale in the registration area of the Washington State Convention and Trade Center. Price: $22 net each. **No additional discounts will apply.**

ADVANCE-COPY PURCHASE ORDER FORM

1994 Abstracts with Programs

Volume 26, Number 7

Return this form by Friday, September 9. This purchase option is only for those residing in the U.S., Canada, and Mexico. No refunds given for duplicate orders. Copy this form for your records.

SHIP TO: ☐ Check here if GSA Member

Name _____

Address _____

City _____ State _____ ZIP _____

Daytime Phone _____

Quantity _____ at $22 net each (no additional discounts)

Amount enclosed $ _____

Method of payment: (prepayment required)

☐ Check or money order enclosed (U.S. funds, U.S. banks)

☐ Credit card (circle one) MC VISA AmEx Diners

Card No. _____ Exp. Date _____

Name of cardholder (print) _____

Signature of cardholder _____

Send to: GSA Publication Sales, P.O. Box 9140, Boulder, CO 80301
1-800-472-1988 ◆ (303) 447-2020 ◆ fax 303-447-1133
Orders must by received by September 9

1994 ANNUAL MEETING

Seattle, Washington ◆ October 24–27

Preregistration Due
September 16

Abstracts Due **July 6**

For abstract forms
(303) 447-2020
E-mail: ncarlson@geosociety.com

Program, Transportation, and Hotel Information
(303) 447-2020 or 1-800-472-1988
Fax: 303-447-0648
E-mail: mball@geosociety.com

Seattle — at the leading edge

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Boulder, CO 80301

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