

GSA TODAY

A Publication of the Geological Society of America

1992 ANNUAL MEETING

CINCINNATI

**Cincinnati, Ohio • October 26–29 • Dr. Albert B. Sabin Cincinnati Convention Center
Co-Headquarters Hotels: Hyatt Regency Cincinnati, Omni Netherland Plaza**

From Columbus to Magellan—Discovery

The impetus of the geological sciences can only be sustained if new and pertinent discoveries are made and become widely known. These discoveries then become parts of the whole body of knowledge and can be employed both in the development of new ideas and in the utilization of these ideas in practice.

Discoveries have always been at the heart of the geological sciences and have always been promoted by GSA. In 1992, the quincentenary of Columbus's first voyage to America, and a year in which the *Magellan* satellite is still mapping Venus from space, the theme is particularly pertinent. In 1492, Columbus journeyed to discover a new world on Earth. We are now discovering and charting a new world in space, and in the process we are exploring worlds of new ideas. Join us in celebration of new discoveries

in the geological sciences on the quincentenary of the Columbus landing in the Bahamas, which revealed to Europe the existence of another, unexpected world. In the same spirit, the Cincinnati meeting

will present images of unexpected new worlds from the surface of Venus to the subsurface of Ohio. Come to examine the new discoveries ranging from those made by the *Magellan* spacecraft to the detection of a large rift basin a mile beneath Cincinnati. Also special at this year's meeting will be a greatly increased number of sessions on environmental geology.

The GSA will hold its Annual Meeting in Cincinnati from October 26 through 29. The meeting will take place in the newly remodeled and enlarged downtown Convention Center, which is connected by skywalks to almost all of the downtown hotels.

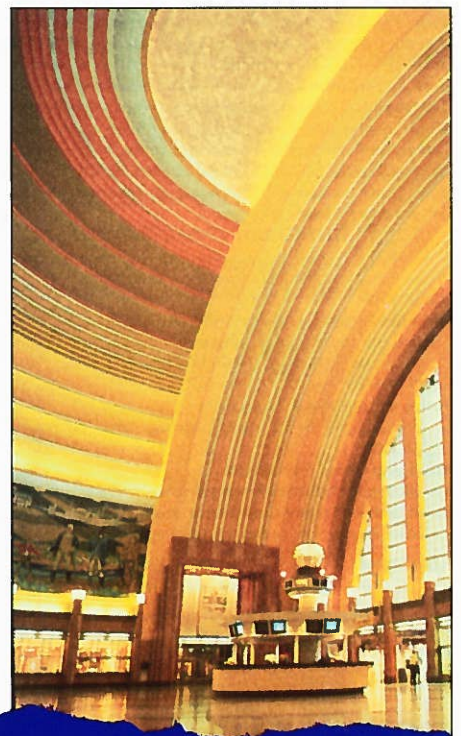
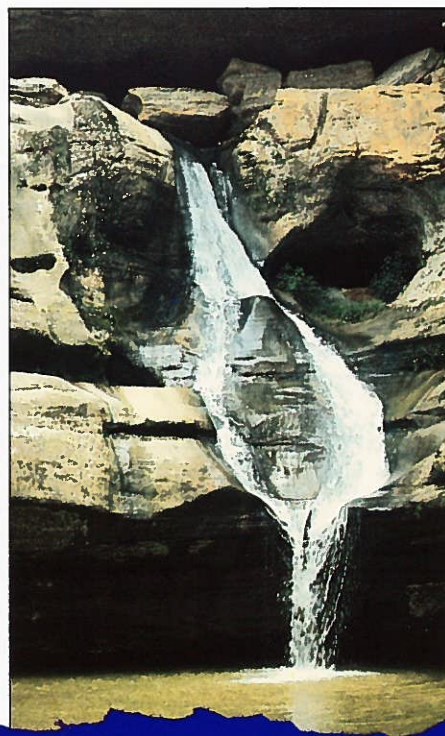
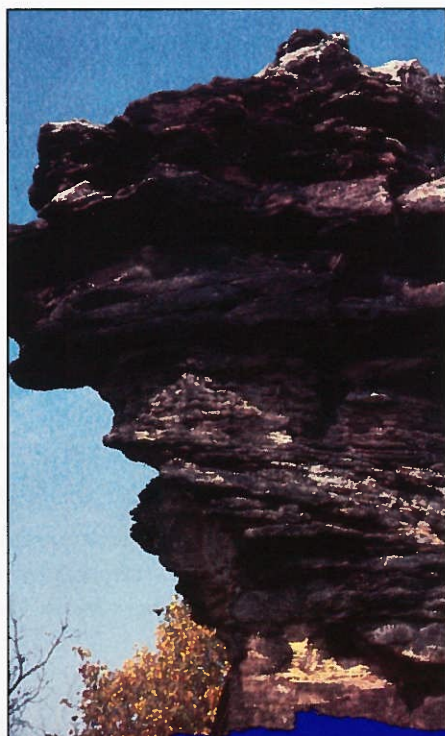
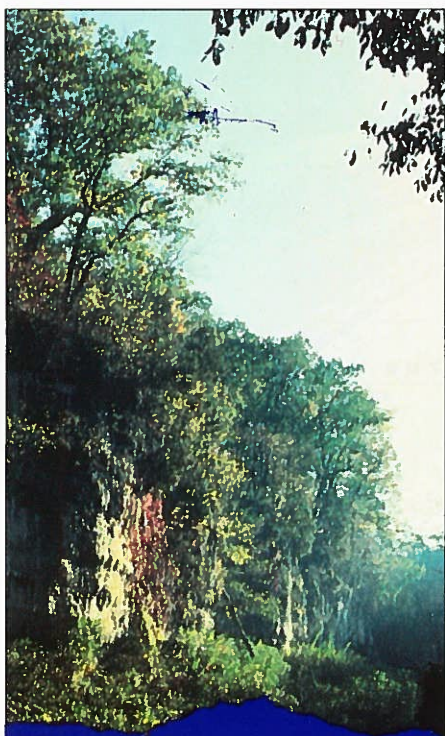
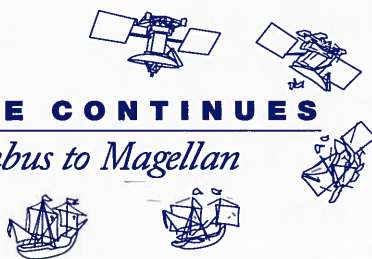
Cincinnati provides a setting where you can easily stay within comfortable walking distance of the Convention Center and restaurants. The skywalk leads directly to the sessions—no traffic to dodge, no worry about weather.

Cincinnati is also a major airlines hub and is a convenient drive for many, so travel will also be pleasant.

—RAPHAEL UNRUG AND J. BARRY MAYNARD
1992 GENERAL CO-CHAIRS

THE VOYAGE CONTINUES

From Columbus to Magellan



GEOLOGICAL SOCIETY OF AMERICA

Associated Societies

Association of Geoscientists for International Development
 Association for Women Geoscientists
 Cushman Foundation*
 Geochemical Society*
 Geoscience Information Society*
 Mineralogical Society of America*
 National Association of Geology Teachers*
 National Earth Science Teachers Association
 Paleontological Society*
 Sigma Gamma Epsilon
 Society of Economic Geologists*
 Society of Vertebrate Paleontologists
 *Representatives serve on the 1992 Joint Technical Program Committee

COVER PHOTOS:

Pebbles Dolomite (Silurian) exposed along Paint Creek, Highland County, Ohio. Photo by Tomi Lou Spyker.

Standing Rock, Guernsey County, Ohio. Photo by Russell Pryor.

Cedar Falls, Black Hand Sandstone (Lower Mississippian), Hocking Hills State Park, Ohio. Photo by Michael C. Hansen, Ohio Geological Survey.

Rotunda inside The Museum Center. The Museum Center.

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THE VOYAGE CONTINUES From Columbus to Magellan

More than one hundred volunteers have been involved in the planning and development of the 1992 Annual Meeting. Most of these are associated with the universities, surveys, and museums in the tristate area of Ohio, Kentucky, and Indiana. Geologists giving personal and professional time to such a major undertaking are always appreciated at GSA, but on top of this, our 1992 hosts have initiated environmentally focused programs and other fresh, new events that call for participation, scientific creativity, and imagination. All of us owe the faculty, students, and area alumni special thanks and recognition.

Technical Program


 **GSA Institute for Environmental Education (IEE) Annual Environmental Forum**

Ground Water Cleanup vs. Ground Water Protection: Where Should the \$\$\$ Go?

Sunday, October 25, 1:30 to 5:30 p.m.; Cincinnati Convention Center.

The IEE offers a geoscience interface between the private and public sectors and the geological community on matters of the environment through programs directed at the applied geological sciences in the areas of geologic hazard mitigation, land use management, mineral and energy resource management, waste management, and water resource management.

Speakers will present viewpoints of environmental and public interest groups, regulatory agencies, and private industry, as well as of geoscientists dealing with the subject. Focus will be on the incompatibilities that exist between relevant science and technology, policy, and public perception, and on the trade-offs that will necessarily be required. The forum is intended to inform attendees of various societal, technological, economic, and regulatory considerations that must be addressed in dealing with ground water contamination problems and ground water protection.

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

Moderator, Fred A. Donath
GSA Institute for Environmental Education
Andrew W. Stone
The American Ground Water Trust
Ground Water Contamination Problems—A Historical and International Perspective

Robert H. Harris
ENVIRON Corporation
Do Contaminated Aquifers Represent Real or Imagined Health Risk? An Assessment and Prognosis

Fletcher G. Driscoll
Geraghty & Miller, Inc.
Can We, in Fact, Remediate... Is It Possible In Most Geologic Terranes?

Robert S. Raucher
RCG/Hagler, Bailly, Inc.
The Economic Value of Ground Water Protection

Linda E. Greer
Natural Resources Defense Council
Ground Water Pollution Prevention—Putting Our Money Where Our Mouth Is

Douglas "Dusty" Hall
City of Dayton, Ohio
Making the Transition from Cleanup to Prevention—A Municipal Government Approach

Alvin L. Alm
Science Applications International Corp.
Ground Water Policy Developments

John A. Cherry
University of Waterloo
Who Is To Blame? Where Do We Go From Here?

The 1992 Annual Environmental Forum Booklet is available on the GSA Registration Form at a cost of \$3. This 32-page, 8 1/2 x 11 publication includes information on the Forum, IEE, and its co-sponsors, the speakers' backgrounds, and a 1000-word précis for each presentation. Registrants will receive this booklet on-site.

Those wishing to have the AEF Booklet mailed in advance should call GSA Publication Sales, 1-800-472-1988. This publication will also be shown in the GSA catalogue.

GLORIA: Sonar Images of the Entire U.S. Seafloor

Sunday, October 25 through Thursday, October 29; Cincinnati Convention Center.

Using the long-range side-scan sonar GLORIA, the U.S. Geological Survey has obtained sonar images of all the U.S. coasts. The Cincinnati meeting is the first time all of these remarkable sonar mosaics will be displayed together.

This project was undertaken in 1984 in cooperation with the Institute of Oceanographic Sciences, United Kingdom. The resulting sonar images show major fracture zones, giant Hawaiian landslides, thousands of submarine volcanoes, details of canyon morphology, and pathways of turbidite transport never before imagined. Accompanied by terrain maps at 1:2,000,000 scale, these giant mosaics provide an exciting and new perspective on America's continental margins. For more information, contact M. E. Field, J. V. Gardner, or C. Gutmacher, U.S. Geological Survey, Menlo Park, California, (415) 354-3184, or D. Twichell, U.S. Geological Survey, Quissett Campus, Woods Hole, Massachusetts, (508) 548-8700.

Technical Sessions

Technical sessions consist of both invited and volunteered papers organized in one of three presentation formats: symposia, theme sessions, and discipline sessions. Abstracts were due on July 8 and selected and organized into sessions by the Joint Technical Program Committee (JTPC) on August 7 and 8. The JTPC consists of 30 geoscientists representing those associated societies and GSA divisions participating in the technical program. The JTPC chairs, nominated by the Cincinnati Annual Meeting Committee and approved by the GSA Council, also serve a four-year term on GSA's standing Program Committee, which oversees all technical program activities.

Abstract notices mailed August 19
Speaker information mailed August 21
Technical Program Schedule
(GSA Today) September 5

Invited Papers (Symposia)

This format includes only abstracts that have been invited by the convener of a symposium. The dates indicated are tentative and may be changed by the JTPC on August 7-8. Full descriptions appeared in the July issue of GSA Today, and the final schedule appears in the September issue.

S1. Keynote Symposium *From Columbus to Magellan—Discovery*

Monday, October 26, 8:00 a.m. to 12:00 noon; Cincinnati Convention Center.

Leading off the theme on Monday morning will be a special Keynote Symposium sponsored by the Cincinnati Annual Meeting Committee and organized by Nicholas Rast, University of Kentucky. This symposium marshals some salient features of recent discoveries in geological sciences.

Umberto G. Cordani, IUGS Past President
Universidade de São Paulo, Brazil
Introduction: Post-Columbus Discovery

William R. Muehlberger
University of Texas at Austin
Geological Maps

Thomas E. Krogh
University of Toronto, Canada
On the Importance of Precise U/Pb Time Measurements in Geological Correlations

Mary Lou Zoback
U.S. Geological Survey, Menlo Park
State of Stress in the Crust

Lee R. Kump
Pennsylvania State University,
University Park
Geological Perspectives of Climate

Simon C. Morris
University of Cambridge, United Kingdom
Bursts in the Evolution of Life

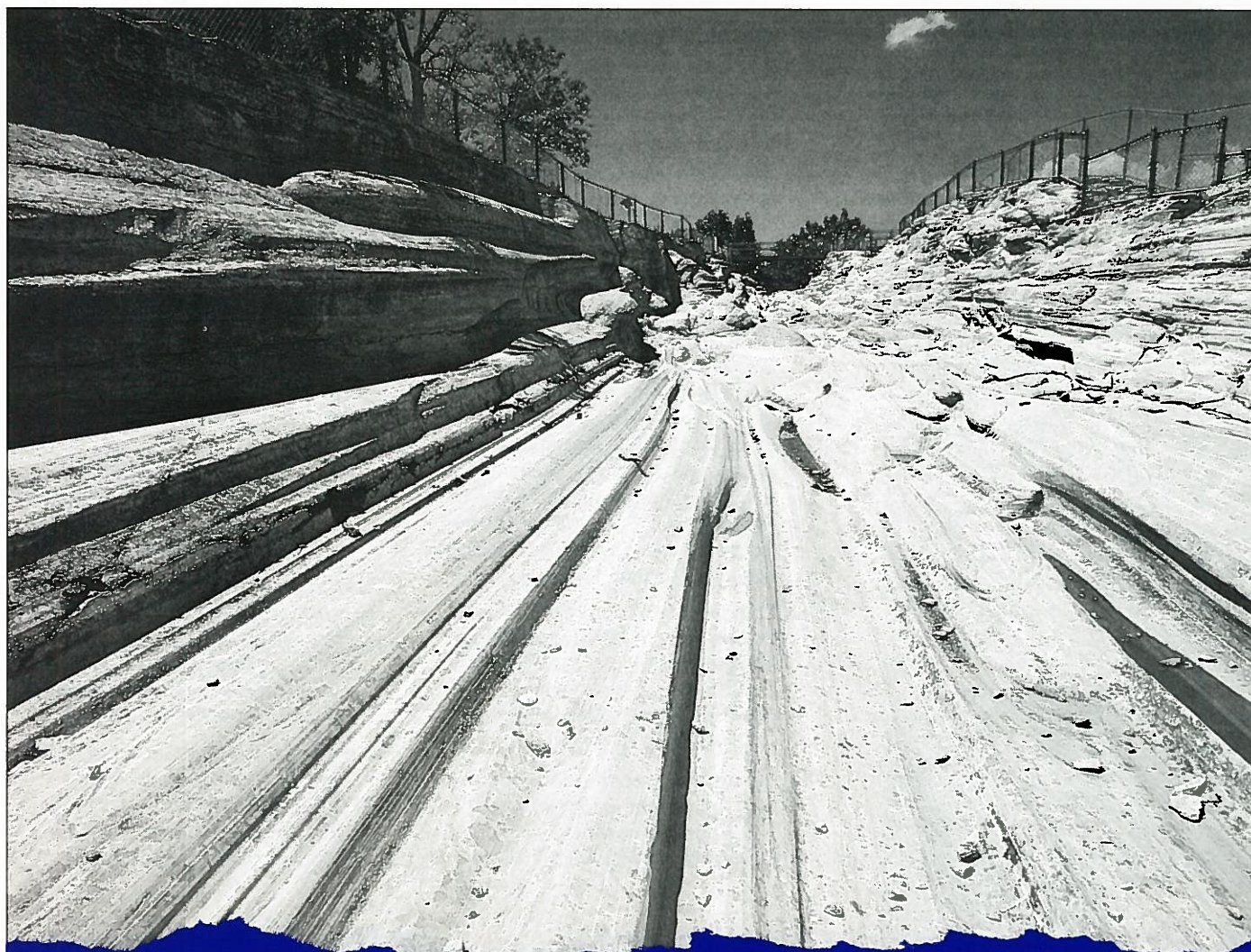
James W. Head III
Brown University
The Magellan Mission to Venus: Charting an Earth-like Planet

John Rodgers
Yale University
Summary and Closing Remarks

S2. **History of Late Glacial Runoff from the Southern Laurentide Ice Sheet.** *Quaternary Geology and Geomorphology Division.* James T. Teller, University of Manitoba, Winnipeg, Canada. Wednesday, October 28, afternoon.

S3. **The History of the Use of Imagery (Art, Photography, Maps, and other Illustrations) in Geological Literature.** *History of Geology Division.* Donald M. Hoskins, Pennsylvania Geological Survey, Harrisburg. Tuesday, October 27, morning.

Glacial grooves, Columbus Limestone (Middle Devonian), Kelleys Island, Lake Erie, Ohio. Photo by Michael C. Hansen, Ohio Geological Survey.



S4. **Preserving Geoscience Imagery.** *Geoscience Information Society.* Louise S. Zipp, University of Iowa. Tuesday, October 27, afternoon.

S5. **Frontiers of Chemical Mass Transport in Contaminant Systems.** *Hydrogeology Division, Institute for Environmental Education.* Yu-Ping Chin and Frank W. Schwartz, Ohio State University. Tuesday, October 27, morning.

S6. **Reform in Science Education.** *National Association of Geology Teachers.* Charles Q. Brown, East Carolina University, North Carolina. Monday, October 26, afternoon.

S7. **Mineralization Related to Continental Rifts.** *Society of Economic Geologists.* Richard E. Beane, Oro Valley, Arizona. Sunday, October 25, all day.

S8. **Black Shales and Related Ore Deposits.** *Society of Economic Geologists.* Richard I. Grauch, U.S. Geological Survey, Denver; Holly Huyck, Denver, Colorado. Monday, October 26, afternoon.

S9. **Ground Truth: Geology of the Earth and Planets from Rocks and Analogs.** *Planetary Geology Division.* Harry Y. McSween, University of Tennessee, Knoxville. Tuesday, October 27, morning.

S10. **Applications of Stable Isotope Geochemistry to Problems in High-Temperature Petrogenesis.** *Geochemical Society.* Theodore C. Labotka, University of Tennessee, Knoxville. Tuesday, October 27, afternoon.

S11. **Geologic Aspects of Development Projects in Latin America and the Caribbean Basin.** *International Division, Engineering Geology Division.* Jerome V. DeGraff, USDA Forest Service, Clovis, California; John S. Oldow, Rice University. Tuesday, October 27, afternoon.

S12. **Instability on Clay and Shale Hillslopes.** *Engineering Geology Division.* William C. Haneberg, New Mexico Bureau of Mines, Socorro; Robert W. Fleming, U.S. Geological Survey, Denver. Wednesday, October 28, morning.

S13. **Physical and Chemical Responses to Allocyclic Processes in Carboniferous Coal-Bearing Strata.** *Coal Geology Division.* Cortland F. Eble, Kentucky Geological Survey, Lexington; C. Blaine Cecil, U.S. Geological Survey, Reston. Monday, October 26, morning.

S14. **Controls on Carbon Preservation.** *Organic Chemistry Division of the Geochemical Society.* Cindy Lee, State University of New York at Stony Brook. Sunday, October 25, all day.

S15. **The Role of Fluids in Crustal Deformation.** *Structural Geology and Tectonics Division.* Jan A. Tullis, Brown University; Terry Engelder, Pennsylvania State University, University Park. Monday, October 26, afternoon.

S16. **Synergism: Archaeological and Geological Sciences.** *Archaeological Geology Division.* Bonnie A. Blackwell, Purdue University. Tuesday, October 27, afternoon.

S17. **Paleosols: Their Geologic Applications (Part I).** *Sedimentary Geology Division.* Mary J. Kraus, University of Colorado; David E. Fastovsky, University of Rhode

Island. Wednesday, October 28, morning. (Part II is T16. Paleosols field trip and short course also available.)

S18. **Speciation in the Fossil Record.** *Paleontological Society.* Douglas H. Erwin, U.S. Museum of Natural History, Washington; Robert Anstey, Michigan State University. Tuesday, October 27, morning.

Volunteered Papers

This format includes all abstracts that are not specifically invited for a symposium. Two types of sessions are available:

1. Discipline sessions.

The JTPC selects and organizes papers in sessions that focus on one scientific discipline, e.g., hydrogeology or structural geology. Each paper receives three reviews. The papers are organized with topical coherence whenever possible, and sessions may be given an appropriate title by the JTPC representative.

2. Theme sessions.

Papers are submitted to a specific, preannounced topic and to one scientific category. Theme sessions are interdisciplinary; each theme may have as many as three disciplines (categories) associated with it. Each theme has one or more advocates who proposed the idea as well as encouraged submission of papers. The advocates, however, are not able to guarantee acceptance of papers, since this is the responsibility of the reviewers and the JTPC representatives. Full theme descriptions appeared in the April issue of *GSA Today*, and the final schedule appears in the September issue.

T1. **Tectonic Settings and Paleoenvironments of the Paleo-Pacific Margin—Antarctic and Related Gondwana Sequences.** James W. Collinson and David H. Elliot, Ohio State University. Paleoclimatology/Paleobotany, Tectonics.

T2. **New Discoveries in Neoproterozoic Earth History.** Nicholas Christie-Blick, Lamont-Doherty Geological Observatory; Samuel A. Bowring, Massachusetts Institute of Technology. Paleontology, Sedimentology, Tectonics.

T3. **Intraplate Neotectonics.** Roy B. Van Arsdale, University of Arkansas, Fayetteville; Eugene S. Schweig, U.S. Geological Survey, Memphis. Geophysics/Tectonophysics, Quaternary Geology, Structural Geology.

T4. **Hydrogeochemistry and Isotope Hydrology of Regional Aquifer Systems.** Songlin Cheng, Wright State University. Geochemistry/Aqueous, Hydrogeology, Paleoclimatology.

T5. **Hydrogeology, Hydrogeochemistry, and Ground Water Contamination in the Midwest Basin and Arches Region.** *Hydrogeology Division.* Robert W. Ritz, Wright State University; Ed Bugliosi, U.S. Geological Survey, Columbus. Hydrogeology, Sedimentology, Structural Geology.

T6. **Environmental Geology: The Voice of Warning.** *GSA Geology and Public Policy Committee, Institute for Environmental Education.* Monica E. Gowan, GeoLogic,

Bellingham, Washington. Engineering Geology, Environmental Geology, Hydrogeology.

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

T8. **Gulf Coast Cretaceous Project: Biostratigraphy and Correlation; Sea-level Change and Paleogeography; Depositional Environments and Diagenesis.** *Global Sedimentary Geology Program.* David T. King, Jr., Auburn University; Suzanne D. Weedman, Pennsylvania State University, University Park. Paleontology/Paleobotany, Sedimentology, Stratigraphy.

T9. **Discovery in Hydrogeology—Heritage, Wisdom, and Vision.** *Hydrogeology Division, History of Geology Division.* John Van Brahana, U.S. Geological Survey, Fayetteville, Arkansas; Richard R. Parizek, Pennsylvania State University, University Park; Wilson M. Laird, Kerrville, Texas. Engineering Geology, History of Geology, Hydrogeology.

T10. **Transmission Electron Microscopy in Mineralogy and Petrology.** *Mineralogical Society of America.* Peter R. Buseck, Arizona State University. Geochemistry/Other, Mineralogy, Petrology.

T11. **Paleozoic Depositional Sequences; Contrasts in Environments and Fossil Diversity.** *Cushman Foundation for Foraminiferal*

Research. Charles A. Ross, Chevron USA, Houston, Texas; Paul L. Brinckle, Amoco Production Co., Houston, Texas. Micropaleontology, Paleontology, Stratigraphy.

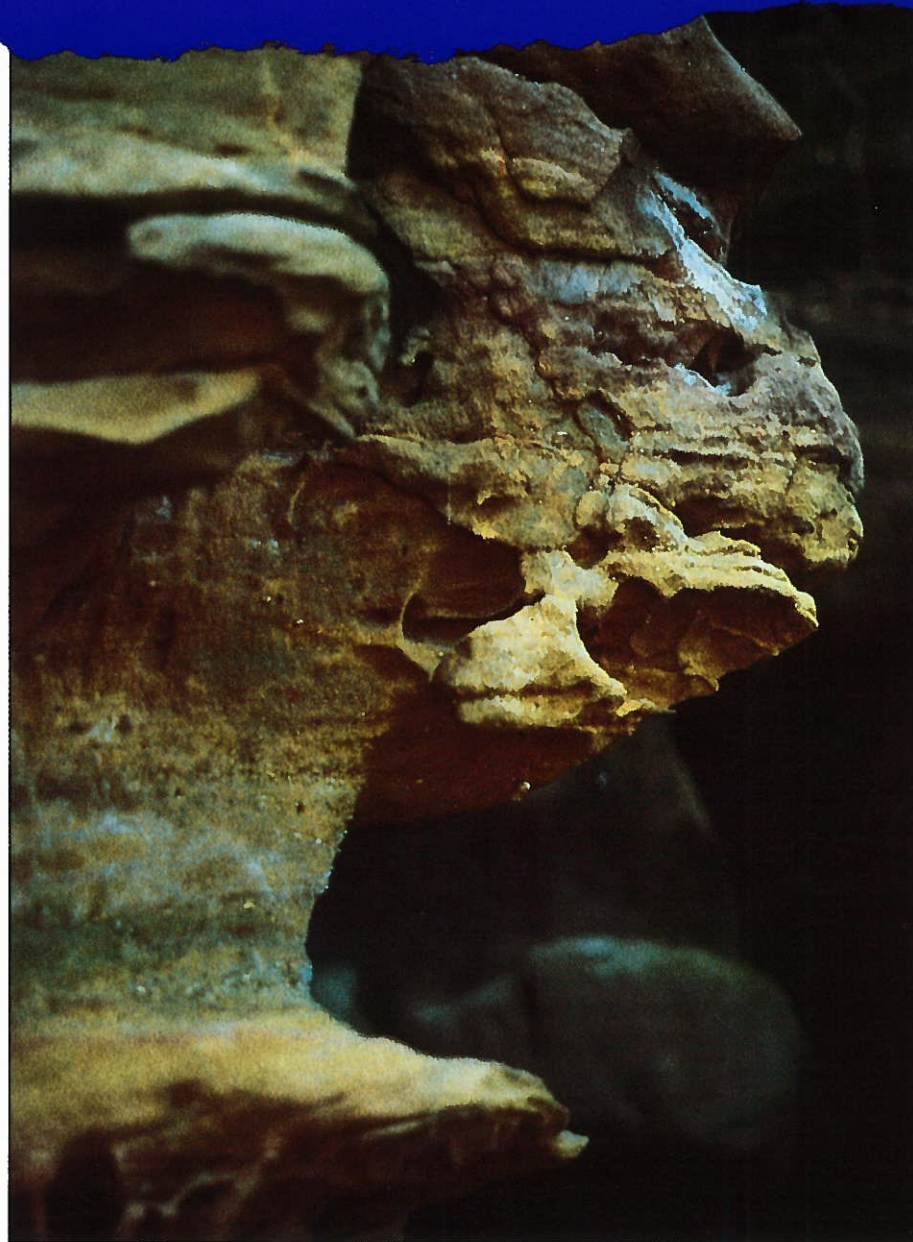
T12. **Origin and Nature of Meltwater Release from the Laurentide Ice Sheet and Its Impact on Late Glacial Oceans.** *Quaternary Geology and Geomorphology Division.* James T. Teller, University of Manitoba, Winnipeg, Canada. Global Change, Paleoclimatology, Quaternary Geology.

T13. **Environmental Issues in Urban Settings.** *Quaternary Geology and Geomorphology Division, Institute for Environmental Education.* John D. Vitek, Oklahoma State University; John R. Giardino, Texas A&M University. Engineering Geology, Environmental Geology, Geomorphology.

T14. **Consultants' and Industries' Innovative Applications in Environmental Investigations.** *Institute for Environmental Education* Todd M. Gates, T.M. Gates, Inc., Milford, Ohio; A. Dwight Baldwin, Jr., Miami University, Oxford, Ohio. Engineering Geology, Environmental Geology, Hydrogeology.

T15. **Magellan, Galileo, and Planetary Frontiers: The Discovery of New Worlds Continues.** Larry S. Crumpler, Brown University. Geophysics/Tectonophysics, Planetary Geology, Remote Sensing.

T16. **Paleosols: Their Geologic Applications (Part II).** *Sedimentary Geology Division.* Mary J. Kraus, University of Colorado; David E. Fastovsky, University of Rhode



Old Man's Cave, Black Hand Sandstone, Hocking Hills State Park, Ohio. Photo by Rebecca Barger.

Island. Paleoclimatology/Paleo-
climatology, Sedimentology, Stra-
tigraphy. (Part I is S17.)

- T17. **Thrust Fault Sesquicentennial.** Paul A. Washington, North Carolina Dept. of Environment, Health, and Natural Resources, Raleigh. History of Geology, Structural Geology, Tectonics.
- T18. **Quantitative Chemical Hydrogeology: Calculation of Solute Transport and Water Rock Interaction in Geochemical Processes.** Peter C. Lichtner, Universität Bern, Switzerland; Eric H. Oelkers, Université Paul Sabatier, France. Computers, Geochemistry/Aqueous, Hydrogeology.
- T19. **Ordovician K-bentonites.** Dennis R. Kolata, Illinois Geological Survey, Champaign; Warren D. Huff, University of Cincinnati. Geochemistry/Other, Stratigraphy, Tectonics.
- T20. **Biotic Responses to Alloccyclic Processes in Carboniferous Coal-Bearing Strata.** *Paleontological Society.* Ronald R. West, Kansas State University; Christopher Maples, Kansas Geological Survey, Lawrence; William A. DiMichele, Smithsonian Institution; Harold B. Rollins, University of Pittsburgh. Paleontology, Sedimentology, Stratigraphy.
- T21. **Time and Place of Compressional Events in the Appalachian Orogen.** William A. Thomas, University of Kentucky; James W. Skehan, Boston College. Stratigraphy, Structural Geology, Tectonics.
- T22. **Formation of Fault Systems.** Mark H. Anders, Lamont-Doherty Geological Observatory; Ronald L. Bruhn, University of Utah. Geophysics, Structural Geology, Tectonics.
- T23. **Advances in Investigation, Characterization, and Monitoring of the Geologic Environment for Waste Disposal.** *Engineering Geology Division, Institute for Environmental Education.* John D. Rockaway, University of Missouri, Rolla. Environmental Geology, Engineering Geology, Hydrogeology.
- T24. **Metamorphism in North and Central America: Regional Studies and Digital Compilation Techniques (Poster Session).** Robert G. Berman, Geological Survey of Canada, Ottawa, Ontario. Computers, Metamorphic Petrology, Tectonics.
- T25. **Late Proterozoic Rifting of the North American Craton.** James A. Drahovzal, Kentucky Geological Survey, Lexington; Lawrence H. Wickstrom, Ohio Division of Geological Survey, Columbus; Brian Keith, Indiana Geological Survey, Bloomington. Precambrian Geology, Structural Geology, Tectonics.
- T26. **New Cretaceous-Tertiary Boundary Discoveries—Caribbean and High Latitudes.** Charles B. Officer, Dartmouth College; Gerta Keller, Princeton University. Geochemistry/Other, Sedimentology, Stratigraphy.

Environmental and Hydrogeology Highlights

Technical Program

- Ground Water Cleanup vs. Ground Water Protection: Where Should the \$\$\$ Go?
- Geologic Aspects of Development Projects in Latin America and the Caribbean Basin
- Frontiers of Chemical Mass Transport in Contaminant Systems
- Hydrogeochemistry and Isotope Hydrology of Regional Aquifer Systems
- Hydrogeology, Hydrogeochemistry, and Ground Water Contamination in the Midwest Basin
- Environmental Geology: I. The Voice of Warning, II. The Voice of Reason
- Discovery in Hydrogeology—Heritage, Wisdom, and Vision
- Environmental Issues in Urban Settings
- Consultants' and Industries' Innovative Applications in Environmental Investigations
- Quantitative Chemical Hydrogeology: Calculation of Solute Transport and Water Rock Interaction in Geochemical Processes
- Advances in Investigation, Characterization, and Monitoring of the Geologic Environment for Waste Disposal

Short Courses

- Environmental/Engineering Geology and Land-Use Planning—An Interface Between Science and Regulations
- Phase I—Preliminary Site Assessments (PSAs)
- Practical Tracing of Ground Water, with Emphasis on Karst Terranes
- Environmental Applications of Shallow Seismic Reflection

Field Trips

- Karst and Cave Systems in the Stones River Group
- Rumpke Sanitary Landfill

New Poster Session Award

GSA is sponsoring a best poster award daily after each morning and afternoon session. Entries will be judged by the Cincinnati Annual Meeting Committee based on scientific content, clarity, coherence, and graphics. Specific guidelines will be mailed to poster authors in their speaker kits in late August. Winners' names will be posted daily and appear in a future GSA Today issue. So, plan ahead and put your best into your poster display!



Field Trips

Cincinnati is central to classical Paleozoic successions of the Midcontinent and Appalachian Basin. The city is also a focal point for exceptional Pleistocene glacial and periglacial features that have been debated for decades. A wide variety of field trips planned for the 1992 Annual Meeting will give participants exceptional opportunities to see classical sites as well as new ones that have been crucial to the interpretation of North American geology. We hope you will choose to participate in one or more of these excursions.

All trips begin and end in Cincinnati unless otherwise indicated. Participants must provide their own transportation to the starting point and the termination point for those trips not originating or terminating in Cincinnati. Trips are technical in nature and can be physically rigorous. Please check with the trip leader if you have any questions.

Trip costs include transportation for the trip, guidebook, and other services as

noted by the following symbols: B—breakfast, L—lunch, D—dinner, and ON—overnight lodging.

Preregistration for a field trip is recommended because of participant limitations. All participants are accepted on a first-come, first-served basis through GSA headquarters.

PREREGISTRATION DEADLINE: Must be RECEIVED at GSA headquarters no later than September 25.

The registration form and procedures are provided in this announcement. Registration for field trips after the deadline may be possible if trip logistics and space permit; contact the GSA Registration Coordinator. Meeting registration fees are not required for those participating only in field trips. Although preregistration is advised, on-site registration for mini-trips and post-meeting trips MAY be possible during the meeting in the Registration Area, Cincinnati Convention Center.



Geologist Raymond Lamborn, 1930s. Photo by Wilbur Stout.

CANCELLATION DEADLINE IS OCTOBER 2. No refunds will be given after this date. If GSA must cancel a field trip because of logistics or registration requirements, a full refund will be issued after the meeting. Also, please be aware of cancellation penalties imposed by the airlines. You may wish to cancel your flight arrangements if a trip you have registered for is canceled. It is a good idea to plan alternatives ahead of time.

GUIDEBOOKS may be purchased at the Field Trip Guidebook Desk during the meeting. After the meeting, write 1992 Guidebooks, ODNR, 4383 Fountain Square Drive, Division of Geological Survey, Columbus, OH 43224-1362. For further information contact the 1992 Field Trip Chairman, Thomas M. Berg, Ohio Dept. of Natural Resources Division of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224-1362, (614) 265-6576, or the Registration Coordinator, GSA headquarters.

Premeeting

1. Sampling the Layer Cake That Isn't: The Stratigraphy and Paleontology of the "type-Cincinnatian."

Friday, October 23 through Saturday, October 24. Richard Arnold Davis, Cincinnati Museum of Natural History, 1720 Gilbert Ave., Cincinnati, OH 45202, (513) 621-3890; Roger J. Cuffey, Pennsylvania State University, University Park. Cost: \$95 (2 L). Limit: 40.

For over a century and a half, the rocks of the Cincinnatian region have been the reference "section" for the Upper Ordovician of North America. Participants will have the rare opportunity to observe the Cincinnatian in its "type-area" and to collect the rocks and fossils that characterize these classic units. The intention is to visit as many of the formations and members of the "type-Cincinnatian" as time will allow—from Edenian through Richmondian.

2. Paleoclimate Controls on Carboniferous Sedimentation and Cyclic Stratigraphy in the Appalachian Basin.

Thursday, October 22 through Sunday, October 25. Sponsored by the Coal Geology Division. C. Blaine Cecil, U.S.

Geological Survey, 956 National Center, Reston, VA 22092, (703) 648-6415; Cortland F. Eble, Kentucky Geological Survey, Lexington. Cost: \$247 (3 L, 3 ON). Limit: 40. Trip begins in Morgantown, West Virginia.

This trip will examine evidence for a variety of paleoclimatic controls on sediment flux and cyclic stratigraphy in Carboniferous strata, including major economic coal beds, in the Appalachian basin. Changes in paleoclimate, such as (1) long-term climate change as eastern North America moved from Southern Hemisphere dry latitudes through the tropical rainy belt of the paleoequator into Northern Hemisphere dry latitudes, (2) intermediate-term climate change that may be related to 100-ka and 400-ka cycles of orbital eccentricity, and (3) short-term climate cycles that may be the result of cycles in axial tilt and precession appear to have been a primary control on the physical, chemical, and biological stratigraphy of Carboniferous strata. Evidence for eustatic controls on transgressive-regressive cycles will also be examined.

3. The Geology Of Columbus's Landfall.

Thursday, October 22 through Saturday, October 24. Mark R. Boardman, Dept. of Geology, Miami University, Oxford, OH 45056, (513) 529-3216; Cindy Carney, Wright State University, Dayton; Don Gerace, Bahamian Field Station, San Salvador, Bahamas. Cost: \$760 (airfare to San Salvador, 3 B, 3 L, 3 D, 3 ON). Limit: 20. Trip begins and ends in Ft. Lauderdale, Florida. Trip travels to San Salvador, Bahamas. Cost includes an overflight. (Optional day trip, October 25, to Joulters, additional \$225.) Limit: 12.

This trip will begin at Ft. Lauderdale, Florida, where on day 1, participants will have a guided aerial tour of the Bahamas including Bimini, Great Bahama Bank lagoon, Joulters Cays ooid shoal, Schooner Cays ooid shoal, Eleuthera Island, Cat Island, and San Salvador. In the afternoon, participants can observe the variability of fauna and flora within lagoonal depositional environments by snorkeling, and Holocene transgressive dunes will be examined. On the second day, participants will see "geology from

the ocean" from a large dive boat and will study modern patch reefs—complete with crinoids. The third day will be devoted to the investigation of tidal creeks, stressed lagoons and interior ponds, tidal deltas, Holocene strand plains and beaches, and beachrock. Day 4 will bring participants directly back to Ft. Lauderdale in time to make their way to Cincinnati by mid-afternoon on Sunday. An optional field trip to Joulters Cays ooid shoal will be available on day 4; participants will return to Ft. Lauderdale in the early evening in time to make a late-night flight to Cincinnati.

4. Regional Aspects of Pottsville and Allegheny Stratigraphy and Depositional Environments, Ohio and Kentucky.

Saturday, October 24 through Sunday, October 25. Charles L. Rice, U.S. Geological Survey, 926 National Center, Reston, VA 22092, (703) 648-6938; Ronald L. Martino, Marshall University, Huntington, West Virginia; Ernie R. Slucher, Ohio Dept. of Natural Resources Division of Geological Survey, Columbus. Cost: \$96 (2 L). Limit: 40.

This field trip will examine basal Pennsylvanian strata of southern Ohio for comparison with those of northeastern Kentucky that show local variations of the Mississippian-Pennsylvanian unconformity, the character of some intra-Pennsylvanian diastems, and regional correlations of Middle Pennsylvanian stratigraphic units. Lithology and stratigraphy of the Pottsville Formation will be contrasted with that of the Allegheny Formation, emphasizing marine shales and limestones and commercial clay deposits in the coal and clay mining district of southern Ohio. Facies architecture of marine units will be discussed in terms of deposystem dynamics and relative sea level fluctuations. We will examine the sedimentology and paleoichnology of selected marginal marine facies, including heterolithic tidal rhythmites that show a hierarchy of thickening and thinning cycles, bipolar paleocurrents, and abundant trace fossils.

5. The Sangamonian-Wisconsinan Transition in Southwestern Ohio and Southeastern Indiana.

Sunday, October 25. C. Scott Brockman, Ohio Dept. of Natural Resources Division

of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224-1362, (614) 265-6473; Robert D. Hall, Indiana University/Purdue University at Indianapolis; Thomas V. Lowell, University of Cincinnati; Barry B. Miller, Kent State University. Cost: \$48 (1 L). Limit: 22. Trip will be repeated after the meeting, on October 30.

Nonglacial sediments and paleosols form important markers above and below glacial sediments, bracketing the transition between major glacial events. We will view this set of deposits at five well-known sites near Eaton and New Paris, Ohio, and Richmond and Connersville, Indiana. New analyses of paleosols, carbon-14 dates, amino acid ratios, and till facies relations refine and challenge stratigraphic interpretations and Pleistocene history, centered on the Sangamonian-Wisconsinan transition, that have stood for 30 years in this area. Some sections have moderately difficult access and require waterproof boots.

6. Geological Aspects of Key Archaeological Sites in Northern Kentucky and Southern Ohio.

Saturday, October 24 through Sunday, October 25. Sponsored by the Archaeological Geology Division. Timothy S. Dalbey, Dept. of Anthropology, Southern Methodist University, Dallas, TX 75275, (817) 334-2625; Ken Tankersley, Research and Collection Center, Springfield, Illinois. Cost: \$107 (1 B, 2 L, 1 D, 1 ON). Limit: 42.

The first day of this trip includes the sites of Big Bone Lick (Kentucky), Shawnee Lookout, Miamisburg Mound, Sun-Watch, Ohio Historical Center, Newark Earthworks, Flint Ridge, and Dillon State Park. The second day will cover Hocking Hills Gorge, Ash Cave (rigorous hike) and Conkle's Hollow, Mound City, Story Mound (Adena), Seip Mound, Serpent Mound, Fort Hill (optional, very rigorous hike), and travel through the Wisconsin Cuba end moraine to Fort Ancient. This is a rigorous schedule, and the two optional stops depend on the time we take at other stops.

7. Karst and Cave Systems in the Stones River Group, Central Tennessee.

Thursday, October 22 through Saturday, October 24. Ray C. Gilbert, Tennessee Division of Geology, Room B30, 701 Broadway, Nashville, TN 37243-0445, (615) 742-6703; Nicholas Crawford, Western Kentucky University, Bowling Green; Patricia Thompson, DRE Consultants, Franklin, Tennessee. Cost: \$88 (2 B, 2 L, 2 D, 2 ON). Limit: 40. Trip begins and ends in Nashville, Tennessee.

This trip will examine features associated with the Snail Shell cave system, an extensively studied and well-known karst hydrologic system that covers several square miles of the central basin of Tennessee near Murfreesboro in Rutherford County. This karst system is located near the crest of the Nashville dome and is developed in the Middle Ordovician carbonate rocks of the Stones River Group. We will discuss the hydrologic, structural, and stratigraphic relations of the karst system and the diverse subsurface drainage features evident in the area.



Decemented, highly permeable sandstone of Bethel Formation (Mississippian) of submarine channel fill near Tip Top, Hardin County, Kentucky. Photo by Paul Potter, University of Cincinnati.

8. Ordovician, Silurian, and Middle Devonian Stratigraphy in North-western Kentucky and Southern Indiana—Some Reinterpretations.

Saturday, October 24 through Sunday, October 25. James E. Conkin, Dept. of Geology, University of Louisville, Louisville, KY 40292, (502) 588-6821; Barbara M. Conkin, Jefferson Community College, Louisville, Kentucky; John Kubacko, Jr., Park Aerial Services Inc., Louisville, Kentucky. Cost: \$100 (2 L, 1 D, 1 ON). Limit: 40.

This trip will focus partly on reinterpretations of the Middle-Late Ordovician boundary and the Middle Silurian Laurel-Waldron and Waldron-Louisville boundaries. It will include treatment of the lithostratigraphy of the Louisville Limestone and Silurian-Devonian-type paraconformity. The trip will also cover the detailed stratigraphy of Middle Devonian formations, including biozones, paraconformities, bone beds, and metabentonites (Kawkawlin, Onondaga, Indian Nation, Lake Chelan, and Tioga). There will be opportunities and time to collect macrofossils (including attached crinoid bases) and microfossils (including forams, charophytes, and conodonts). Bone beds and metabentonites may be sampled as well.

9. Cincinnati's Geologic Environment: A Trip For Secondary School Science Teachers.

Sunday, October 25. Sponsored by the *Engineering Geology Division*. William Haneberg, New Mexico Bureau of Mines and Mineral Resources, Socorro, NM 87801, (505) 835-5808; Mary Riestenberg, College of Mt. St. Joseph, Mt. St. Joseph, Ohio; Richard Pohana, H. C. Nutting Co., Cincinnati. Cost: \$42 (1 L). Limit: 50. (Registration for secondary school teachers only.)

Secondary school science teachers are invited to participate in a one-day overview of Cincinnati's geologic environment and its impact on human activities. Topics will include bedrock geology and Paleozoic history; surficial deposits and Quaternary geologic history; modern-day hillside processes along the Ohio River valley; the economic consequences of landslides; ground water resources; and geologic considerations in landfill siting. There will be ample opportunities for fossil collecting and photography. No previous geological training is required, but sturdy walking shoes or boots are recommended.

Half-Day Mini Trips

(held during the meeting)

10. Geologic Glimpses from Around the World: The Geology of Monuments in Woodland Cemetery and Arboretum, Dayton, Ohio.

Monday, October 26 (afternoon). Sponsored by the *History of Geology Division*. Michael R. Sandy, Dept. of Geology, University of Dayton, Dayton, OH 45469-2364, (513) 229-2952. Cost: \$23. Limit 40.

This half-day trip will examine some of the igneous, sedimentary, and metamorphic rocks used in the monuments and buildings of Woodland Cemetery and Arboretum, which was established in 1841. The polished surfaces of many monuments provide excellent opportunities to examine their composition and textures and to consider their geologic histories. The graves of some preeminent Daytonians, including the Wright Brothers, Paul Lawrence Dunbar, and the paleontologist August Foerste, will also be visited.



Thick section of Cratonic Turbidites of the Borden Formation (Mississippian) on Highway 546, east of Vanceburg, Lewis County, Kentucky. Photo by Paul Potter, University of Cincinnati.

11. Excursion to Caesar Creek State Park in Warren County, Ohio: A Classic Upper Ordovician Fossil Collecting Locality.

Wednesday, October 28 (afternoon). Douglas L. Shrake, Ohio Dept. of Natural Resources Division of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224-1362, (614) 265-6473. Cost: \$26 (1 L). Limit: 135.

This half-day trip will take participants to Caesar Creek State Park in Warren County, Ohio. This site is a classic locality that is noted for abundant and well-preserved Upper Ordovician (Richmondian) fossils. More than 30 species of macrofossils and ichnofossils have been found here, including three species of trilobites. Appropriate field attire is recommended. Physical exertion level is very low. If possible, participants should bring their own sample containers. Trip will be suitable for spouses and children.

12. Rumpke Sanitary Landfill.

Thursday, October 29 (morning). Sponsored by the *Institute for Environmental Education*. A. Dwight Baldwin, Jr., Dept. of Geology, Miami University, Oxford, OH 45056, (513) 523-5624. Cost: \$10. Limit: 60.

This half-day field trip will visit the Rumpke 450-acre landfill in northern Hamilton County, approximately 15 miles north of downtown Cincinnati. The landfill is Ohio's busiest and one of the nation's largest, accepting over 5,000 tons of municipal solid waste daily. The filling area utilizes recompacted clay liners and subterranean leachate collection systems. The site also has a methane extraction plant that is one of the most advanced in the nation.

The tour of the landfill will be preceded by a brief slide presentation of the facility's operations and a question-and-answer session with in-house geologists. The presentation will emphasize the hydrogeologic and geotechnical considerations that are an integral part of the landfilling operations.

Postmeeting

13. Mississippian Paleosols, Paleokarst, and Eolian Carbonates in Indiana.

Friday, October 30 through Saturday, October 31. Sponsored by the *Sedimentary Geology Division*. Donald E. Hattin and J. Robert Dodd, Dept. of Geological Sciences, Indiana University, 1005 E. Tenth St., Bloomington, IN 47405, (812) 855-8232; Cost: \$130 (1 B, 2 L, 1 D, 1 ON). Limit: 44. (Also see technical sessions and short courses.)

Participants in this trip will examine evidence for sea-level fluctuation and sequence stratigraphy in the St. Louis and Ste. Genevieve Limestones of southern Indiana. On the first day the field party will observe limestone units consisting of marine-derived carbonate sand grains reworked by eolian processes, paleosols, and exposure features in the Ste. Genevieve Limestone near Corydon, Indiana. Also in the Ste. Genevieve we will view an oolitic sand shoal underlain and capped by exposure surfaces. On the second day we will see exposure features including calcrete, mud cracks, brecciation, and rhizocretions in the upper Ste. Genevieve and lower St. Louis Limestone. At the last stop of the trip we will see a spectacular buried paleokarst system and other sub-aerial exposure features displayed along the wall of a deep canyon cut into the St. Louis Limestone. Collection of samples and use of hammers will not be permitted at stop 6, which is in a state park.

14. Fort Payne Carbonate Facies of South-Central Kentucky.

Thursday, October 29 through Saturday, October 31. David L. Meyer, Dept. of Geology, University of Cincinnati, Cincinnati, OH 45221, (513) 556-4530; William I. Ausich, Ohio State University, Columbus. Cost: \$194 (2 B, 2 L, 2 D, 2 ON). Limit: 35.

Paleoecology, taphonomy, and depositional environments of the Lower Mississippian Fort Payne Formation are the objective of this trip, where the spectacular exposures along Lake Cumberland will be studied by boat. In south-central Kentucky, the Fort Payne is lithologically heteroge-

neous and richly fossiliferous. Of special interest are the carbonate buildups, which include crinoid packstone buildups and wackestone buildups interpreted to be examples of the Waulsortian facies.

15. Changing Interpretations of Kentucky Geology: Layer-Cake, Facies, Flexure, and Eustasy.

Friday, October 30 through Sunday, November 1. Frank R. Etensohn, Dept. of Geological Sciences, University of Kentucky, Bowman Hall, Lexington, KY 40506-0059, (606) 257-3758; Donald R. Chesnut, Kentucky Geological Survey, Lexington; Steve Barnett, Bryan College, Dayton, Tennessee. Cost: \$182 (2 B, 3 L, 2 D, 2 ON). Limit: 40.

This is the University of Kentucky Department of Geological Sciences' Centennial Field Trip. The rather staid "layer-cake" interpretation of Kentucky and mid-continent geology is continually being challenged. Participants on this three-day trip will examine some of Kentucky's more typical and atypical Ordovician-Pennsylvanian units in light of these challenges. Emphasis will be on models suggesting that many of the units reflect local and regional facies variations resulting from the interaction of basement structures with flexural movements of the lithosphere and with eustasy. We will suggest that such flexural movements can be related both to local examples of synsedimentary tectonism and to the regional far-field-tectonic effects of coeval orogenies.

16. Building Stone in Three Ohio Cities: Cincinnati, Columbus, and Cleveland.

Thursday, October 29 through Saturday, October 31. Joseph T. Hannibal, Cleveland Museum of Natural History, 1 Wade Oval Drive, Cleveland, OH 44106-1767, (216) 231-4600; Richard A. Davis, Cincinnati Museum of Natural History; Ruth Melvin; Garry D. McKenzie, Ohio State University, Columbus; Mark T. Schmidt, Woodward-Clyde Consultants, Solon, Ohio. Cost: \$127 (1 B, 2 L, 1 D, 1 ON). Limit: 40. Trip ends in Cleveland, Ohio.

Many types of dimension stone, including Berea Sandstone, Columbus

Limestone, and Massillon Sandstone, have been used for buildings and monuments constructed in Ohio during the past 150 years. Stone from other North American localities and Europe have also been used in Ohio structures. We will examine a great variety of these stones, used in classic buildings as well as modern skyscrapers, in the downtown areas of Cincinnati, Columbus, and Cleveland. A visit to an active dimension-stone quarry is also planned.

17. Sangamonian-Wisconsinan Transition in Southwestern Ohio and Southeastern Indiana.

Friday, October 30. C. Scott Brockman, Ohio Dept. of Natural Resources Division of Geological Survey, 4383 Fountain Square Drive, Columbus, OH 43224-1362, (614) 265-6473; Robert D. Hall, Indiana University/Purdue University at Indianapolis; Thomas V. Lowell, University of Cincinnati; Barry B. Miller, Kent State University. Cost: \$48 (1 L). Limit: 22. Trip will also be run before the meeting on October 25.

Nonglacial sediments and paleosols form important markers above and below glacial sediments, bracketing the transition between major glacial events. We will view this set of deposits at five well-known sites near Eaton and New Paris, Ohio, and Richmond and Connersville, Indiana. New analyses of paleosols, carbon-14 dates, amino acid ratios, and till facies relations refine and challenge stratigraphic interpretations and Pleistocene history, centered on the Sangamonian-Wisconsinan transition, that have stood for 30 years in this area. Some sections have moderately difficult access and require waterproof boots.

18. Structure and Tectonics of the Rough Creek Graben, Western Kentucky and Southeastern Illinois.

Thursday, October 29 through Saturday, October 31. Donald K. Lumm and W. John Nelson, Illinois State Geological Survey, Natural Resources Building, 615 E. Peabody Dr., Champaign, IL 61820-6964, (217) 244-2428. Cost: \$174 (2 B, 2 L, 1 D, 2 ON). Limit: 44.

Structures of tensional and compressional origin as well as tectonically influenced sedimentary features will be examined in several roadcuts and quarries. The structures are formed in Carboniferous strata and exhibit evidence for two or more episodes of movement. The features are related to the late Paleozoic reactivation of the Reelfoot Rift aulacogen and its eastward extension, the Rough Creek graben. The trip will conclude either at the Greater Cincinnati International Airport or in Cincinnati.

Other Field Trips

SEG-Sponsored

Final preregistration deadline for SEG field trips is Friday, September 11, 1992; final payment is due October 1. To reserve a place, send a deposit of \$50 per person to the field trip leader at the address shown for each trip. Numerous SEG members have already expressed interest in these trips. To hold your place, get your deposit in early!

Keweenaw Copper Deposits of Western Upper Michigan.

Tuesday, October 20 (evening) through Friday, October 23 (evening). Theodore J. Bornhorst, Dept. of Geological Engineering, Geology, and Geophysics, Michigan Technological University, Houghton, MI 49931, (906) 487-2721; William

Cannon, U.S. Geological Survey, Reston; Jeffrey Mauk, University of Michigan, Ann Arbor. Cost: \$350 (members and students), and \$375 (nonmembers). (3 B, 3 L, 3 D, 4 ON.) Trip begins and ends in Houghton, Michigan. Limit: 30.

This field trip will focus on the Mid-continent Rift System as the geologic setting for the native copper deposits of the Keweenaw Peninsula (epigenetic, stratabound, lava flow top and intraflow sediment-hosted native copper) and the White Pine copper deposit (classic sediment-hosted copper deposit with superimposed structurally controlled copper mineralization). Planned stops include underground tours of the White Pine and Caledonia Mines, drill core displays, and surface stops to view rift characteristics. Lectures about the rift geology and world-class White Pine and Keweenaw deposits will be presented in the evenings.

Zinc Deposits In East Tennessee.

Thursday, October 29 (afternoon) through Sunday, November 1 (afternoon). Kula Misra, Dept. of Geological Sciences, University of Tennessee, Knoxville, TN 37796-1410, (615) 974-2366; Robert E. Fulweiler, Tennessee Division of Geology, Knoxville. Cost: \$325 (members and students), and \$350 (nonmembers). (3 B, 2 L, 1 D, 3 ON, bus transportation to and from Knoxville.) Limit: 27.

This trip will focus on the stratigraphic setting and nature of mineralization of Mississippi Valley-type zinc deposits hosted in the Upper Knox (Lower Ordovician) carbonates. Planned stops include: Young Mine, the largest in the Mascot-Jefferson City zinc district, and its mill; the Mossy Creek open cut, the first zinc mine in the district; surface tour of the inactive Idol Zinc Mine (Copper Ridge zinc district); and (time permitting) the Ballard open pit (Sweetwater barite-fluorite district). Distinct mineralization will be seen in the New Prospect Mine (Powell River district), where lead is present in faults and shear zones in the lowermost Knox (Copper Ridge Dolomite, Cambrian) and the underlying Maynardville Limestone. The Thornhill section, comprising well-exposed rocks from the Lower Cambrian Rome Formation to the Lower Mississippian Grainger Formation, will provide an excellent overview of the regional stratigraphy.

Keck-Sponsored

Cyclic Sedimentation and Sequence Stratigraphy of a Storm-Dominated Carbonate Ramp: Kope and Fairview Formations of the Cincinnati Region.

Sunday, October 25. Thomas J. Algeo, Fisk Laboratory of Sedimentology, Dept. of Geology, University of Cincinnati, Cincinnati, OH 45221-0013, (513) 556-4195; Ben Datillo; Sharon Diekmeyer. For information: Henry H. Woodard, Keck Consortium Coordinator, Dept. of Geology, Beloit College, Beloit, WI 53511, (608) 363-2222. *Participation limited to faculty and students of the Consortium.*

The trip will examine lithologic and faunal cyclicity within the Upper Ordovician Kope and Fairview formations in light of recent interpretations of the sequence as a record of storm-dominated carbonate-ramp sedimentation. The interplay of eustatic and climatic factors in the development of multiple orders of cyclicity will be considered. Recent work indicating that meter-scale cyclicity within the formations formed through orbital forcing of the climate system at Milankovitch periodicities will be reviewed.

THE VOYAGE CONTINUES

From Columbus to Magellan

Meet the GSA Congressional Science Fellow

Wednesday, October 28, 12:15 to 1:15 p.m.; Cincinnati Convention Center. Sponsored by the GSA Geology and Public Policy Committee.

The Congressional Science Fellowship program places scientists on the staffs of numerous congressional offices. While gaining first-hand experience with the legislative process, Congressional Fellows assist in the analysis of public policy issues by providing scientific and technical expertise.

As GSA's sixth Congressional Science Fellow, Kenneth B. Taylor has spent one year working in the Office of U.S. Senator Harry M. Reid (D-NV). Some

of the issues that Taylor has dealt with are site characterization and federal support of research development.

At this open session sponsored by the GSA Geology and Public Policy Committee, Taylor will tell of his experiences on the Hill, and attendees will have an opportunity to learn more about the program. Previous Congressional 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.

Science Theater

Monday, October 26 through Wednesday, October 28, 9:00 a.m. to 4:00 p.m., and Thursday, October 29, 9:00 a.m. to 3:00 p.m.; Cincinnati Convention Center.

Science Theater 1992 will feature a host of new video programs, as well as repeating the best of those you regret having missed last year. In addition to the broad range of usual geologic topics, there will be programs on space exploration and images of Earth from space in accordance with the theme of the 1992 meeting, "Discovery: From Columbus to Magellan." High school earth science teachers will find many videos of interest. There will be programs on El Niño; the backward flow of the Amazon; symmetry in art, nature, and molecules; reservoir geophysics; and preservation of geoscience imagery.

Video buffs, on the other hand, will be interested in many of the informative and colorful programs on acid rain, volcanoes, oil from space, dinosaurs, earthquakes, mountain building, and other topics of broader geologic interest. We will also be previewing a new 26-part geology course and public television series, "EARTH REVEALED," and we hope to stage Science Theater demonstrations of two emerging video technologies. Science Theater has something for everyone.

Support for the Science Theater has come through a gift from the Annenberg/CPB Project.



GSA and the University of Cincinnati Host Top Seniors

GSA and the University of Cincinnati will be sponsoring a group of top undergraduate seniors during the meeting. Arrangements have been made by GSA to fund housing and registration fees for these select Top Seniors. The University of Cincinnati will serve as host to these seniors by providing a local field trip and assistance as needed. Travel expenses will be paid for by the student's university.

The project is meant to expose the best and brightest of the seniors to broader visions in geology and to provide them with the opportunity to meet others who have chosen the field of geology as their career. The program has been, by

necessity, carried out by invitation only, and 30 Top Seniors for 1992 have been chosen. Those schools that participated in 1991 were not included in the invitation list for 1992. Students chosen for 1992 were selected on a first-come, first-served basis.

Funding has been provided by GSA, and by the University of Cincinnati and other local sponsors. If you wish to assist with financial sponsorship for these students, please contact the Top Seniors Chairman, Craig Dietsch, Dept. of Geology, University of Cincinnati, Cincinnati, OH 45221-0013, (513) 556-2547, or Kathy Ohmie Lynch, GSA headquarters.

Introducing the 1992 Exhibitors: Discover New Technologies

Cincinnati Convention Center South and West Halls



Cincinnati Convention Center.
Courtesy of Cincinnati Convention &
Visitors Bureau.

Beginning with the Welcoming Party on Sunday evening, the exhibits will offer a world of discoveries! See demonstrations of the latest in computers and software for the geosciences, as well as scientific instrumentation, microanalysis, and camera equipment. Explore the many displays of publications, maps, and other educational materials. Discover new gems, jewelry, and mineral and fossil specimens. Pick up some new field equipment and supplies. Visit with

representatives from universities and educational organizations about their current programs. Check on the most recent governmental programs and projects such as air-quality and waste management.

With dedicated support of GSA's exhibitors, the size of the exhibits has more than doubled since GSA met in Cincinnati in 1981! Don't miss this opportunity to meet them!

Sunday	Monday	Tuesday	Wednesday	Thursday
October 25	October 26	October 27	October 28	October 29
6:00 p.m. to 9:00 p.m.	8:00 a.m. to 5:00 p.m.	8:00 a.m. to 5:00 p.m.	8:00 a.m. to 3:00 p.m.	Not Open

Food and Beverage Service available in the Exhibit Hall during all exhibit hours.

Meeting Exhibitors

As of July 15, 1992

Academic Press, Inc.
Activation Laboratories Limited
Allen Press, Inc.
American Association of Petroleum Geologists (AAPG)
American Geological Institute
American Geophysical Union
American Institute of Physics
American Institute of Professional Geologists
American Journal of Science
ASC Scientific
Association of American State Geologists
Bermuda Biological Station for Research, Inc.
Blackwell Scientific Publications, Inc.
Bowling Green State University
Buehler Limited
Bureau of Economic Geology
Cal Graeber Minerals
Cambridge University Press
Center for Applied Energy Research—University of Kentucky
Center for Ground Water Management—Wright State University
Chapman & Hall
Cincinnati Museum of Natural History
Columbia University Press
Council for Undergraduate Research
Cushman Foundation for Foraminiferal Research
Dapple Systems
Desert Research Institute
Donald K. Olson & Associates
Earth'nWare
Economic Geology Publishing Company
EiChrom Industries, Inc.
Elsevier Science Publishing Company, Inc.

Encyclopaedia Britannica North America
ESRI—Environmental Systems Research Institute
Europa Scientific Limited
Finnigan MAT
Fisons Instruments
Forestry Suppliers, Inc.
Friendship Publications
General Supply Corporation
Geochemical Society
Geographics
Geological Society of America—1993 Annual Meeting
Geological Society of America—Bookstore
Geological Society of America—Combined Publishers Display
Geological Society of America—Foundation and Public Policy Committee
Geological Society of America—Journals on Compact Disk
Geological Society of America—Planetary Geology Division
Geological Society of America—SAGE Program
Geology Stuff
Geoscience Information Society
Geotech Computer Systems, Inc.
HBJ/Saunders College Publishing
Howard Minerals
Ikon Mining & Exploration
Indiana Geological Survey
Institute for Mining and Minerals Research
J C P D S—I C D D
J.L. Darling Corporation
JEOL USA, Inc.
Jet Propulsion Laboratory

Joint Oceanographic Institute/US Science Support Program
Kendall/Hunt Publishing Company
Kentucky Geological Survey
Kluwer Academic Publishers
Krueger Enterprises, Inc.
Leco Corporation
Leica, Inc.
Logitech Products of Struers, Inc.
Louisiana State University
Lubrecht and Cramer Limited
Macmillan Publishing Company
Mineralogical Society of America
Mountain Press Publishing Company
NASA/Solar System Exploration Division
National Association of Geology Teachers
National Earth Science Teachers Association
National Research Council/National Academy of Sciences
National Science Foundation
Nature's Own
Nikon Inc., Instrument Group
Ohio Geological Survey
Ohio State University
Oklahoma Geological Survey
Omni Resources, Inc.
Ontario Geological Survey
Oxford University Press
Paleomap Project—U.T. Arlington
Paleontological Society
Pennsylvania Geological Survey
Pergamon Press, Inc.
Peterson-Scully Studios
Philips Electronic Instruments Company
Plenum Publishing Corporation
Prentice Hall
Princeton University Press

Project PANGEA
Rigaku, USA
Rocklabs
S E P M (Society for Sedimentary Geology)
Schonstedt Instrument Company
Scintag, Inc.
Siemens Analytical X-Ray Instrument
Sigma Gamma Epsilon
Society of Economic Geologists
Spectrex Corporation
Spex Industries, Inc.
Springer-Verlag New York, Inc.
Texas A&M University
THE Company
University of Akron
University of Chicago Press
University of Cincinnati
University of Idaho
University of Kentucky
University of Oklahoma
University of Toledo
University of Wyoming
US Bureau of Mines
US Department of Energy-Yucca Mountain Project
US Department of Energy/E R & W M
US Department of Energy/OCRWM
US Geological Survey
Van Nostrand Reinhold
W.H. Freeman & Company
Washington State University
West Publishing Company
Wildlife Supply Company
Wiley & Sons, Inc., John
William C. Brown Publishers
Williams & Heintz Map Corporation
Wright State University
X-Ray Assay Laboratories

Professional Horizons

GSA-Sponsored Short Courses

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

Registration for the meeting is not required. Preregistration is recommended; on-site is \$25 additional. You may register for GSA courses on the Annual Meeting Preregistration Form. Registration substitutions may be made at any time.

**PREREGISTRATION DEADLINE:
SEPTEMBER 25**

Cancellation Deadline: October 2

**FOR MORE INFORMATION
CONTACT EDNA COLLIS, GSA
SHORT COURSE COORDINATOR**

1. Geographic Information System Software: Facts and Fiction.

Friday, October 23 through Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center.

GIS software is used extensively in academia to complete research work; in government to manage, analyze, and display spatial information; and in industry to explore and develop mineral, forest, agriculture, and land resources as well as for environmental applications. This workshop will provide a technical forum where attendees will learn about GIS software capabilities and see actual demonstrations provided by vendors. Before the workshop, GIS software vendors will be invited to participate, and will be given a choice of data sets and a set of problems to complete. Vendors will be required to submit a set of deliverables based on the problem set(s). Three data sets will be provided, and vendors can choose to work with any or all of the information. The data will cover petroleum, mining, and environmental applications.

- Day One—Introduction to the various GIS applications including maps, spatial information, earth science usage, examples of GIS, GIS components; data input and output; data sources, quality, and errors; spatial data models; DEMs; data management; GIS analysis functions; methods of data analysis and spatial modeling and interpolation; selecting and implementing GIS; sources of GIS; training needs for GIS personnel; pitfalls of selecting, installing, and using GIS; and, capabilities of public domain and commercially available GIS.
- Days Two and Three—The vendors will demonstrate how they analyzed the data set(s).

Faculty: **Stephen A. Krajewski**, Vice-President, Industrial Ergonomics, Inc., Denver, Colorado; Ed.D., Pennsylvania State University. For the past eight years, Krajewski's work has focused on helping end-users select, install, and use microcomputers and technical applications software for geological, geophysical, engineering, and environmental applications. He has conducted workshops on micro-computer applications for several professional societies and for industries both

in the United States and abroad. **Betty Gibbs**, President, Gibbs Associates, Boulder, Colorado; M.S., Colorado School of Mines. Since the early 1970s Gibbs has worked with mining companies as an engineer specializing in computer applications. Through her engineering career in surface and underground mining operations she has emphasized development of computer programs for mining applications and has used numerous commercial programs. Since 1982 she has evaluated in detail more than 50 programs for a variety of mining-related computer programs. Gibbs writes columns and articles on computer applications for a wide variety of mining and related publications, as well as her own publications. As a consultant since 1982, Gibbs has provided computer-related services or information to more than 400 companies.

Limit: 50. Fee: \$275, students \$255; includes course manual and lunch all three days.

2. How To Do Anything with Mohr Circles (Except Fry an Egg): A Short Course About Tensors for Structural Geologists.

Saturday, October 24, 8:00 a.m. to 5:00 p.m. and Sunday, October 25, 8:00 a.m. to 12:00 noon; Cincinnati Convention Center. Cosponsored by the *Structural Geology and Tectonics Division*.

This course is a hands-on exercise, in which participants will make their way through a short course workbook, with the help of the instructor. It is intended for students and teachers of structural geology who know what a vector is but who have little or no understanding of second-order tensors. Tensors abound in structural geology, but there is hardly any room for instruction about them in typical geology curricula. This course presents a Mohr circle approach to the subject that is believed to be an efficient teaching approach, and rich in practical applications. Geometry is put before algebra, matching the bent of many structural geologists. Topics to be covered include:

- the general nature of tensors,
- the universality of Mohr circles for tensors,
- the finite deformation tensor,
- the velocity gradient tensor,
- the stress tensor,
- the tensor transformation rule,
- Mohr diagrams for three-dimensional tensors.

Faculty: **Winthrop D. Means**, Dept. of Geological Sciences, State University of New York at Albany; Ph.D., University of California, Berkeley. Means is the author of an elementary text on stress and strain theory (1976, Springer-Verlag) and co-author of a structural geology textbook (1976, Wiley). His research centers around the development of microstructure in deforming materials, using deformation apparatus mounted on a microscope stage. He has been among geologists publishing papers over the past ten years that have exploited Mohr's diagram and considerably enlarged its application.

Limit: 30. Fee: \$150, students \$130; includes two course manuals and lunch on Saturday.



Sand waves at bridge over Mill Creek, Cincinnati, Ohio. Photo by Paul Potter, University of Cincinnati.

3. Introductory Rock and Paleomagnetism.

Saturday, October 24, 8:00 a.m. to 5:00 p.m. and Sunday, October 25, 8:00 a.m. to 12:00 noon; Cincinnati Convention Center. Cosponsored by the *Geophysics Division*.

Paleomagnetism is one of the most broadly applicable disciplines in geophysics, having uses in such diverse fields as geomagnetism, tectonics, paleoceanography, and sedimentology. Although the potential applications are quite varied, the fundamental techniques are remarkably uniform. Thus, a grounding in the basic tools and theory can open the door to a great many of the applications of paleomagnetic techniques. This introductory level course will cover the following material:

- introduction—review of the general properties of Earth's magnetic field and paleomagnetic coordinate systems,
- rock magnetism—sketch of the basis for understanding how rocks get and stay magnetized, beginning with the response of all materials to external magnetic fields and extension of this theory to understanding the behavior of permanently magnetized materials,
- field and laboratory techniques—description of the techniques used from field sampling to measuring of a variety of paleomagnetic data,
- paleomagnetic tricks—statistical analysis of the data and an overview of paleomagnetic plotting preferences,
- tectonic applications—summary of the most prevalent applications of paleomagnetic techniques to tectonic studies including apparent polar wander and continental drift, microplate studies, and the potential for assessing tectonic strain using the anisotropy of magnetic parameters,

- stratigraphic applications—techniques of magnetostratigraphy and environmental magnetism. We will review the origin of the geomagnetic reversal time scale and potential uses of the magnetostratigraphic technique.

Faculty: **Lisa Tauxe**, Scripps Institution of Oceanography, La Jolla, California; Ph.D., Columbia University. Tauxe has been an active researcher and educator in the field of paleomagnetism since 1983. She is currently an Associate Professor of Geophysics at Scripps and teaches several classes to undergraduates in addition to advanced classes and seminars for graduate students.

Limit: 40. Fee: \$150, students \$130; includes course manual and lunch on Saturday.

4. Environmental/Engineering Geology and Land-Use Planning—An Interface Between Science and Regulations.

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center. Cosponsored by the *Engineering Geology Division*.

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

This course is aimed at those who are interested in understanding the use of geologic principles in the regulatory context of land-use planning. Its purpose is to develop an improved understanding of how geologic principles and simple data-gathering techniques can be incorporated into or guide land-use regulations. One emphasis will be upon concepts and sources of information. Another will be

on information required for various types of land-use regulations and how this information can be applied to specific cases. Because of time constraints, a limited number of examples will be discussed, but from these should come an appreciation of broad principles. Topics covered include:

- NEPA and environmental impact statements—use and misuse,
- land-use planning in the broad context together with concepts of land capability, the coastal environment,
- slopes and land-use regulations—approaches,
- waste disposal—solid, low-level radioactive, and sewage,
- urban runoff—what do principles of sedimentation and geomorphology tell us?
- ground water—availability, long-term supply, conjunctive use, and protection,
- provision for building materials.

The ultimate objective of this course is to provide for the participants' insight into how they may develop appropriate approaches to the solution of land-use planning problems in their respective communities.

Faculty: **Charles W. Welby**, Dept. of Marine, Earth, and Atmospheric Sciences, North Carolina State University; Ph.D., Massachusetts Institute of Technology. During the past 20 years, Welby has taught an upper division course, Environmental Geology, and served on several municipal and county boards and task forces dealing with the land-use planning matters and development of regulations. He is currently Chairman of the Engineering Geology Division of GSA and Chairman of the North Carolina Radiation Protection Commission. **Jerome V. DeGraff**, Forest Geologist, USDA Forest Service; M.S., Utah State University. DeGraff has spent the past 15 years providing geology input to land-use issues in national forests in Utah and California. More recently, he has served as a technical specialist to governmental and international agencies involved with regional development issues in developing countries. He is chairman-elect of the Engineering Geology Division and manager of the Landslide Committee of the Association of Engineering Geologists.

Limit: 50. Fee: \$130, students \$110; includes course manual and lunch.

5. Paleosols for Sedimentologists.

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center. Cosponsored by the *Sedimentary Geology Division*. (Also see technical sessions and field trips.)

ATTENTION STUDENTS: The Sedimentary Geology Division will SUBSIDIZE ALL STUDENTS WHO ARE VALID DIVISION MEMBERS. The student MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed \$50 after the GSA meeting by the Division. To be reimbursed, students must apply in writing to: Mary J. Kraus, Dept. of Geology, University of Colorado, Boulder, CO 80309-0250.

This course is intended as an introduction for sedimentologists and stratigraphers who are concerned primarily with pre-Quaternary siliciclastic depositional systems and basin analysis but have little or no previous experience with paleosols. The course focuses on the fundamental aspects of paleosol description, recognition, and interpretation, concentrating on field and petrographic features, key terminology, and utility of paleosols for reconstructing basin history and paleoclimate.

Participants will have ample opportunity to examine pedogenic features in

hand sample and thin section, as well as representative profiles of soils and paleosols. Specific topics to be covered are:

- description and recognition of basic pedogenic features, such as root traces, peds, cutans, and nodules,
- identification and origin of master soil and paleosol horizons, including A, E, spodic B, oxic B, vertic B, argillic B, calcic B, and C,
- classification of paleosols,
- variables controlling soil and paleosol development and preservation, such as composition and grain size of parent, landscape variability, climate, time, and diagenesis,
- case study of the interpretation of Pliocene-Pleistocene paleoclimate using field, petrographic, and isotopic characteristics of paleosols of the southern Rio Grande rift,
- case study of the role of tectonics on the development of paleosols in Pliocene-Pleistocene alluvial-fan and fluvial strata of the southern Rio Grande rift.

Faculty: **Greg H. Mack**, Dept. of Earth Sciences, New Mexico State University, Las Cruces; Ph.D., Indiana University. Mack specializes in interpretation of the influence of tectonism and paleoclimate on depositional environments of Phanerozoic siliciclastic sediment. His current research involves the use of paleosols to interpret Permian, Cretaceous, and late Tertiary paleoclimate. **W. Calvin James**, Dept. of Geological Sciences, Ohio State University, Columbus; Ph.D., Indiana University. James's research focuses on the modification of siliciclastic rock texture and composition by pedogenic and early diagenetic processes. His current research includes pedogenesis and early diagenesis of nonmarine sedimentary rocks of the Rio Grande rift.

Limit: 30. Fee: \$180, students \$160; includes course manual and lunch.

6. Phase I—Preliminary Site Assessments (PSAs).

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center.

This course is designed for entry-level professionals in the environmental field (i.e., geologists, hydrogeologists, and environmental scientists) who are interested in learning about the importance of conducting PSAs as well as how they are conducted. Attendees will learn how to evaluate a property to assess whether it is or could be contaminated (soils and/or ground water). Attendees will address important considerations relating to approach and rationale for identifying environmental knowns about a subject property and how to use available hydrogeologic-geologic and public domain information to identify or speculate on potential unknowns. This course will present general concepts technical professionals should know to meet expected "due diligence" requirements. Topics covered:

- what are Phase I Preliminary Site Assessments?,
- why are Phase I Preliminary Site Assessments performed?,
- environmental regulations (overview),
- liability issues,
- who requests Phase I Preliminary Site Assessments?,
- who performs Preliminary Site Assessments?,
- how are Phase I Preliminary Site Assessments performed?,
- reporting requirements,
- case studies.

Faculty: **Jeffrey L. Peterson**, Environmental Manager, GeoStrategies, Inc.,

Hayward, California; M.S., California State University. Currently Peterson's responsibilities include technical guidance and mentorship to the more than 30 professional geologists, hydrogeologists, engineers, and environmental scientists employed at GeoStrategies. Peterson is a registered professional geologist, a registered environmental assessor, and a certified environmental inspector. He has been an instructor at the University of California—Extension, Santa Cruz, in the Hazardous Materials Certification Program, and is a contributing author of the book *Principles of Contaminant Hydrogeology*. Limit: 40. Fee: \$155, students \$135; includes course manual and lunch.

7. Practical Tracing of Ground Water, with Emphasis on Karst Terranes.

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center. Cosponsored by the *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 Division.

Aimed at the professional geologist or hydrologist, this course will introduce participants to the applications of tracer tests and the practical mechanics of how to conduct ground water tracing tests in karst terranes, granular aquifers, and fractured rocks, as well as how to select the most appropriate tracer, how to interpret tracer tests that are positive, and how to interpret those that are negative. Greatest emphasis will be on terranes in limestone. Topics covered:

- principles of tracing,
- toxicity of tracers,
- cost of tracer investigations,
- simultaneous use of several tracers,
- interpretation of tests in which tracer is recovered,
- sources of tracers,
- introduction to fluorescent dyes,
- introduction to other tracers,
- applications of tracing to ground water monitoring,
- case studies.

Faculty: **James F. Quinlan**, Quinlan & Associates, Nashville, Tennessee; Ph.D., University of Texas at Austin. Quinlan is a self-employed consulting hydrogeologist. Previously, for 16 years, he was a Research Geologist for the National Park Service at Mammoth Cave, Kentucky. Quinlan has worked in karst terranes of more than 26 states, Puerto Rico, Guam, and 23 foreign countries. He is author or co-author of more than 180 publications on karst-related topics and tracing. He and co-author Ralph Ewers received the GSA Engineering Geology Division's E.B. Burwell, Jr. Award in 1986 for a paper on the principles of ground water monitoring in karst terranes.

E. Calvin Alexander, Jr., Dept. of Geology and Geophysics, University of Minnesota, Minneapolis; Ph.D., University of Missouri. A professor at the University of Minnesota since 1973, Alexander is author or co-author of more than 100 publications on isotopic investigations, ground water studies, and environmental geology. His research includes isotopic studies of ground water age or residence times and tracing in a variety of aquifers and hydrogeological settings.

Limit: 50. Fee: \$135, students \$115; includes course manual and lunch.

8. Environmental Applications of Shallow Seismic Reflection.

Friday, October 30, 8:00 a.m. to 5:00 p.m., Hyatt Regency. Cosponsored by the *Geophysics Division*.

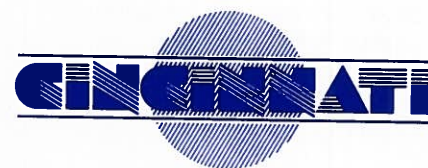
This course provides a practical overview of the types of seismic reflection surveys that are commonly applied in shallow geologic settings. The decades-old use of reflection techniques in exploration for petroleum and other mineral resources is well established in contrast to their application to near-surface environmental problems, which dates only from the mid-1980s. An overview of the basic theoretical background without the use of calculus will be followed by discussions of instrumentation, shallow seismic energy sources, and field parameter design. A discussion of seismic data processing emphasizes the unique processing considerations that are necessary for shallow reflection work. The main topics to be covered will include:

- elastic parameters and seismic waves,
- field parameters for shallow reflection,
- seismic energy sources for shallow applications,
- pitfalls and noise,
- processing shallow seismic reflection data,
- environmental case histories,
- shallow S-wave reflections,
- critical path management of geophysical field work,
- projected trends, uses, and research needs.

Faculty: **Don W. Steeples**, Chief Geophysicist, Kansas Geological Survey, Lawrence; Ph.D., Stanford University. Since 1977, Steeples has specialized in shallow high-resolution seismic reflection research. He has done consulting and/or contract research for Amoco Production Company, Arco, Chevron, Conoco, Getty Oil, Mobil Research, Phillips Petroleum, Los Alamos and Livermore National Laboratories, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, U.S. Geological Survey, and others. He is the co-founder and president of Great Plains Geophysical, Inc., a consulting firm.

Richard D. Miller, Chief, Exploration Services, Kansas Geological Survey, Lawrence; M.S., University of Kansas. Since 1983, Miller has managed the Kansas Geological Survey's high-resolution seismic reflection field crew. He is primarily responsible for processing survey-acquired seismic reflection data. He has also been a consulting geophysicist, specializing in shallow high-resolution seismic reflection acquisition and CDP processing, to a score of environmental, engineering, oil, transportation, and mining companies.

Limit: 50. Fee: \$145, students \$125; includes course manual and lunch.



Other Short Courses/Workshops

Minerals & Reactions at the Atomic Scale: High-Resolution Transmission Electron Microscopy.

Friday, October 23 through Sunday, October 25, 12:00 noon; Hueston Woods State Park Lodge, College Corner, Ohio. Sponsored by the Mineralogical Society of America.

The goals of the course are to (a) provide a background into the TEM as a mineralogical tool, (b) give an introduction to the principles underlying its operation, and (c) explore mineralogical applications and ways in which electron microscopy can augment our knowledge of mineral structures, chemistry, and origin. Special attention will be devoted to mineralogical applications. We will have a JEOL 1210 analytical electron microscope at the course for hands-on demonstration and exercises. There will also be an opportunity for participants to use the microscope on samples they bring to the course. Topics to be covered include: general principles of transmission electron microscopy; principles I: electron diffraction—SAED and CBED; principles II: high-resolution image formation, simulation, and analysis; inelastic interaction EDS chemical analysis; EELS and electron channeling (ALCHEMI); nonstoichiometry, polysomatism, and reactions in minerals; polytypism and stacking disorder; phase definition by HRTEM; diagenetic reactions and processes: clays and shales; carbonates; analysis of deformation in geological materials; imaging transformation-induced microstructures.

Organizer: Peter R. Buseck, Arizona State University.

Preregistration required. Limit: 100. Fee (based on double occupancy): MSA member—\$475; MSA student member—\$225; nonmember—\$525; student nonmember—\$255. Fee includes accompanying volume of *Reviews in Mineralogy*, lodging Thursday, Friday, and Saturday nights, and all meals beginning with the reception and light buffet dinner on Thursday and continuing through lunch on Sunday. Bus service will be provided from the Greater Cincinnati Airport to the short course site. For information and registration: MSA Business Office, 1130 17th Street N.W., Suite 330, Washington, DC 20036, (202) 775-4344, fax 202-775-0018.

Teaching Topics in Earth Science and Geology with Video as a Partner: For Secondary School Teachers.

Saturday, October 24, 9:00 a.m. to 12:00 noon; Cincinnati Convention Center. Sponsored by the Annenberg/CPB Project, National Association for Geology Teachers, and Southern California Consortium.

Explore how to use video modules with youngsters in your classrooms, making concepts of geology believable with examples drawn from the new PBS 26-part series, "EARTH REVEALED." Emphasis will be on the capability of the video to:

- provide visual imagery of dynamic processes important to geology, such as earthquakes, landslides, and erosion,
- offer vivid examples of strong links between understanding and solving geologic problems and meeting the needs of human society through common real-life applications,
- show role models of geologists and scientific research in action,
- fit flexibly into your lesson designs, serving to model, demonstrate, and explain a range of topics.

The workshop will include working in groups organizing inventive problem-solving approaches to a lesson on volcanism, earthquakes, or plate tectonic theory, for example. The workshop will be led by Richard W. Hazlett, Pomona College, of the academic development team for "EARTH REVEALED," together with a teacher who is using these video materials with secondary students.

Limit: 60 persons. No fee. Preregistration required. For information and registration: Janice Ford, Annenberg/CPB Project, 901 E Street N.W., Washington, DC 20004, (202) 879-9655.

been made in understanding how microorganisms modify the composition of sediment during transportation and after deposition and will show how microbiological processes are important in the formation of a variety of economic deposits, including oil shale, coal, biogenic methane, crude oil, native sulfur, and black shales enriched in heavy metals. The course will describe new insights gained from molecular structure and isotopic composition of organic geochemical fossils (biomarkers), into the origin and nature of Precambrian life forms and into the biochemical record of evolution. We will trace the maturation of organic matter from deposition through



Ash Cave, Black Hand Sandstone (Lower Mississippian), Hocking Hills State Park, Ohio. Photo by Michael C. Hansen, Ohio Geological Survey.

Organic Geochemistry of Sediments and Sedimentary Rocks.

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Hyatt Regency. Sponsored by SEPM.

The fields of organic geochemistry and biogeochemistry have evolved rapidly in the past decade because improved analytical techniques now allow fast and accurate analysis of organic molecules. Application of these techniques has produced a wealth of data leading to new perspectives about organic reactions in natural environments. This course will present modern approaches and state-of-the-art concepts pertaining to the role of organic matter in sediments, sedimentary rocks, and mineral deposits. We will review the significant progress that has

burial and thermal alteration. The migrated products and in situ residues of organic matter will be described in terms of reaction kinetics and maturation indices. Published kinetic models for predicting generation and yield of petroleum from source beds will be presented and critiqued. This course will provide participants with an understanding of limitations as well as strengths in organic geochemical models. We will integrate data from oceanography, limnology, sedimentology, and geology in order to provide an overview of the biological and chemical processes resulting in sedimentary deposits. The course content is designed for geologists, geochemists, paleontologists, and explorationists with diverse interests in modern and ancient sedimentary sequences. (Credit: 0.7 C.E.U.)

Faculty: John B. Comer, Indiana Geological Survey and Lisa M. Pratt, Indiana University, Bloomington.

Preregistration required. Limit: 50. Fee: SEPM members—\$198, nonmembers—\$250, student members—\$30, student nonmembers—\$50 (includes course notes). For information and registration: SEPM Business Office, P.O. Box 4756, Tulsa, OK 74159, (918) 743-9765, fax 918-743-2498.

Trace Fossils.

Sunday, October 25, 8:00 a.m. to 5:00 p.m.; Hyatt Regency. Sponsored by the Paleontological Society.

Trace fossils provide a wealth of paleobiological information about organisms that commonly do not have fossilized hard parts. Although use of trace fossils in paleoenvironmental studies has become standard practice among many sedimentologists, their use by paleontologists has lagged behind. This course will provide a well-established forum for bringing to light the importance of trace-fossil studies in paleontological research.

Faculty: Christopher G. Maples, Ronald R. West, David J. Bottjer, Thomas M. Brown, Richard G. Bromley, H. Allen Curran, Mary L. Droser, A. A. Ekdale, James O. Farlow, Stephen T. Hasiotis, James P.A. Magwood, Timothy J. Palmer, Charles E. Savrda, Mark F. Schult, Adolf Seilacher, Andrew C. Scott, and Mark A. Wilson.

No fee or registration. Course notes will be available on site for approximately \$15. For information: Christopher G. Maples, Kansas Geological Survey, 1930 Constant Avenue, Lawrence, KS 66047, (913) 864-3965, fax 913-864-5317.

Teaching Introductory Geology with Video as a Partner: For College Teachers.

Sunday, October 25, 1:30 to 4:30 p.m.; Cincinnati Convention Center. Sponsored by the Annenberg/CPB Project, National Association for Geology Teachers, and Southern California Consortium.

Explore how to use video models to prompt students to interact with geology concepts, with examples drawn from the new PBS 26-part series, "EARTH REVEALED: Introductory Geology." Emphasis will be on the capability of the video to:

- provide visual imagery of dynamic processes important to geology, such as landslides, earthquakes, and sediment transport,
- offer vivid examples with lasting impact of strong links between the study of geology and the needs of human society,
- show role models of geologists and show scientific research in action.

The workshop will include working in groups organizing inventive approaches to a lesson on plate tectonics or volcanism, for example. The workshop will be led by Richard W. Hazlett, Pomona College, of the academic development team for "EARTH REVEALED," together with a teacher who is using these video materials in an undergraduate course.

Limit: 60 persons. No fee. Preregistration required. For information and registration: Janice Ford, Annenberg/CPB Project, 901 E Street N.W., Washington, DC 20004, (202) 879-9655.

GIS Database Forum.

Sunday, October 25, 3:00 to 5:00 p.m.; Hyatt Regency. Sponsored by the *Geoscience Information Society*.

This forum will focus on databases in 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 crystallography, weather, and climate. 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: Charlotte Derksen, Stanford University, Branner Earth Sciences Library, Mitchell Building, Stanford, CA 94305, (415) 723-1093, fax 415-725-6566.

Continental Scientific Drilling Forum.

Monday, October 26, 8:00 a.m. to 5:00 p.m.; Hyatt Regency. Sponsored by the *Interagency Coordinating Group for Continental Scientific Drilling*.

The annual CSD Forum was established by the Interagency Coordinating Group for Continental Scientific Drilling (composed of Geoscience program managers from DOE, NSF, and USGS) to provide an opportunity to discuss scientific drilling ideas at an early stage of development. John Eichelberger, University of Alaska, Fairbanks, chairs the organizing committee, which represents expertise in drilling-related science and in drilling technology as the committee guides the discussions. The intent is to open the proposal process, which will lead to the best possible melding of scientific ideas, researchers, and technology within existing budgetary constraints.

At a CSD Forum on December 8, 1991 in San Francisco, reports on seven active projects, three developing projects, and three new project concepts showed that despite the absence of deep drilling, research drilling is alive and well in the United States and spans an impressive breadth of scientific problems. Contributions for the CSD Forum in Cincinnati are now being solicited. The emphasis will be on new project concepts, but summaries of significant developments in ongoing or developing projects are also welcome. Presentations of approximately one-half hour each at the Monday session (supporting poster displays are encouraged) will be followed by a Tuesday evening roundtable discussion involving presenters of new project concepts, and members of the Forum Organizing Committee. The Monday session will feature a keynote address by Mark Zoback of Stanford University, entitled "Prospects for an International Continental Scientific Drilling Program."

To be included in this year's Forum program, contributors should send one-page summaries of their projects by September 15, 1992, to: The CSD Forum, Attn: Cathy Littleton, College of Geosciences, Texas A&M University, College Station, TX 77843. For additional information, contact Earl R. Hoskins at Texas A&M University, (409) 845-3651.

Grant Writing Workshop for K-12 Teachers.

Monday, October 26, 8:00 to 9:30 a.m. or 9:45 to 11:00 a.m.; Cincinnati Museum of Natural History. Sponsored by *Science Awareness through Geoscience Education (SAGE)*.

In this workshop teachers will learn 1) effective grant writing skills, 2) where to apply for additional classroom funding, and 3) how collaboration can help improve the success of your proposal submissions.

Limit: 30 persons per session. No fee. Preregistration required. For information and registration: Ed Geary, GSA headquarters, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020, fax 303-447-0648.

Teacher-Scientist Workshop.

Monday, October 26, 8:00 to 9:30 a.m. or 9:45 to 11:00 a.m.; Cincinnati Museum of Natural History. Sponsored by *Science Awareness through Geoscience Education (SAGE)*.

In this workshop, scientists will team with local teachers to learn how to develop and demonstrate exciting earth science concepts in the classroom using a variety of teaching techniques (e.g., hands-on cooperative learning). Participants will work in small groups focusing on a particular grade level (K-6, 6-8, 9-12). If you have children in school or are concerned about K-12 science education, this workshop is for you.

Limit: 30 persons per session. No fee. Preregistration required. For information and registration: Ed Geary, GSA headquarters, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020, fax 303-447-0648.

GeoRef Intermediate/Advanced Workshop.

Monday, October 26, 2:30 to 3:30 p.m.; Hyatt Regency. Sponsored by the *Geoscience Information Society* and *American Geological Institute*.

Learn how to search AGI's GeoRef database more effectively on CD-ROM and on line. Experienced geoscience librarians will share their ideas for effective

searches. If you think your searches could be better at finding relevant entries from GeoRef's more than one million available references to geological literature, 1785 to the present, come to hear about some sample searches and special tips for searching. Bring questions and problem searches for group discussion and questions from the audience.

No fee or registration. For information: Marilyn Stark, U.S. Geological Survey Library, Box 25046, MS 914, Denver, CO 80225-0046, (303) 236-1004, fax 303-236-0015.

Our Common Future: The Concerns of Earth Science Students.

Tuesday, October 27, 5:30 to 7:30 p.m.; Hyatt Regency. Sponsored by the *GeoSphere Alliance Committee*.

Students now studying the earth sciences will live through the period when human population will approach 10 billion. An enormous increase in use of natural resources to support this population will greatly modify Earth's environment. Earth scientists must play a larger role in all aspects of development to ensure the wise use of Earth. We invite geology students, at all levels, or groups of students, from all nations, to submit abstracts summarizing their concerns and their ideas on what must be done to protect Earth and improve the human condition.

Abstracts should be submitted by September 15 to William Fyfe, Dept. of Geology, University of Western Ontario, London, Ontario N6A 5B7, Canada, (519) 661-3187 (direct), (519) 661-3180 (dept.), fax 519-661-2179.

Geology and Public Policy Forum

Economic Benefits and Public Policy Issues of Geologic Mapping.

Tuesday, October 27, 12:00 noon to 1:30 p.m.; Cincinnati Convention Center.

The annual GSA Geology and Public Policy Committee forum will be on the economic benefits provided by the investment of public funds in programs of geo-

logic mapping. The forum will examine also the several public policy issues of geologic mapping, including the process by which an economic benefit of a public program can be calculated, the prioritization of areas to be mapped, and the responsibilities and issues of federal, state, and academic participation in geologic mapping programs.

In May 1992 the National Geologic Mapping Act (H.R. 2763) was signed into law. In that legislation Congress finds and declares that "during the past two decades, the production of geologic maps has been drastically curtailed" and goes on to state that "geologic maps are the primary data base for virtually all applied and basic earth-science investigations..." The purpose of the Act is "to expedite the production of a geologic-map data base for the Nation..." It authorizes in the USGS a National Cooperative Geologic Mapping Program with four components: a federal geologic mapping component, a geologic mapping support component, a state geologic mapping component, and a geologic mapping education component.

In the forum speakers will provide an overview of the status of geologic maps and mapping programs in the United States, the experience of geologically mapping an entire state at a scale of 1:24,000 and the benefits thereby provided to the State of Kentucky, the benefit-to-cost ratios computed for a two-county geologic mapping program in Illinois, and the issues of geologic mapping programs in an academic setting.

Speakers will include Charles J. Mankin, Oklahoma Geological Survey; Donald C. Haney, Kentucky Geological Survey; Subhash Bhagwat, Illinois State Geological Survey; and Steven P. Esling, Southern Illinois University. Convener of the forum is David L. Gross, Illinois State Geological Survey.

The forum will be a panel discussion format. It is the eighteenth in the series and is open to everyone, including guests and the general public.



Ironstone concretion in Ohio Shale (Upper Devonian), Franklin County, Ohio. Photo by Preston Fettrow.

Educational Programs for K-12 Teachers (Science, Pedagogy, and Resources)

Registration and events are complimentary to K-12 teachers and will be held at the Cincinnati Convention Center unless noted otherwise. Appropriate ID is necessary. For registration materials and additional information contact Ed Geary, Coordinator for Educational Programs, GSA headquarters, or Larry Wiedman, 1992 GSA Annual Meeting Education Coordinator, Dept. of Geology, Monmouth College, Monmouth, IL 61462.

At GSA's Annual Meeting, K-12 teachers will have opportunities to:

- visit and learn about the geology of the Cincinnati area,
- participate in cooperative, hands-on earth science investigations,
- learn how to develop and write grants,
- listen to Stephen Jay Gould, and
- attend a variety of scientific, educational, and environmental symposia.

In addition, participating teachers will receive free resource materials and meet earth scientists interested in precollege education. Whether you are a teacher or a scientist, we hope that you will join us for one or more of the following activities. Additional information can be found within this publication under the appropriate heading.

Teaching Introductory Geology with Video as a Partner: For Secondary School Teachers.

Saturday, October 24, 9:00 a.m. to 12:00 noon. See Other Workshops.

Cincinnati's Geologic Environment: A Field Trip for Secondary School Science Teachers.

Sunday, October 25, 8:00 a.m. to 5:00 p.m. Fee: \$42. See Field Trips.

GSA Exhibits Opening Night and Welcoming Reception.

Sunday, October 25, 6:00 to 9:00 p.m. See Special Events.

Teacher-Scientist and Grant Writing Workshops for K-12 Teachers.

Monday, October 26, 8:00 to 11:00 a.m., Cincinnati Museum of Natural History. See Other Workshops.

GSA Geoscience Education Division Luncheon with speaker Stephen Jay Gould.

Monday, October 26, 11:30 a.m. to 1:00 p.m., Cincinnati Museum of Natural History. Fee: \$10. See Special Events.

National Association of Geology Teachers Symposium: Reform in Science Education.

Monday, October 26, 1:30 to 5:30 p.m. See Technical Program, Symposium S6.

GSA Presidential Address and Awards Ceremony.

Monday, October 26, 5:30 to 7:00 p.m. See Special Events.

Guest Program

Cincinnati is known as the Queen City of the West after the rolling, steep hills that form a crown around the city. It has many jewels within its crown, offering a unique blend of European charm and American excitement with its rich and varied ethnic heritage, diverse architecture, famous museums and galleries, and world-class culture at the symphony, ballet, and opera. Shopping ranges from the fine New York stores to old world shops with special antiques.

The Guest Committee cordially welcomes you to Cincinnati and wants to make your visit a memorable one. All guest registrants are invited to visit the Hospitality Room, located in the North Hall of the beautiful Omni Netherland Plaza hotel. Join us there to greet old friends, meet new friends, and learn about the interesting tours and seminars we have planned for you. We will be serving light refreshments throughout the day, and our hostesses will be happy to answer your questions.

Sunday 12:00 noon to 4:30 p.m.

**Monday—
Wednesday 8:00 a.m. to 4:30 p.m.**

Thursday 8:00 a.m. to 1:00 p.m.

Seminars

No registration or cost. All seminars will be in the Omni Netherland Plaza hotel.

Welcome to Cincinnati

Monday, October 26, 8:00 to 8:30 a.m.

Suzanne Costandi, Guest Committee Chair, together with a representative of Cities on Tour will welcome you to Cincinnati and give you a preview of what there is to see and do. The variety of tours and exciting seminars will please you. Afterward, feel welcome to attend the keynote technical session, "From Columbus to Magellan—Discovery."

Seeds for the Future

Monday, October 26, 9:30 to 11:00 a.m.

The Cincinnati Zoo is world-renowned for its work with endangered species. An expert from the "sexiest" zoo around will tell us about the assisted reproduction technologies used by the Center for Reproduction of Endangered Wildlife. Their program is used to help both endangered plants and animals avoid extinction. Later in the week an informal trip to the zoo is planned where you will see the rare white Bengal tigers.

Financial Planning in the '90s

Tuesday, October 27, 9:00 to 10:00 a.m.

A recession, low interest rates, rising costs—all very real in this decade. Join Dan Turbek, Financial Planner from Shearson Lehman Brothers Incorporated, as he shares strategies in planning for the future whether it is for college-bound children or your own retirement. Become aware of the best financial opportunities available to make your dollars grow.

Are They Grown Up Yet?

Wednesday, October 28, 9:00 to 10:30 a.m.

If you have teenage children or grandchildren, you will enjoy the expert advice of Richard Luftig, Director of Miami University's Center for Development, Learning and Teaching. After teaching high school for twelve years, Luftig put his experience and education to the test when he decided to go into research. Humorously acknowledging that raising children can be a challenge, Luftig offers supportive advice on how you can help your teens develop a positive self image.

Omni Tour and High Tea

Wednesday, October 28, 2:30 to 4:30 p.m.

Join us for a tour of the fabulous Omni Netherland Plaza, our host hotel for the week. The Omni was built in the early 1930s, and restored to its original charm in the 1980s. This French art deco historical landmark is brimming with hidden treasures. Following the tour, we will have traditional high tea in the Hospitality Room. During tea, Ruby Rogers, Museum Director for the Cincinnati Historical Museum, will discuss the development of the museum and its world-class exhibits.

Tours

Since many people will be arriving in Cincinnati early, we have planned a Sunday tour for those eager to experience the area. All GSA meeting registrants are welcome to participate on any of the tours. You might want to also consider Field Trip #11 to Caesar Creek State Park on Wednesday, October 28. See page 167 for details.

Tours will leave the Omni Netherland Plaza from the exit on Fifth Street. Reservations for all tours will be accepted on a first-come, first-served basis, so please register early. Since space is limited, please be sure to preregister. We hope you will join us.

Indiana's Wine Country

Sunday, October 25, 2:00 to 6:00 p.m.

Chateau Pomije, one of Indiana's largest wineries, is just 45 minutes from downtown Cincinnati. This winery, owned and run by a family, is situated in some of the most picturesque countryside in the tristate area. After a tour of this rustic winery, we will sample a variety of its international and national award-winning wines complemented by fresh fruit and cheese. Relax by the fireplace or stroll the grounds, as you enjoy the beautiful surroundings, set off by hundreds of grape vines.

Cost: \$30 (includes transportation, tour, wines, and snacks).

Cincinnati— Up, Down, and All Around

Monday, October 26, 9:00 a.m. to 2:00 p.m.

Soon after starting the tour you will understand why Cincinnati is called the Queen City of the West. We will see the

THE VOYAGE CONTINUES

From Columbus to Magellan



vibrant downtown area, beautiful Eden Park, and historic northern Kentucky. Stops will be made at the Krohn Conservatory, famous for its exotic tropical and desert plants collection, and the Basilica of the Assumption, where you will see the largest stained-glass window in the world. Our last stop will be lunch at the Mike Fink Restaurant, a paddlewheel boat permanently moored on the Ohio River, and recently placed on the National Historic Register of Buildings and Places.

Cost: \$31 (includes transportation, guides, admissions, and lunch).

Sights and Sounds of Cincinnati

Tuesday, October 27, 9:15 a.m. to 3:15 p.m.

According to Beverly Sills, Cincinnati Music Hall is one of the most acoustically perfect halls in the world. After a backstage tour of the music hall, we will head to the Cincinnati Art Museum for a tour of the Asian Arts exhibit and a sneak preview of the major renovations nearing completion. A relaxing lunch in the museum's Garden Terrace will follow. The next stop is the Taft Museum, a gracious Federal architecture home with paintings by Turner and Goya, Duncan Phyfe furniture, and Chinese porcelain.

Cost: \$30 (includes transportation, guides, admissions, and lunch).

Stagecoach Stops and Antique Shops

Tuesday, October 27, 10:30 a.m. to 4:00 p.m.

The Golden Lamb Inn is the oldest stagecoach stop in Ohio, in existence since 1803. Displaying one of the finest collections of Shaker artifacts in the country, the inn has hosted many distinguished guests, including ten past presidents. After a delicious lunch at the inn, it's off to Waynesville, the antique capital of the Midwest, for a leisurely two hours of browsing and bargain hunting. In just three blocks, you will find almost 50 antique and specialty shops offering high-quality items in a country atmosphere.

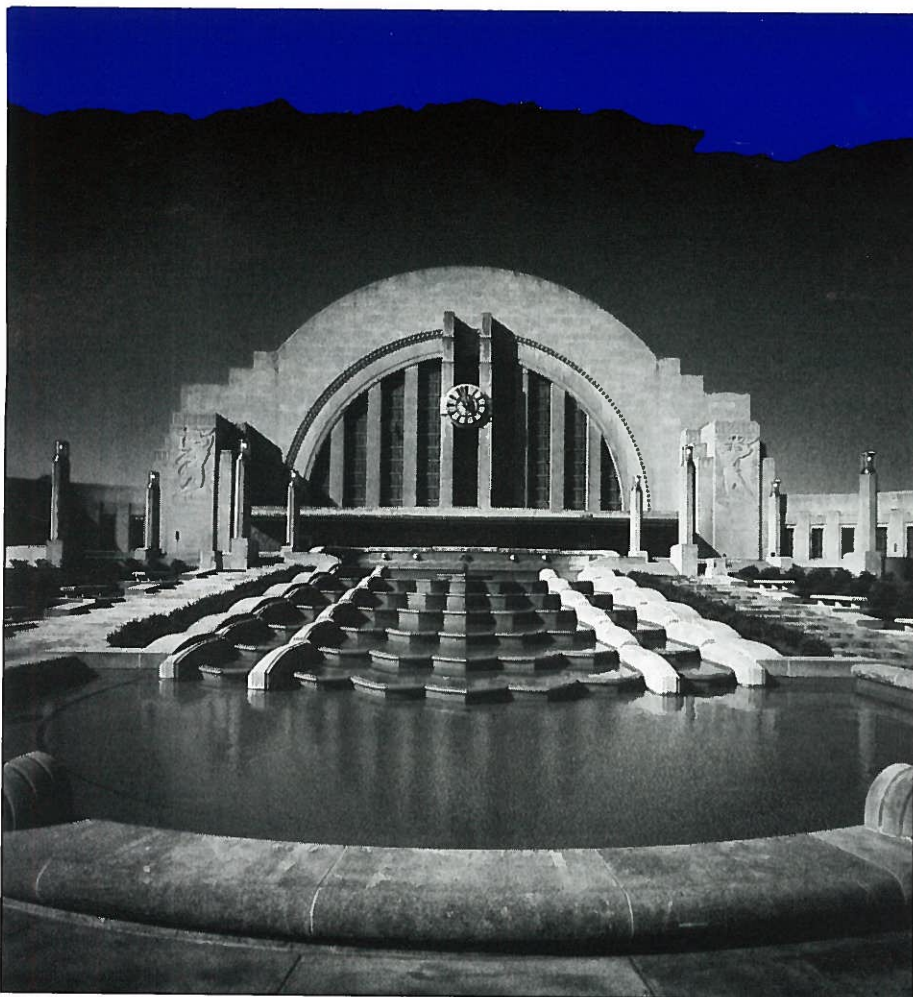
Cost: \$36 (includes transportation, lunch, and guides).

Saks Fifth Avenue—The Art of Dressing

Wednesday, October 28, 8:45 to 9:45 a.m.

Do you need a fashion philosophy? Join us for a light champagne continental breakfast at Saks Fifth Avenue, while you learn how to enhance your image and simplify your wardrobe. This seminar will cover wardrobe management, the season's trends, classic styles, accessories, and budget considerations. Coordination is the key.

Cost: \$8 (includes lecture and continental breakfast).



The Museum Center at Cincinnati Union Terminal. *The Museum Center.*

Graduate School Information Forum

Monday, October 26 through Wednesday, October 28, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center.

Students! Shortcut your search for just the right graduate school program to suit your needs. Come to Cincinnati and meet with your favorite schools without spending the travel time and money to go to each school for information or 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. If you would like to receive a complete list of participating schools with the contact and telephone numbers or if your school would like to participate, please write or call Kathy Ohmie Lynch, GSA headquarters. The deadline for schools to sign-up was July 15, but space may still be available.



Special Events

Swan Lake Cincinnati Ballet Company
Saturday, October 24, 6:00 to 10:30 p.m.; Cincinnati Music Hall.

Join GSA friends for a buffet dinner at the Critics' Club, pre-performance lecture, and main floor seating for a performance of Swan Lake performed by the Cincinnati Ballet Company. This is a classic way to enjoy Cincinnati, while saving money on Saturday excursion airfares. Although GSA is handling the registration for this on the GSA registration form, the event has been organized by Nancy Adams of *Travel to Music*. You will receive further information, including a map and tickets from Nancy after you register. Transportation will not be provided; however, the Music Hall is only a short cab ride from the hotels. Cost: \$55. Limit: 40. **Available by preregistration only through October 2.**

Cincinnati Welcoming Reception
Sunday, October 25, 6:00 to 9:00 p.m.; Cincinnati Convention Center.

The 1992 GSA Annual Meeting kicks off with the Welcoming Party in the exhibit hall. Come and preview the exhibits while making contact with your friends and col-

leagues. Exhibitors will be on hand to welcome you, and some will be hosting delicious specialty foods from their booths. *Mat Britain & Caribé* will offer musical entertainment in the Convention Center lobby. Dress is casual. A first-class start to an eventful meeting!

GSA Presidential Address and Awards Ceremonies

Monday, October 26, 5:30 to 7:00 p.m.; Cincinnati Convention Center.

The GSA Presidential Address and Awards Ceremonies will begin with President E-an Zen's address, *The Citizen Geologist*. The GSA Awards Ceremonies will immediately follow:

Penrose Medal	John F. Dewey
Arthur L. Day Medal	..	Susan W. Kieffer
Young Scientist Award (Donath Medal)	John P. Grotzinger
GSA Distinguished Service Award	A. R. (Pete) Palmer

Recognition will also be given to newly elected Honorary Fellows, Yang Zun-yi and Hans Fuchtbauer.

Employment Service

Monday, October 26 through Wednesday, October 28, 8:00 a.m. to 5:00 p.m.; Cincinnati Convention Center.

Do you need qualified scientists to fill staff needs? Or are you looking for employment in the earth science 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 17, 1992, 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 June 1992 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 25, 12:00 noon to 2:00 p.m.; Cincinnati Convention Center.

At last year's meeting, the annual forum on employment opportunities in the geosciences was changed to allow more one-on-one interaction between panel members and individuals or small groups. This change proved very successful and will be repeated at this year's meeting. 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 EMPLOYMENT SERVICE OR THE ANNUAL MEETING TO PARTICIPATE IN THESE DISCUSSIONS.**

Everyone is encouraged to attend, professionals and students, to talk with as many of the experts as you like, and to pick up a free copy of the 1992 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, Federal Legislation, and Environmental Restoration.

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



Cincinnati Ballet Company.
Courtesy of Cincinnati Convention & Visitors Bureau.

Alumni Night

Monday, October 26, 7:00 to 9:30 p.m.;
Omni Netherland Plaza.

Everyone knows someone at the popular Alumni Receptions. It's a haven for geologists who thrive on college connections. More than 70 colleges and universities will be represented. If you would like your university to hold a reception, have your department chairman contact Vanessa George, Events Coordinator, GSA headquarters.

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 check the Registration Form for event dates and to order tickets. Location and times will appear on the ticket.

Following several morning programs for K-12 teachers, the GSA Geoscience Education Division will hold its annual luncheon at the Cincinnati Museum of Natural History. The luncheon will feature guest speaker, Stephen Jay Gould. As with other GSA ticketed meals, you may register for this event on the GSA Registration Form. **LIMITED SEATING. PREREGISTRATION ONLY.**

T.A.C. (Thursday Afternoon Club)

Thursday, October 29, 3:30 to 5:00 p.m.;
Cincinnati Convention 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 the Queen City. Beer will be available.

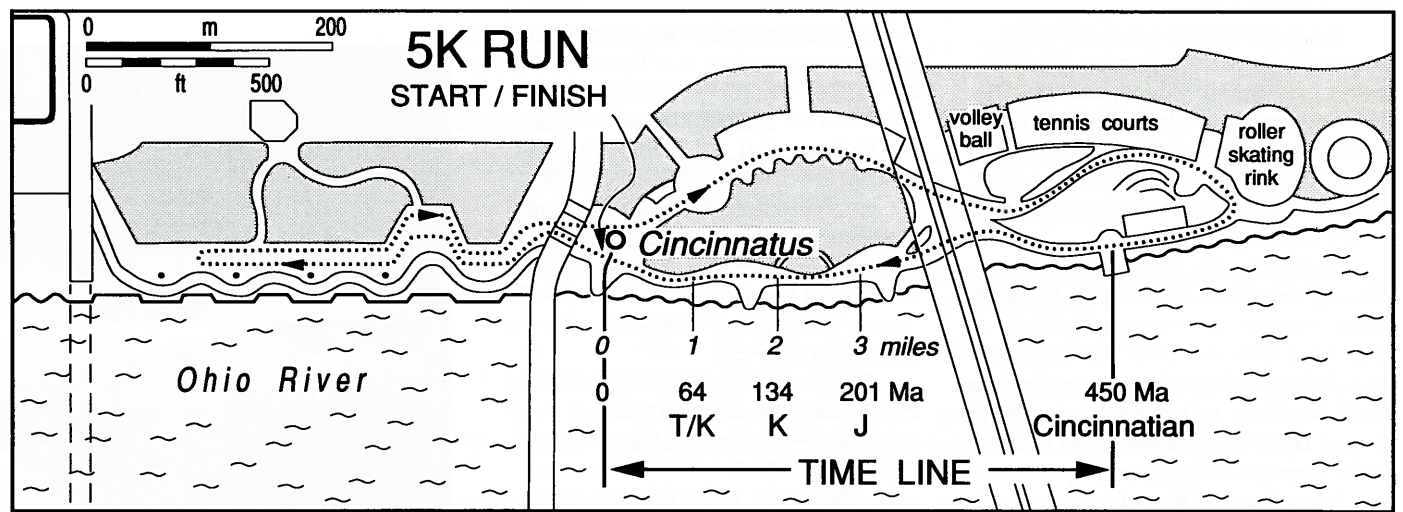
Sports Events

Timeline 5K Run

Wednesday, October 28, 7:00 to 8:00 a.m.; Riverfront Park.

Faster! Faster! Want to make up for lost time? Run the GSA 5K and experience 5 billion years of geology in a few minutes! Riverfront Park features a Geologic Timeline—a race route made for geologists. The park is located within easy walking distance from the Convention Center, just east of Riverfront Stadium. The weather should be crisp and cool—perfect for an invigorating run, but pack your windbreaker just in case. The race will be professionally directed and timed by Don Connolly. Water will be provided on the course, with refreshments and prizes at the finish. GSA will provide race shirts, so be sure to indicate your shirt size on the registration form. Shirts and maps may be picked up in the Registration Area at the Cincinnati Convention Center. Take the time to join us for this annual fun event.

Fee: \$20 (includes shirt, refreshments).



Other Sports

If you want to play tennis, volleyball, or roller-skate in Riverfront Park, please contact the GSA 1992 Annual Meeting Athletic Director, Kees A. DeJong, (513) 556-6696 or fax 513-556-6931 by October 1.

Health/Fitness

Many of the downtown GSA hotels offer complete health centers for their guests. Please refer to the hotel descriptions for what your hotel features. For people not staying at one of these hotels, downtown Cincinnati offers a complete facility at Moore's Fitness World, 609 Rusconi Place (Sixth and Elm Streets),

(513) 381-2323. Offering state-of-the-art equipment and programs, Moore's is conveniently located adjacent to the Convention Center in the skyway. Guest passes are \$15 per day or \$25 for a weekly pass. Hours are 6:00 a.m. to 9:00 p.m. weekdays, 9:00 a.m. to 5:00 p.m. Saturday, and 11:00 a.m. to 5:00 p.m. Sunday.



A Taste of Cincinnati

Wednesday, October 28, 7:00 to 11:30 p.m.

Cincinnati Museum of Natural History

MIX & MATCH — YOU CREATE THE PERFECT EVENING!

Buffet Dinner featuring Cincinnati Favorites

serving 7:00-10:00 p.m.

Famous Cincinnati Five Way Chili
Coneys Made to Order
Chips, Fudge Nut Brownies, Cookies

German Kielbasa Sausage, Brats, and Metts with Sauerkraut
Potato Salad, Cinnamon Apples,
German Chocolate Cake, Strudel

Vegetarian Lasagna, Garden Salad,
Cheese Cake with Fresh Strawberries, Tarts

Coffee, Tea, Soft Drinks, Cash Bar

Natural History Museum Exhibits

Cincinnati's Ice Age, Kentucky Limestone Cavern,
African Reflections from the American Museum of Natural History

Dancing or Listening Music

London Street Rock and Ballroom Dance Band (Rotunda)
Harpist Ann Westerman (Losantiville Room)

Omnimax Theater

"To The Limit" is showing, but not included in your ticket price.
Purchase tickets at Museum Center for \$5.95 adult, \$3.95 child.
Showings at 7:00 p.m. and 8:00 p.m.

AN EVENING FOR ALL AGES. BRING FAMILY AND FRIENDS.

Cost: \$20 (includes transportation, dinner, museum admittance, music).

Transportation

Getting To Cincinnati

By Air. The Greater Cincinnati International Airport is served by eight carriers offering more than 650 daily arrivals and departures; Delta Airlines is the major carrier into this airport. Downtown Cincinnati is approximately 12 miles (20 minutes) from the airport. Consider staying over Saturday night in Cincinnati for significant airfare savings.

GSA's official travel agent, Cain Travel Group, has negotiated excellent discounts with the major Cincinnati carriers. Cain can also assist you with the special discounts and coupon offerings in your area. 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 an adjustment.

Students: The GSA Foundation has awarded matching grants to each of the six GSA sections to assist students wishing to travel to GSA section and annual meetings. For applications, contact individual section secretaries or call GSA headquarters.

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 25 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 Cincinnati Convention Center during the meeting.

By Car. Cincinnati is located along major north-south Interstate Highways I-75 and I-71, and at the eastern terminus of Interstate I-74. We are aware of the economic constraints imposed on some people. Participants should consider car pooling or using vans to save on transportation costs.

By Train and Bus. Amtrak passenger trains provide service to and from Cincinnati. Greyhound and Trailways provide bus service into Ohio. Call the offices in your area to get the best rates and schedules.

Getting To Your Hotel

The Greater Cincinnati International Airport is 12 miles from the Convention Center downtown. The only GSA hotel offering its own shuttle van is the Quality Hotel Riverview in Kentucky. Since the other properties do not offer shuttle service, your transportation options are as follows:

Jet'Port Express. This bus service operates from 5:30 a.m. to 10:00 p.m. daily. To purchase a ticket go to one of the Jet'Port Express ticket counters located in the baggage claim area at the airport. Look for the GSA signs. A ticket agent will give you instructions on where to board the Jet'Port Express. Buses depart every half-hour. Cost: \$12 round trip, \$10 one way. *Jet'Port Express does NOT stop at any of the GSA properties in Kentucky.* If you are staying at one of the Kentucky properties, consider taking Jet'Port to downtown Cincinnati and from there take a cab to your Kentucky hotel for approximately \$5.

From your hotel to the airport. The Jet'Port Express departs every half hour from the Hyatt Regency and Omni hotels. Jet'Port also provides service from the Clarion, Terrace Hilton, Westin, and Holiday Inn—Queensgate hotels. No reservation is necessary. For scheduling information call (606) 283-3702. Cost: \$12 round trip, \$10 one way.

Taxicabs. Several taxicab companies serve the city of Cincinnati. All vehicles are

metered and regulated. Charges in the downtown area are approximately \$1.50 for the first mile and \$1.20 for each mile thereafter. Approximate cost from the airport to downtown is \$20.

Car Rental. Alamo is the official car rental agency for the meeting. Identify yourself as a GSA delegate by giving *Group I.D.#: 85204* and *Plan Code: GR* to get guaranteed, discounted, daily/weekly rates as follows: economy \$27/\$109; compact \$29/\$129; mid-size \$31/\$149; standard \$33/\$169; premium \$35/\$189; luxury \$37/\$209. An additional convention discount may be available by having your Alamo agent check Rate Code 7G. Unlimited mileage. Follow the "Courtesy Shuttle Pick-Up" signs posted in the baggage level at the airport. Look for the blue and yellow Alamo vans. Advance reservations are recommended. Call Alamo at 1-800-732-3232.

Getting Around In Cincinnati

An excellent freeway system makes travel by car easy. Transit Authority of

Northern Kentucky (TANK) provides bus transportation between northern Kentucky and downtown Cincinnati. Queen City Metro serves the suburban areas, and the Downtowner provides bus access to the downtown area. There is also a trolley that provides limited transportation throughout downtown and across the river.

GSA Shuttle. Rain or shine, access is easy from the downtown hotels to the Cincinnati Convention Center. Most hotels are within walking distance and accessible through the skywalk system that connects the downtown hotel properties, shopping malls, and the Cincinnati Convention Center. A free GSA shuttle will be provided to the hotels on the Kentucky side of the river and to the one Cincinnati hotel located several blocks from the Convention Center, Holiday Inn-Queensgate. The shuttle will operate all day and into the evening beginning 6:30 a.m. on Sunday, October 25 and ending Thursday, October 29. Shuttle schedules will be posted at the Convention Center and participating hotel lobbies.



**RISING AIRFARES?
BEAT THEM WITH DISCOUNTS!**

Call CAIN TRAVEL GROUP today
(official travel agency for the Cincinnati meeting)

Cain offers up to 40% off coach, will meet or beat any fare quote, and will handle the special discount fares advertised in your area.

1-800-346-4747 toll-free

(303) 443-2246 collect from outside U.S., fax 303-443-4485

8:30-5:30 MST, Monday through Friday

You can't lose. Book today. If airfares drop, Cain will automatically reissue your ticket at the lower rate!

BEAT THE HIGH PRICES. CALL CAIN TODAY.

THE VOYAGE CONTINUES

From Columbus to Magellan

Lodging

Cincinnati's downtown offers a wonderful convention setting, with five major hotels within walking distance of the convention center. GSA has arranged special rates at nine properties. They are the five downtown hotels, one hotel approximately one mile from the convention center, and three properties across the Ohio River in Kentucky which are one to three miles from the convention center. These nine properties include a cross section of lodging that should fit almost everyone's budget and taste. All meet GSA's standards for rate reliability, cleanliness, service, and location. *The four hotels not within walking distance of the convention center will be serviced by the GSA shuttle.* Please refer to the individual hotel descriptions.

Co-headquarters for the Cincinnati meeting are the Hyatt Regency Cincinnati and the Omni Netherland Plaza. Both hotels are within easy walking distance of the Convention Center (one to three blocks). Other participating downtown hotels are the Clarion, Terrace Hilton, Westin, and Holiday Inn—Queensgate. In Kentucky, the Quality Hotel Riverview, Travelodge—Riverfront, and Holiday Inn—Riverfront will host GSA attendees. There is an excellent set of options within this group, including four-star properties and basic motels. Rates vary at each property; single rooms range from \$41 to \$97, and double rooms from \$45 to \$117. There are 450 single rooms priced between \$40 and \$55, and 850 single rooms between \$70 and \$80.

To Make Your Hotel Reservation

Fill out the Official Housing Request Form and mail it to the Cincinnati Housing Bureau at the address shown on the form. All reservations must be RECEIVED BY FRIDAY, OCTOBER 2. From the October 2 deadline until October 14, the Housing Bureau will accept reservations by phone (513-621-2119) or fax (513-621-2156), *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 October 14.

AFTER Wednesday, October 14, you should contact the GSA hotel of your choice directly or you may contact the Housing Bureau for information on hotel availability. Note that most hotels will be

filled by October 2, 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*. The Housing Bureau will NOT be handling suite reservations.

Assignment

Hotel rooms will be assigned on a first-come, first-served basis as requests are received by the Housing Bureau. Please number your hotel choices from one to nine in order of your preference. If you do not number all hotels and the hotels you have chosen are sold out, the Housing Bureau will automatically place you in the hotel available closest to the

Convention Center. 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 two weeks, contact the Housing Bureau 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 the 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.*

Meeting attendees with special needs should specify this on the Housing Form. The Americans With Disabilities Act ensures that barrier-free rooms will be available.

Room Deposits/Guarantees

Reservations must be guaranteed if you will be arriving *after* 6:00 p.m. 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 (American Express, Diners Club, Discover, MasterCard, or VISA); 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** Wednesday, October 14, should be communicated to the Housing Bureau in writing by either mail or fax, 513-621-2156. Please supply your confirmed hotel reservation number. The phone number for the Housing Bureau is (513) 621-2119 and should be used *only* for last-minute changes or problems.

AFTER October 14, 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.

GSA Official Housing Request Form

Your Housing Form must be received **BY FRIDAY, OCTOBER 2**. Please mail to: GSA Housing Bureau
300 W. 6th Street
Cincinnati, OH 45202

Only for last minute changes, cancellations, and information call the Cincinnati Housing Bureau at (513) 621-2119.

HOTEL PREFERENCE: Please number ALL hotels in preferred order.

# is map reference	Single 1 bed/1 person	Double 1 bed/2 people	Double/Double 2 beds/2 people
___ Omni Netherland Plaza ①	\$ 95	\$ 95	\$ 117
___ Hyatt Regency ②	\$ 97	\$ 117	\$ 117
___ Clarion ③	\$ 80	\$ 94	\$ 94
___ Westin ④	\$ 94	\$ 94	\$ 94
___ Terrace Hilton ⑤	\$ 73	\$ 73	\$ 73
___ Holiday Inn—Queensgate ⑥	\$ 53	\$ 61	\$ 61
___ Quality Hotel Riverview ⑦	\$ 55	\$ 60	\$ 60
___ Holiday Inn—Riverfront ⑧	\$ 52	\$ 52	\$ 52
___ Travelodge—Riverfront ⑨	\$ 41	\$ 45	\$ 45

Note: All rooms subject to tax: 10% Ohio, 9.18% Kentucky.

TYPE OF ACCOMMODATION NEEDED:

- | | |
|--------------------------------------|-------------------|
| ___ Single (1 person, 1 bed) | ___ 1 more person |
| ___ Double (2 people, 1 bed) | ___ 2 more people |
| ___ Double/Double (2 people, 2 beds) | ___ Add rollaway |
- (For suites, call the hotel direct)

Special Housing Requirements: Wheelchair accessible _____ Other _____

Arrival Day/Date _____ Time _____ a.m./p.m.

Departure Day/Date _____

GUARANTEED ROOM RESERVATION AUTHORIZATION:

- ___ Credit card information is provided below to guarantee my reservation.
 ___ My guarantee will be made directly to the hotel *after* I receive my hotel confirmation.

Please guarantee my room reservation with the following:

- ___ American Express ___ Diners Club ___ Discover ___ MasterCard ___ VISA

NAME (as on credit card) _____

SIGNATURE _____

CARD NUMBER _____ EXP. DATE _____

NAMES OF OCCUPANTS:

1. _____ 3. _____
 2. _____ 4. _____

MAIL CONFIRMATION TO:

Name _____ Telephone () _____

Address _____

City _____ State _____ ZIP _____ Country _____

***** PLEASE DO NOT SEND CHECKS OR CASH WITH THIS FORM *****

Alternative Housing

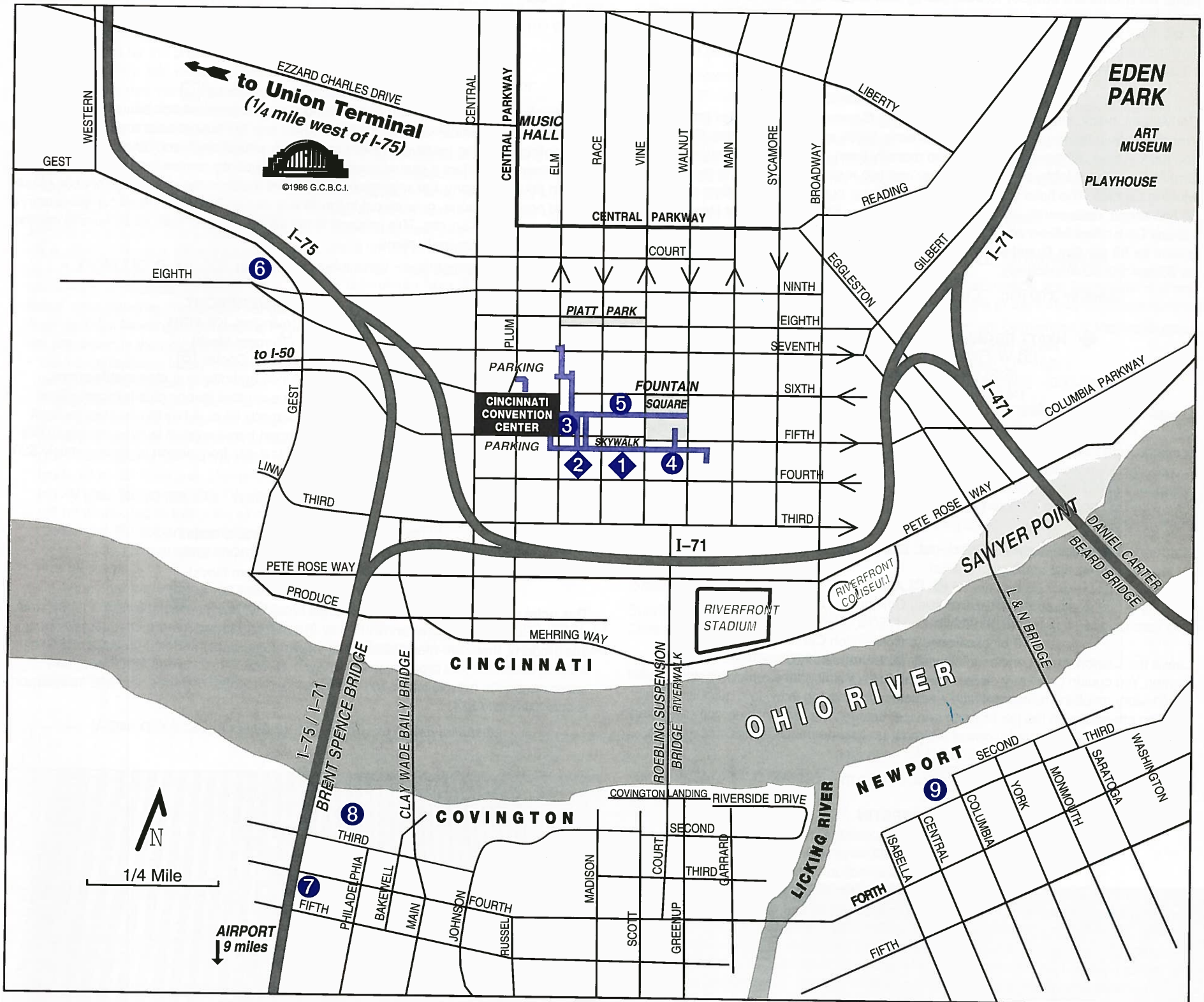
Beating the high cost of housing is a high priority of GSA staff and the 1992 Annual Meeting Committee. Here are some alternatives:

- Call 1-800-555-1212 or check the Yellow Pages to learn the 800 number for your favorite hotel chains, such as Motel 8 or Comfort Inns, which have properties outside the downtown area. You will need to provide your own transportation.
- Check your library copy of the *Hotel and Motel Redbook*, which lists metro properties. Because of the hundreds of properties in the area (some good, some bad), GSA does not provide a general list.

Cincinnati Museum of Natural History Exhibit, The Cavern.
Cincinnati Museum of Natural History.



Greater Cincinnati



Hotels

- ❖ 1 Omni Netherland Plaza
- ❖ 2 Hyatt Regency
- ❖ 3 Clarion
- ❖ 4 Westin
- ❖ 5 Terrace Hilton
- ❖ 6 Holiday Inn—Queensgate
- ❖ 7 Quality Hotel Riverview
- ❖ 8 Holiday Inn—Riverfront
- ❖ 9 Travelodge—Riverfront

Hotels served by the GSA Shuttle

Parking

Parking lots are located directly next to the Cincinnati Convention Center. Some lots are attached to the skywalk system. Parking fees range from \$4 to \$4.75 for up to 12 hours. Costs for secured overnight parking range from \$5 to \$5.75.

Downtown Cincinnati with Riverfront Stadium and Roebling Suspension Bridge.
Courtesy of Cincinnati Convention & Visitors Bureau.



Please make your reservation with the Cincinnati Housing Bureau.

Note: All rooms are subject to occupancy tax, which is 10% in Ohio and 9.18% in Kentucky.  Hotels serviced by the GSA shuttle.

1 OMNI NETHERLAND PLAZA (Co-Headquarters)

35 W. Fifth Street, Cincinnati, OH 45202
(513) 421-9100 (375-room block)
1 block from the Convention Center

Convenient, quick, and enclosed walkways to the Convention Center. This magnificent French art deco landmark hotel, built in the early 1930s and restored in the 1980s, takes you back in time. All sleeping rooms have recently been completely renovated. The Omni's Palm Court lobby offers one lounge and two restaurants, including the award-winning Orchids. The hotel is part of the Carew Tower complex, which offers more than 60 fine shops, restaurants, and entertainment options. The Carew Tower Health and Fitness Club offers full-service, high-tech training equipment, and lap pool to Omni guests for \$3 per day. Guest services staff, and public and valet parking are available for \$8 and \$12.50 respectively.

Check-in: 3:00 p.m. Check-out: 12:00 noon CC: AX, DC, MC, V

2 HYATT REGENCY CINCINNATI (Co-Headquarters)

151 W. Fifth Street, Cincinnati, OH 45202
(513) 579-1234 (350-room block)
1/4 block from the Convention Center

Located directly adjacent to the Convention Center through an enclosed walkway, the 22-story Hyatt offers convenience, comfort, and excellent Hyatt service. Surrounding the garden atrium lobby, the hotel features two restaurants for casual to elegant dining, and two cocktail lounges for relaxation. Recreational facilities include an exercise room, whirlpool, heated indoor pool, and sauna. Saks 5th Avenue is connected to the Hyatt for a world of shopping. Concierge, laundry, and gift shop. Valet and self-parking start at \$7 per day.

Check-in: 3:00 p.m. Check-out: 12:00 noon CC: AX, D, DC, MC, V

3 CLARION

141 W. Sixth Street, Cincinnati, OH 45202
(513) 352-2100 (750-room block)
0 blocks from the Convention Center

Leave the Clarion via the enclosed skywalk and immediately enter the Convention Center. You couldn't stay any closer. The hotel offers dining for everyone's taste, from the 31-story revolving restaurant with a spectacular evening view, to a quick snack for meeting attendees on the go, or room service. Leisure activities include complimentary use of Moore's Fitness World, one of the most up-to-date health facilities downtown. Valet parking is \$6 for short term and \$11 for overnight.

Check-in: 3:00 p.m. Check-out: 11:00 a.m. CC: AX, C, DC, MC, V

4 WESTIN

At Fountain Square, Cincinnati, OH 45202
(513) 621-7700 (200-room block)
2 blocks from the Convention Center

The excellence and quality of the Westin name hold true at this lovely property. Enjoy award-winning specialties in their fine-dining restaurant as you view historic Fountain Square. The hotel also features a casual European-style restaurant for breakfast, lunch, and dinner. Live classical piano echoes through the bright atrium lobby and lounge. Enjoy the indoor pool and jacuzzi after a full day. The Westin is connected to the Convention Center and other downtown offerings by the skywalk system. Valet parking is \$12.50 and self-parking is \$8.

Check-in: 3:00 p.m. Check-out: 1:00 p.m. CC: AX, DC, MC, V


5 TERRACE HILTON

15 W. Sixth Street, Cincinnati, OH 45202
(513) 381-4000 (60-room block)
1-1/2 blocks from the Convention Center

High above the downtown bustle, the hotel lobby is on the eighth floor with quiet sleeping rooms above it. The hotel offers a casual restaurant serving all meals beginning at 6:30 a.m. daily. The health center is complete with whirlpool, sauna, and exercise equipment. The Hilton will begin a major renovation project in August, but this is not expected to affect GSA hotel guests. Valet parking is \$11.

Check-in: 3:00 p.m. Check-out: 1:00 p.m. CC: AX, C, D, DC, MC, V


6 HOLIDAY INN—QUEENSGATE

800 W. Eighth Street, Cincinnati, OH 45203
(513) 241-8660 (150-room block)
8 blocks from the Convention Center 

This property has pleasant, comfortable rooms with free parking for hotel guests. The Holiday Inn has one restaurant that serves breakfast, lunch, and dinner at reasonable prices beginning at 6:30 a.m. daily. For evening entertainment visit the top-level lounge and enjoy the view and top-40 music hits.

Check-in: 2:00 p.m. Check-out: 12:00 noon CC: AX, MC, V


7 QUALITY HOTEL RIVERVIEW

666 W. Fifth Street, Covington, KY 41011
(606) 491-1200 (150-room block)
1 mile from the Convention Center 

Directly off Interstate 75, the top of this 18-floor circular hotel affords beautiful views of the downtown Cincinnati skyline, the Ohio River, and the Mainstrasse area of Kentucky. The rooftop revolving restaurant offers reasonably priced lunch and dinner, while Kelly's on the main level offers a casual breakfast buffet. Recently remodeled, each room has its own private balcony. For relaxation, there is live music in the pub, a four-season glass-domed pool and sauna, or work-out in the fitness center. The hotel offers complimentary parking and airport shuttle. This property is *not* serviced by Jet'Port, so be sure to call the hotel van or have alternate plans.

Check-in: 3:00 p.m. Check-out: 12:00 noon CC: AX, D, DC, MC, V


8 HOLIDAY INN—RIVERFRONT

600 W. Third Street, Covington, KY 41011
(606) 291-4300 (75-room block)
1 mile from the Convention Center 

The hotel restaurant which serves breakfast, lunch and dinner at reasonable prices, opens at 6:30 a.m. daily. In the evening there is a cocktail lounge plus live comedians performing nightly in the hotel's Funny Bone Comedy Club. A health club, free to hotel guests, is within a five-minute drive. Jet'Port airport transportation is not available to this property, and the hotel does *not* offer a shuttle; taxi ride from airport is approximately \$20. The hotel offers complimentary parking.

Check-in: 3:00 p.m. Check-out: 12:00 noon CC: AX, D, DC, MC, V

9 TRAVELODGE—RIVERFRONT

222 York Street, Newport, KY 41071
(606) 291-4434 (75-room block)
4 miles from the Convention Center 

This hotel offers complimentary continental breakfast daily, newspaper in the lobby, and parking. Some rooms have showers only (no baths). Although there is no restaurant at this property, there are many reasonably priced restaurants and fast-food options within walking distance. This property is fairly new and recently renovated. Jet'Port airport transportation is *not* available, and the hotel does *not* offer a shuttle; taxi ride from airport is approximately \$24.

Check-in: 3:00 p.m. Check-out: 12:00 noon CC: AX, D, MC, V



Historic Fountain Square, downtown Cincinnati. Courtesy of Cincinnati Convention & Visitors Bureau.

Credit Card (CC) Codes: AX = American Express, C = Carte Blanche, D = Discover, DC = Diners Club, M = MasterCard, V = VISA.

Convenience Information

Accessibility for Registrants with Special Needs

GSA is committed to making the Annual Meeting accessible to all people interested in attending. We realize that some have special requirements, such as interpreters for the deaf and shuttle vehicles with lifts. We will do our best to accommodate everyone. If you have special needs, check the appropriate box on the registration form or contact Becky Martin at GSA headquarters.

Child Care

Due to 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 5, 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.
- Cincinnati 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 Hyatt Regency concierge,

(513) 579-1234, for local child-care services.

- GSA will provide a room at the Convention Center for children and parents to relax together. It will be a clean, quiet room with basic furnishings (no cribs or playpens).

Computer/Copy Center

Sunday, October 25 through Thursday, October 29; Cincinnati Convention Center.

PCR Computers will be on hand to provide registrants and exhibitors with PCs, laser printers, and copiers for general 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 minimal fee will be charged to use the equipment. Computer equipment will also be available from this area for short-term rental. We hope you plan ahead to use PCR's quality services. For specific needs, requirements or rental rates, contact Kathy Ohmie Lynch, GSA headquarters.

Information/Messages

Friday, October 23 through Thursday, October 29.

GSA information and message desks will be located at both the Cincinnati Convention Center and the Hyatt Regency Hotel.

Cincinnati Convention Center (513) 784-6010
Hyatt Regency Hotel (513) 579-1234

Provide the above telephone numbers, as well as your hotel telephone number, to both home and office. In this way, messages will be taken and received in the most efficient way.

News Room

Sunday, October 25 through Thursday, October 29; Cincinnati Convention Center.

The News Room provides information on many topics for release to the news media. Please come in to let us know of material that is noteworthy for the science or general press. Also, 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 Dept., GSA headquarters.

Recycling

To assist nationwide recycling programs and take responsible action in protecting our environment, GSA and the Cincinnati Convention 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 and watch for further information and specific locations in the Annual Meeting Program.

Sack Sitters

Sunday, October 25 through Thursday, October 29; Cincinnati Convention Center.

A service desk to cover registrant and exhibitor needs! Sack Sitters offers you an

alternative to carrying those heavy bags around into the technical sessions and the exhibit hall. Leave your meeting materials and purchases from exhibit booths in a safe place for a minimal fee. Pick them up at the end of the day or have them packaged and mailed home—no more heavy baggage to carry back on the airplane!

Services include:

- Packaging service, boxes, mailing tubes, postage stamps
- UPS, RPS, U.S. Mail and Federal Express outbound shipping
- Luggage and coat storage
- Fax
- Office supplies

Tourist Information

Information and friendly service are available at the following contact numbers:

Cincinnati Convention & Visitors Bureau
300 W. Sixth Street
Cincinnati, OH 45202
(513) 621-2142, 1-800-344-3445

Northern Kentucky Convention & Visitors Bureau
605 Philadelphia Street
Covington, KY 41011
(606) 261-4677, 1-800-354-9718

Weather

The average daytime temperatures for late October in Cincinnati are about 65°F high and 55°F low. Light-weight clothing with a sweater or jacket is recommended for evening. Rainwear may be needed.



NEW for 1992!

At the request of the 1992 Annual Meeting Committee and the GSA membership, we are reducing the amount of paper generated by the registration folders. This year GSA will provide registrants only with a recyclable folder and a Program. Optional fliers will be available on carousels in the Registration Area. The idea is to "build your own kit," taking only what you really want.

The daily newsletter, Down to Earth, will contain pertinent information on daily activities and program changes, as well as information that used to be in the registration folder. Pick up your issue each day!

Downtown Cincinnati skyline.
Courtesy of Cincinnati Convention & Visitors Bureau.



Registration

PREREGISTER TODAY!

PREREGISTRATION DUE: SEPTEMBER 25

1. There is a \$10–\$20 savings in registration 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 and on the shuttle, 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 member number to register using the member rates.
4. Full payment **MUST** accompany registration. Unpaid purchase orders are **NOT** accepted as valid registration. Charge cards are accepted as indicated on 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, to attend technical sessions, or to visit the exhibit hall. Guest registrants **MUST** be accompanied by either a registered professional or student. A guest is defined as a non-geologist spouse or friend of a professional or student registrant.
7. **CURRENT** student ID is required to obtain student rates at both the on-site and preregistration counters. Students not carrying a current student ID when they arrive to pick up registration materials will be required to pay the professional fee.
8. Complimentary registration will be provided for K–12 science teachers. To register for the Science Teachers program or field trip, please contact Ed Geary, SAGE Program, GSA headquarters.
9. All preregistrations **RECEIVED** after the preregistration deadline of September 25 will automatically be charged the on-site rates.



Part of Borden Formation containing channel at the base of the Nancy Member. AA Highway, Maysville to Garrison, Kentucky. Courtesy of Kentucky Geological Survey.

Cancellations, Changes, and Refunds

All requests for registration additions, changes, and cancellations must be made in writing and received by October 2. GSA will refund advance registration fees for cancellations received in writing by October 2. **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. **NO** refunds for on-site registration and ticket sales.

Preregistration Form

1992 GSA Annual Meeting
Cincinnati, Ohio • October 26–29

Please print • Copy for your records • SHADED AREAS ARE FOR YOUR BADGE

Name (Last)			(First name/nickname as it should appear on badge)			Init.
Employer/University (affiliation for badge)						
Employer/University mailing address for Employer/University above						
City		State	ZIP Code			
Country (other than USA)	Business Phone	Fax	Home Phone			
Guest/Spouse Name (Last)			(First)			
City		State/Country				

PERSONAL PROFILE (Optional) Please check all that apply: Male Female AGE 18–24 25–34
 EMPLOYED AS 1/Professor/Asst. Professor 2/Government Geologist 35–44 45–54
 3/Manager/Administrator 4/Teacher/Instructor/TA 5/Corporate Geologist 55–65 over 65
 6/Consultant 7/Retired 8/Self-Employed 9/Other _____

Circle member affiliations (to qualify for member registration discount): (A) GSA (Member # _____)
 (B) CF (C) GS (D) GIS (E) MSA (F) NAGT (G) PS (H) SEG (I) AWG (J) SGE (K) AGID (L) SVP (M) NESTA

(Registration required for participation in all exhibits and technical sessions.)	(PLEASE CHECK ONE):		Qty	Column A Amount
	Full 5 Days	or 1 Day		
Professional Member	(1) \$150 <input type="checkbox"/>	(2) \$ 85 <input type="checkbox"/>	1	\$ _____
Professional Non-Member	(3) \$190 <input type="checkbox"/>	(4) \$105 <input type="checkbox"/>	1	\$ _____
Student Member	(5) \$ 60 <input type="checkbox"/>	(6) \$ 35 <input type="checkbox"/>	1	\$ _____
Student Non-Member	(7) \$ 80 <input type="checkbox"/>	(8) \$ 45 <input type="checkbox"/>	1	\$ _____
Spouse/Guest (fill in name above for badge)	(9) \$ 65 <input type="checkbox"/>			\$ _____

GUEST ACTIVITIES	Date	Qty	Amount
Indiana's Wine Country	Oct. 25	(20)	\$ 30
Cincinnati Up, Down, and All Around	Oct. 26	(21)	\$ 31
Sights and Sounds of Cincinnati	Oct. 27	(22)	\$ 30
Stagecoach Stops and Antique Shops	Oct. 27	(23)	\$ 36
Saks Fifth Avenue Seminar	Oct. 28	(24)	\$ 8

SPECIAL EVENTS & TICKETED MEAL FUNCTIONS*	Date	Qty	Amount
Swan Lake Ballet/Dinner	Oct. 24	(45)	\$ 55
5K Run	Oct. 28	(40)	\$ 20
A Taste of Cincinnati	Oct. 28	(56)	\$ 20
Geochemical Society Luncheon	Oct. 26	(60)	\$ 18
Geoscience Information Society Luncheon	Oct. 26	(61)	\$ 18
Geoscience Education Division Luncheon	Oct. 26	(62)	\$ 18
Geoscience Education Luncheon K-12 Teachers	Oct. 26	(63)	\$ 10
Association for Women Geoscientists Breakfast	Oct. 27	(64)	\$ 11
Geophysics Division Luncheon	Oct. 27	(65)	\$ 18
Hydrogeology Division Luncheon	Oct. 27	(66)	\$ 18
Mineralogical Society of America Luncheon	Oct. 27	(67)	\$ 18
National Association of Geology Teachers Luncheon	Oct. 27	(68)	\$ 18
Paleontological Society Luncheon	Oct. 27	(69)	\$ 18
Society of Economic Geologists Luncheon	Oct. 27	(70)	\$ 18
History of Geology Division Luncheon	Oct. 28	(71)	\$ 18
Coal Geology Division Luncheon	Oct. 28	(72)	\$ 18
Engineering Geology Division Luncheon	Oct. 28	(73)	\$ 18
Total Column A			\$ _____

FIELD TRIPS*	Date	Qty	Amount	Column B Amount
1 Sampling the Layer Cake That Isn't	Oct. 23–24	(100)	\$ 95	1 \$ _____
2 Paleoclimate Controls, Appalachian Basin	Oct. 22–25	(101)	\$247	1 \$ _____
3 Geology of Columbus' Landfall—first three days	Oct. 22–24	(102)	\$760	1 \$ _____
Geology of Columbus' Landfall—full four days	Oct. 22–25	(103)	\$985	1 \$ _____
4 Regional Aspects of Pottsville & Allegheny Stratigraphy	Oct. 24–25	(104)	\$ 96	1 \$ _____
5 Sangamonian-Wisconsinan Transition, Ohio & Indiana	Oct. 25	(105)	\$ 48	1 \$ _____
6 Geological Aspects of Key Archaeological Sites	Oct. 24–25	(106)	\$107	1 \$ _____
7 Karst and Cave Systems in Stones River Group	Oct. 22–24	(107)	\$ 88	1 \$ _____
8 Ordovician, Silurian, and Middle Devonian Stratigraphy	Oct. 24–25	(108)	\$100	1 \$ _____
9 Cincinnati's Geologic Environment (K-12 Teachers only)	Oct. 25	(109)	\$ 42	1 \$ _____
10 Geologic Glimpses from Around the World	Oct. 26	(110)	\$ 23	1 \$ _____
11 Excursion to Caesar Creek State Park & Warren County	Oct. 28	(111)	\$ 26	1 \$ _____
12 Rumpke Sanitary Landfill	Oct. 29	(112)	\$ 10	1 \$ _____
13 Mississippian Paleosols, Paleokarst, & Eolian Carbonates	Oct. 30–31	(113)	\$130	1 \$ _____
14 Fort Payne Carbonate Facies of South-Central Kentucky	Oct. 29–31	(114)	\$194	1 \$ _____
15 Changing Interpretations of Kentucky Geology	Oct. 30–Nov. 1	(115)	\$182	1 \$ _____
16 Building Stones in Three Ohio Cities	Oct. 29–31	(116)	\$127	1 \$ _____
17 Sangamonian-Wisconsinan Transition (repeat)	Oct. 30	(117)	\$ 48	1 \$ _____
18 Structure and Tectonics of Rough Creek Graben	Oct. 29–31	(118)	\$174	1 \$ _____

SHORT COURSES* (current student ID required at check-in on-site)	Date	Qty	Amount	Column B Amount
1 Geographic Info System Software	Professional Oct. 23–25	(150)	\$275	1 \$ _____
Student	(151)	\$255	1 \$ _____	
2 How to Do Anything with Mohr Circles	Professional Oct. 24–25	(152)	\$150	1 \$ _____
Student	(153)	\$130	1 \$ _____	
3 Introductory Rock & Paleomagnetism	Professional Oct. 24–25	(154)	\$150	1 \$ _____
Student	(155)	\$130	1 \$ _____	
4 Environmental/Engineering Geology	Professional Oct. 25	(156)	\$130	1 \$ _____
Student	(157)	\$110	1 \$ _____	
5 Paleosols for Sedimentologists	Professional Oct. 25	(158)	\$180	1 \$ _____
Student	(159)	\$160	1 \$ _____	
6 Phase I—Preliminary Site Assessments	Professional Oct. 25	(160)	\$155	1 \$ _____
Student	(161)	\$135	1 \$ _____	
7 Practical Tracing of Ground Water	Professional Oct. 25	(162)	\$135	1 \$ _____
Student	(163)	\$115	1 \$ _____	
8 Environmental Applications	Professional Oct. 30	(164)	\$145	1 \$ _____
Student	(165)	\$125	1 \$ _____	

IEE ANNUAL ENVIRONMENTAL FORUM BOOKLET (302) \$ 3 _____ \$ _____
Total Column B \$ _____
Total Column A \$ _____
Columns A & B = Total Remittance \$ _____

Preregistration Deadline: September 25

Remit in U.S. funds payable to: 1992 GSA Annual Meeting
 (All preregistrations must be prepaid. Purchase Orders not accepted.)

Payment by (check one):
 Check American Express VISA
 Diners Club/Carte Blanche MasterCard

Card Number _____ Expires _____
 Signature _____

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

*Meeting registration not required

If you need services to accommodate a disability, please check here. We will contact you by phone.
 Yes No

FOR OFFICE USE
 A _____ D _____ V _____ M _____
 CK# _____
 DR _____ CR _____
 Bal. A/R 1233 _____
 Ref. A/P 2006 _____
 Refund Check # _____

Registration Fees

	Advance (by Sept. 25)	On-Site	One-Day
Professional—Member	\$150	\$170	\$ 85
Professional—Nonmember	\$190	\$210	\$105
Student—Member	\$ 60	\$ 70	\$ 35
Student—Nonmember	\$ 80	\$ 90	\$ 45
Guest	\$ 65	\$ 75	N/A

On-Site Registration Schedule

CINCINNATI CONVENTION CENTER, ELM STREET LOBBY

*Friday, October 23	1:00 p.m. to 5:00 p.m.
*Saturday, October 24	7:30 a.m. to 2:00 p.m.
Saturday, October 24	12:00 noon to 2:00 p.m.
Sunday, October 25	10:00 a.m. to 7:00 p.m.
Monday, October 26	7:30 a.m. to 5:00 p.m.
Tuesday, October 27	7:30 a.m. to 4:00 p.m.
Wednesday, October 28	7:30 a.m. to 2:00 p.m.
Thursday, October 29	7:30 a.m. to 11:30 a.m.

*PREREGISTRANTS ONLY!

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 exactly the amount you paid to join. That's like joining GSA for free. Likewise, students who pay the basic membership dues of \$15 to become a Student Associate will receive a \$20 discount on their Annual Meeting registration. That's even better than joining GSA for free!

The \$40 registration discount for members mentioned above applies to professional members of GSA or an Associated Society. The Associated Societies that qualify are on the registration form. Save time by joining before the meeting. Membership applications are available prior to the meeting from GSA headquarters. During the meeting, they can be picked up at the Membership Booth in the Elm Street Lobby of the Cincinnati Convention Center.

THE VOYAGE CONTINUES

From Columbus to Magellan

Abstracts with Programs

Advance-Copy Purchase
1992, Volume 24, Number 7
Price: \$20 net each.
No additional discounts given.

Only members and nonmembers residing in the United States, Canada, and Mexico may take advantage of GSA's

advance-copy purchase option of the Annual Meeting issue of *Abstracts with Programs*. These advance copies will be mailed about three weeks prior to the meeting. The \$20 price includes shipment by first-class mail.

Members and nonmembers residing outside the United States, Canada, and

Mexico: Due to the prohibitive costs of airmail postage and postal delays in overseas mailing, we regret that we are unable to make this special advance-copy purchase offer available to you. Copies may be purchased at the meeting.

Refunds for duplicate orders will not be given. Members, check your records

carefully to make sure that you have not previously purchased a copy of this publication on either your dues statement or through GSA Publication Sales.

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 for payment. 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 11.

By mail: Use the form provided.

By phone or fax: Call us toll-free at 1-800-472-1988 (outside Colorado), or use our standard business phone (303) 447-2020 during office hours (8:00 a.m. to 4:30 p.m. MT). You may also fax your order to us at 303-447-1133 (24-hour line).

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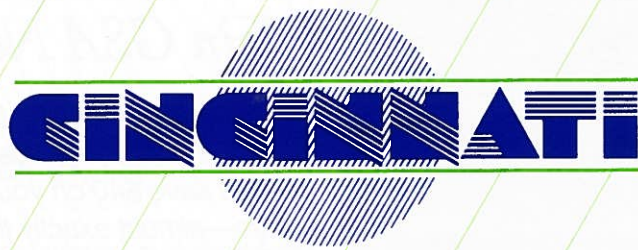
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Rock Bridge, Black Hand Sandstone, Hocking County, Ohio. *Photo by Preston Fettrow.*



Gorge Metro Park, Sharon Sandstone, Northeastern Ohio. *Photo by Trudy Beal.*



Cincinnati skyline at night. *Courtesy of Cincinnati Convention & Visitors Bureau.*



Black Hand Sandstone exposed near Newark in central Ohio. *Photo by Michael C. Hansen, Ohio Geological Survey.*

THE VOYAGE CONTINUES

From Columbus to Magellan



Future GSA Annual Meeting Sites

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New Orleans	November 6-9, 1995
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