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**GEOLOGICAL SOCIETY OF AMERICA**

**1990 Annual Meeting**

**DALLAS**

Dallas, Texas

October 29–November 1

Dallas Convention Center • Hyatt Regency Hotel

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**PREREGISTRATION DUE SEPTEMBER 28**

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1990 GSA  
ANNUAL MEETING  
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APPRECIATION  
FROM GSA

The Geological Society of America is grateful to and sincerely thanks all those who have contributed so much to the success of this meeting: the 1990 Local Committee for its leadership; the speakers for their contributions to the science; exhibitors for their financial support, products, and information; the associated societies for their programs; sponsors and volunteers for their support. To each and every one a special thanks from GSA's Council and staff.

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## ASSOCIATED SOCIETIES

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 National Earth Science Teachers Association  
 Paleontological Society\*  
 Sigma Gamma Epsilon  
 Society of Economic Geologists\*  
 Society of Vertebrate Paleontologists

\*Participating in the 1990 Technical Program



# DALLAS

Geology is alive  
and well in Dallas.

Join us to experience the excitement of current, relevant science at the Dallas Annual Meeting. No longer just for the oil geologist, Dallas is a desirable destination for all geologists.

Dallas has a strong base in other areas besides geology. Beyond recognition for oil and cattle, Dallas is known as the Silicon Prairie; Dallas ranks among the top five cities in computer and microelectronic manufacturing employment in the United States. Dun and Bradstreet reports that Dallas has one of the largest concentrations of million-dollar corporations, the nation's second leading fashion and apparel center, and the world's largest wholesale trading complex.

And when the business day ends, people don't ride off into the sunset, because Dallas lights up with night life dedicated to good times that go well beyond calico and cowboy boots. Today's Dallas lets you kick up your heels at the most sophisticated nightspots. Boasting more restaurants per capita than New York City, Dallas offers culinary delights ranging from French to Thai to Tex-Mex. Every night in Dallas more than 100 live performances are staged including opera, ballet, and improvisational entertainment.

DALLAS: a prime destination for geologists open to the latest in science. And after a long day in sessions, you can be revived by the cuisine and night life offered with a warm Texas welcome.



## TECHNICAL PROGRAM

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 11, and will be selected and organized into sessions on August 10 and 11 by the Joint Technical Program Committee. The JTPC consists of 38 geoscientists representing each of the GSA associated societies and divisions participating in the technical program. The JTPC chairmen, nominated by the Dallas Local Committee and approved by GSA's Council, also serve on the GSA Program Committee, which oversees all technical program activities.

Speaker notices will be mailed by August 24. The final technical program schedule will appear in the September issue of *GSA News & Information*.

## INVITED PAPERS (SYMPOSIUM)

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.

- S1. Seafloor Hydrothermal Mineralization: New Developments.** *Society of Economic Geologists.* Peter Rona, NOAA, Miami; Steven D. Scott, University of Toronto. Sunday, October 28, morning.



- S2. **Geologic Setting and Generation of Very Large Volcanic-hosted Massive Sulfide Deposits.** *Society of Economic Geologists.* Frederick J. Sawkins, University of Minnesota. Sunday, October 28, afternoon.
- S3. **The Origin of Animals.** *Paleontological Society.* Philip W. Signor, University of California, Davis; Stanley M. Awramik, University of California, Santa Barbara. Tuesday, October 30, morning.
- S4. **Active Tectonics in the Mid-Continent.** *Engineering Geology Division.* Norman R. Tilford, Texas A&M University. Monday, October 29, morning.
- S5. **Extinction and Recovery of Plankton from the K/T Boundary Event.** *Cushman Foundation for Foraminiferal Research and North American Micropaleontological Section of SEPM.* Richard K. Olsson, Rutgers University; William A. Berggren, Woods Hole Oceanographic Institution. Tuesday, October 30, morning.
- S6. **Thermodynamic Mixing Properties of Petrologically Important Minerals.** *Mineralogical Society of America.* Mark S. Ghiorso, University of Washington; Robert C. Newton, University of Chicago. Monday, October 29, afternoon.
- S7. **Geoscience Organizations: Their Efforts and Impact on Geoscience Education.** *National Association of Geology Teachers.* Dorothy L. Stout, Cypress College, California. Monday, October 29, afternoon.
- S8. **Geochemistry of Metalliferous Black Shales.** *Organic Geochemistry Division of the Geochemical Society and IGCP Working Group 254.* Philip A. Meyers, University of Michigan; Lisa M. Pratt, Indiana University. Sunday, October 28, afternoon.
- S9. **Transient Responses to Global Change: The Geomorphic and Hydrologic Record.** *Hydrogeology and Quaternary Geology and Geomorphology Divisions.* Steven Wells, University of New Mexico; Jack Hess, Desert Research Institute; Richard Craig, Kent State University. Wednesday, October 31, all day.
- S10. **Oxygen and Carbon Isotopes in Paleozoic and Early Mesozoic Marine Sediments: Toward a Global Isotope Stratigraphy.** *Geochemical Society.* Ethan L. Grossman, Texas A&M University. Tuesday, October 30, morning.
- S11. **Geology of Venus.** *Planetary Geology Division.* Ted A. Maxwell, NASA, Washington; Baerbel K. Lucchitta, USGS, Flagstaff. Tuesday, October 30, morning.
- S12. **The Effects of Scale on Archaeological and Geological Perspectives.** *Archaeological Geology Division.* Julie K. Stein, University of Washington; Angela R. Linse, University of Washington. Tuesday, October 30, afternoon.
- S13. **Geological Societies and Information Transfer in the Electronic Age.** *Geoscience Information Society.* Marie Dvorzak, University of Wisconsin—Madison. Monday, October 29, morning.
- S14. **Salt Tectonics.** *Structural Geology and Tectonics Division.* Mark Cloos, University of Texas, Austin; Martin Jackson, University of Texas, Austin. Monday, October 29, morning.
- S15. **The Effects of Past Global Change on Life.** *1990 Annual Meeting Committee and National Academy of Sciences—National Research Council.* Thomas M. Usselman, National Academy of Sciences—National Research Council. Monday, October 29, afternoon.
- S16. **Eustasy: The Ups and Downs of a Major Concept.** *History of Geology Division.* Robert H. Dott, Jr., University of Wisconsin—Madison. Monday, October 29, morning.
- S17. **Practical Applications of Coal Geology.** *Coal Geology Division.* Robert B. Finkelman, USGS, Reston; Douglas S. Peters, U.S. Bureau of Mines, Denver. Monday, October 29, morning.
- S18. **Structure, Tectonics, and Geophysics of the Southern Margin of North America.** *Geophysics Division.* G. Randy Keller, University of Texas at El Paso; Richard T. Buffler, University of Texas, Austin. Tuesday, October 30, 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 Joint Technical Program Committee 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, pre-announced 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 News & Information*.

- T1. **Strontium Isotopes and Sedimentary Geology.** Richard Koepnick, Mobil Research & Development Corp., Dallas, Texas. Geochemistry, Global Geoscience, Paleooceanography/Paleoclimatology.
- T2. **Mesozoic Tectonic Evolution of Mexico and the Gulf of Mexico.** José Longoria, University of Texas at Dallas; Richard Buffler, University of Texas, Austin. Geophysics, Stratigraphy, Tectonics.
- T3. **Problems and Solutions to Monitoring Ground Water in Karst Terranes.** *Hydrogeology Division.* Ralph O. Ewers, Eastern Kentucky University. Environmental Geology, Hydrogeology, Petrology/Sedimentary.



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T4. **Cretaceous/Tertiary Boundary Sections in the Southern United States.** Gerta Keller, Princeton University; Stefan Gartner, Texas A&M University. Geochemistry, Global Geoscience, Paleontology.

T5. **Hydrogeology of Arid Regions.** *Hydrogeology Division.* Bridget Scanlon, University of Texas, Austin. Hydrogeology.

T6. **Erosional Landscapes of the South-Central United States.** David L. Amsbury, NASA, Houston; O. T. Hayward, Baylor University. Geomorphology, Paleoclimatology, Remote Sensing.

T7. **Oxygen and Carbon Isotopes in Paleozoic and Early Mesozoic Marine Sediments: Toward a Global Isotope Stratigraphy.** *Geochemical Society.* Ethan L. Grossman, Texas A&M University. Geochemistry, Global Geoscience, Stratigraphy.

T8. **Geologic Effects of Hurricane Hugo.** Nicholas K. Coch, Queens College; Paul Gayes, Coastal Carolina College. Environmental Geology, Remote Sensing, Sedimentology.

T9. **Environmental and Engineering Studies for Radioactive Waste Isolation: Experience Based on the Waste Isolation Pilot Plant (WIPP) Project, SE New Mexico.** *Engineering Geology Division.* William M. Roggenthen, South Dakota School of Mines and Technology; Dwight Deal, International Technology Corp., Carlsbad, New Mexico; A. L. Lappin, Sandia National Laboratories. Engineering Geology, Environmental Geology, Hydrogeology.

T10. **Effects of the Loma Prieta Earthquake.** *Engineering Geology Division.* Perry Rahn, South Dakota School of Mines and Technology. Engineering Geology, Environmental Geology, Geophysics.

T11. **Amino Acid Geochemistry: Applications in Stratigraphy and Geochronology.** John F. Wehmiller, University of Delaware. Geochemistry, Quaternary Geology, Stratigraphy.

T12. **Metageology: Expanding Geologic Awareness.** Raymond Pestrong, San Francisco State University; Garry McKenzie, Ohio State University. Environmental Geology, Geology Education, Other.

T13. **The Late Proterozoic Evolution of Organisms and Environments.** Andrew H. Knoll, Harvard University; David DesMarais, NASA, Ames Research Center; Robert J. Stern, University of Texas at Dallas. Global Geoscience, Paleontology, Precambrian Geology.

T14. **Regulatory Geology: Site and Performance Evaluations in the Face of Geological Uncertainty.** Philip S. Justus, U.S. Nuclear Regulatory Commission. Engineering Geology, Environmental Geology, Hydrogeology.

T15. **Salt Domes: Geotechnology, Energy, and Economic Significance.** James T. Neal, Sandia National Laboratories; Steven J. Seni, University of Texas, Austin. Economic Geology, Engineering Geology, Environmental Geology.

T16. **Paleosols and Subaerial Exposure Surfaces in Carbonate Sequences.** Annabelle Foos, University of Akron. Geochemistry, Petrology/Sedimentary, Stratigraphy.

T17. **Upper Cretaceous Stratigraphy and Paleontology, U.S. Gulf Coastal Plain and Adjacent Regions.** David T. King, Jr., Auburn University. Paleontology/Paleobotany, Sedimentology, Stratigraphy.

T18. **Isotope Fractionations in Organic Matter: Biosynthetic and Diagenetic Processes.** Stephen A. Macko, Memorial University; Michael H. Engel, University of Oklahoma. Geochemistry, Paleoceanography, Sedimentology.

T19. **Calibration of Controls on Stratigraphic Sequences.** *Sedimentary Geology Division.* John P. Grotzinger, Massachusetts Institute of Technology. Global Geoscience, Sedimentology, Stratigraphy.

T20. **Geoscience Transects (POSTER MODE ONLY).** *Geophysics Division.* W. R. Van Schmus, University of Kansas; Walter Mooney, USGS, Menlo Park. Geophysics, Structural Geology, Tectonics.

T21. **Applications of Organic Matter Biomarkers in Sedimentary Geology.** Michael A. Kruge, Southern Illinois University. Geochemistry, Paleoceanography, Sedimentology.

T22. **Salt Tectonics.** *Structural Geology and Tectonics Division.* Mark Cloos, University of Texas, Austin; Martin Jackson, University of Texas, Austin. Structural Geology, Tectonics.

T23. **Tectonostratigraphic Correlation of Late Cretaceous-Early Tertiary Island-Arc Rocks in the Caribbean Region.** *International Division.* Paul Mann, University of Texas, Austin; Burke Burkart, University of Texas, Arlington. Geochemistry, Structural Geology, Tectonics.

T24. **Geological Resources, Hazards, and Population.** Garry D. McKenzie, Ohio State University. Engineering Geology, Environmental Geology, Geomorphology.

T25. **Friction Melting Processes and Products in Geologic Materials.** Jerry F. Magloughlin, University of Minnesota; John G. Spray, University of New Brunswick. Engineering Geology, Petrology/Igneous, Structural Geology.

T26. **Writing Assignments: A Tool for Teaching and Learning Geology.** *National Association of Geology Teachers.* R. Heather Macdonald, College of William and Mary; Susan H. Conrad, Vassar College. Geology Education.

T27. **Geochemistry and Global Change.** Keith A. Kvenvolden, USGS, Menlo Park. Geochemistry, Global Geoscience, Paleoceanography/Paleoclimatology.

T28. **Microcomputer Management of Databases in Petrology and Geochemistry.** Joseph Frizado, Bowling Green State University. Computers, Geochemistry, Petrology/Igneous.

T29. **Practical Applications of Coal Geology.** *Coal Geology Division.* Robert B. Finkelman, USGS, Reston; Douglas C. Peters, U.S. Bureau of Mines, Denver. Coal Geology, Environmental Geology, Hydrogeology.

T30. **Granites/Rhyolites: Interrelations, Processes, Geometries, Geochemistries.** M. Charles Gilbert, Texas A&M University. Geochemistry, Petrology/Experimental, Petrology/Igneous.



T31. **Water and Volcanoes (BOTH POSTER AND ORAL MODE).** Grant Heiken, Los Alamos National Laboratory; Marshall Moss, USGS, Tucson. Geochemistry, Hydrogeology, Volcanology.

T32. **Transient Responses to Global Change: The Geomorphic and Hydrologic Record (POSTER MODE ONLY).** *Quaternary Geology and Geomorphology Division.* Steven Wells, University of New Mexico; Jack Hess, Desert Research Institute; Richard Craig, Kent State University. Environmental Geology, Geomorphology, Hydrogeology.

T33. **Opportunities for Scientific Drilling in the Continental Crust: Shallow- to Intermediate-Depth Projects.** Earl Hoskins, Texas A&M University; James J. Papike, South Dakota School of Mines and Technology. Geochemistry, Geophysics, Sedimentology.



## FIELD TRIPS

Big D has been a crossroads for travel in North America for many years. The field trips planned for the 1990 Annual Meeting in Dallas also use the city as a hub from which to venture forth and visit geologic outcrops in Texas, adjoining states, and Mexico. We hope that this listing of trips for GSA's 1990 meeting will pique your interest, and that you will make plans to attend one or more of them.

**Trips begin and end in Dallas unless otherwise noted.** Participants must provide their own transportation to the starting point and from the termination point for those trips not originating or terminating in Dallas. 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. For some trips, group-rate airfares have been arranged to get

participants to Dallas at the termination of a field trip or to another city for the start of a postmeeting trip. If you do not wish to take advantage of this air travel, please register using the fee without airfare for that trip.

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 28.**

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 postmeeting trips **MAY** be possible during the meeting at the Field Trip Desk, Dallas Convention Center.

**CANCELLATION DEADLINE IS OCTOBER 5.** 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 deadlines and 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 Desk during the meeting. After the meeting, contact Dallas Geological Society, Dorothy Newsom (GSA), One Energy Square, Suite 170, Dallas, TX 75206, (214) 373-8614.

For further information, contact either of the 1990 Field Trip Chairmen, Robert T. Clarke, Mobil Research & Development Corp.—DRL, P.O. Box 819047, Dallas, TX 75381-9047, (214) 851-8481, fax 214-851-8185, or Kent C. Nielsen, Program of Geosciences, MS FO2.1, University of Texas at Dallas, P.O. Box 830688, Richardson, TX 75083-0688, (214) 690-2448, fax 214-690-2537, or Registration Coordinator, GSA headquarters.

## PREMEETING

1. **Sedimentation and Diagenesis of Middle Cretaceous Platform Margins, East-Central Mexico**  
*Paul Enos, Dept. of Geology, University of Kansas, Lawrence, KS 66045, (913) 864-4974; Charles J. Minero, Shell Development Co., Houston; J. Eduardo Aguayo Camargo, Universidad Nacional Autónoma de México, Mexico City;*

*Bryan P. Stephens, Texaco Petroleum, Inc., New Orleans. Sponsored by the Sedimentary Geology Division. Wednesday, October 24–Sunday, October 28. Cost: \$725 (4 ON, 4 B, 3 L, 1 D, round-trip airfare Dallas to Tampico). Limit: 30.*

This trip will provide a detailed examination of platform-to-basin transitions in different tectonic settings. Participants will be able to examine superb carbonate outcrops in the Sierra de El Abra and the Sierra Madre Oriental that were part of the Valles–San Luis Potosí platform and the Tamaulipas Basin. Depositional environments, diagenesis, and structural styles will be emphasized in the field along with an evaluation of the porosity evolution in identical lithologic sequences subjected to shallow-through-deep burial histories. Comparisons of the nearby Golden Lane and Poza Rica giant producing trends will be made.

The Sedimentary Geology Division will subsidize students who are valid Division members. Students **MUST PAY THE FULL TRIP FEE WHEN REGISTERING**, but will receive \$50 after the meeting directly from the Division.

2. **Hydrogeology of Trans-Pecos Texas**  
*John M. Sharp, Jr., Dept. of Geological Sciences, University of Texas, Austin, TX 78712, (512) 471-3317; C. W. Kreitter, Texas Bureau of Economic Geology, Austin. Sponsored by the Hydrogeology Division. Thursday, October 25–Sunday, October 28. Trip begins in El Paso, Texas. Cost: \$305 (2 ON, 3 B, 3 L, 1 D, airfare Midland to Dallas); \$235 without airfare. Limit: 30.*

This trip profiles a succession of hydrogeologic features and systems in an arid region between El Paso and Midland, Texas. Field stops include: (a) surface-water flooding problems and an extremely dry vadose zone in a desert floor of an alluvial basin—the Texas Low-Level Radioactive Waste Disposal study area near Fort Hancock; (b) recharge processes across a grassland plateau overlooking the desert basin; (c) ground-water discharge and gypsum precipitation in a salt flat; (d) transition from grassland to maple-pine vegetative communities associated with change in elevation and hydrologic setting along Guadalupe Peak; (e) spring discharge at Balmorhea, Texas, as part of a logical or regional flow system; (f) Wink sink, a recently formed feature of gypsum karst; (g) Carlsbad Caverns; (h) the Ogallala aquifer on the Southern High Plains.

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3. **Petrologic Evolution of the Southeast San Juan Volcanic Field: Oligocene Intracontinental Arc Magmatism**  
*Michael Dungan, Dept. of Geology, Southern Methodist University, Dallas, TX 75275, (214) 692-2752; Michael Colucci, Kurt Ferguson, and Steve Balsley, Southern Methodist University; Peter Lipman, USGS, Denver. Thursday, October 25–Sunday, October 28. Trip begins in Albuquerque, New Mexico. Cost: \$265 (3 ON, 3 B, 2 L, 3 D, airfare to Dallas); \$220 without airfare. Limit: 40.*

The Platoro caldera complex, in the southeastern San Juan Mountains, is the earliest, least silicic, and best exposed of three major caldera clusters of the San Juan volcanic field. Six million years of magmatic activity, from precaldern andesitic stratocones to subsequent ash flows of the Treasure Mountain Tuff and related postcollapse lavas, are represented. The petrologic evolution of the complex will be discussed on the basis of a new and comprehensive geochemical investigation in the context of a refined eruptive stratigraphy and new geochronological data. Combined mineral chemistry and paleomagnetic reversal stratigraphy will be examined as a correlation tool for deciphering ash-flow tuff sequences. Discussion of the transition from prerrift calc-alkaline magmatism to later basaltic rift volcanism will provide an overview of the evolution of the Rio Grande rift.

4. **Remote Sensing Techniques Applied to Structural Geology and Oil Exploration in South-Central Oklahoma**  
*Mike Crawford, ARCO Oil and Gas Co., 2300 W. Plano Pkwy., Plano, TX 75075, (214) 754-3877; Ken Morgan and Nowell Donovan, Texas Christian University; Bill Brown, Baylor University. Thursday, October 25–Sunday, October 28. Cost: \$240 (3 ON, 2 B, 3 L). Limit: 40.*

The purpose of this trip is to examine several structural features in the Ardmore basin and Arbuckle uplift and look at their expression on aerial photography, Landsat TM, and airborne radar imagery. We will visit: the Mill Creek site, where the first experiment on thermal-inertia remote sensing was conducted; Cement, Oklahoma, to examine the classic example of microseepage alteration and its detection by remote sensing techniques; the Meers fault, where evidence for recent movement will be observed on the ground

and in aerial photography and satellite imagery. Finally, in the Wichita Mountains, structural relations and lithologic mapping from remote sensing data will be evaluated. This part of the trip includes a drive up to Mt. Scott to get an overview of the Wichitas and show examples of Landsat TM.

5. **Geology, Geochemistry, and Structure of Low-pressure Sheet Granites, Wichita Mountains, Oklahoma**  
*M. Charles Gilbert, Dept. of Geology, Texas A&M University, College Station, TX 77843-2451, (409) 845-2464. Thursday, October 25–Sunday, October 28. Cost: \$235 (3 ON, 2 B, 3 L, 1 D). Limit: 30.*

Participants in this trip will see the eastern segment of the Wichita Granite Group, including the Mt. Scott Granite and its inclusions and contact relations with the Quanah Granite and Carlton Rhyolite. We will discuss the significance of granophyric texture, miarolitic cavities, red color, sheet form, and fractured character. We will visit the Quanah Granite, a typical hypersolvus granite with sodic amphibole, and study its internal character and geochemistry. In the western segment of the Wichita Granite Group we will observe the Long Mountain Granite, the Cold Springs Granite, and the Lugert Granite. The internal and external contacts of the Lugert Granite with the Reformatory Granite at Quartz Mountain State Park will be given special attention. We will also study the contamination zone in the Mt. Scott Granite which contains intermediate granitoids formed along the contact between granite and gabbro.

6. **Coal Geology of the Western Region of the Interior Coal Province in Parts of Kansas, Missouri, and Oklahoma**  
*Samuel A. Friedman, Oklahoma Geological Survey, N-131 Energy Center, 100 E. Boyd St., Norman, OK 73019-0628, (405) 325-3031; Lawrence L. Brady, Kansas Geological Survey, Lawrence; Joy L. Bostic, Missouri Division of Geology and Land Survey, Rolla. Sponsored by the Coal Geology Division. Thursday, October 25–Sunday, October 28. Trip begins in Tulsa, Oklahoma. Cost: \$210 (2 ON, 2 B, 3 L, 2 D). Limit: 40.*

Part of the western region of the Interior Coal province, an area not previously visited by the Coal Geology Division, will be traversed for about 570 miles. Participants will see surface coal mines producing dull- to bright-banded, high- to low-sulfur middle

Pennsylvanian bituminous coal in western Missouri, eastern Kansas, and eastern Oklahoma. New coal resource estimates will be presented. We will discuss recent advances in stratigraphic correlations and interpretations of depositional environments based on new cross sections, chemical analyses (including trace elements) and petrographic analyses (including vitrinite reflectance). The guidebook will contain supplementary reports on coal characterization based on palynology, petrography, resources, history of mining, stratigraphy, and geochemistry of coal.

7. **Carbonate and Siliciclastic Sedimentation in Late Pennsylvanian Cycles, North-Central Texas**  
*Thomas E. Yancey, Dept. of Geology, Texas A&M University, College Station, TX 77843-3115, (409) 845-2451; Arthur Cleaves, Oklahoma State University, Stillwater; Merlynd Nestell, University of Texas, Arlington. Sponsored by the Sedimentary Geology Division. Saturday, October 27–Sunday, October 28. Cost: \$115 (1 ON, 1 B, 2 L). Limit: 40.*

Participants on this trip will examine carbonate and siliciclastic (sand and mud) sedimentation in Upper Pennsylvanian strata of the eastern shelf of the Midland Basin. This sequence shows strong control by fluctuating sea levels in an area characterized by high rates of sedimentation and repeated deltaic deposition. Well-developed transgressive and regressive sequences show nearly continuous deposition from nonmarine to offshore marine environments involving alternating siliciclastic to carbonate deposition. Depositional models for mixed carbonate-siliciclastic deposition are generated to explain depositional patterns and suggest a framework for deltaic and carbonate bank development. The role of small-scale cyclicity to cyclothem depositional will be examined, along with interbasinal correlation to the midcontinent region based on fusulinid and conodont correlations and cycle comparisons. Data on isotope stratigraphy in the section will be presented along with paleontologic and sedimentologic data.

The Sedimentary Geology Division will subsidize students who are valid Division members. Students MUST PAY THE FULL TRIP FEE WHEN REGISTERING, but will receive \$50 after the meeting directly from the Division.

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 GSA, P.O. BOX 9140, BOULDER, CO 80301



**8. Nearshore Clastic-Carbonate Facies and Dinosaur Trackways in the Glen Rose Formation (Lower Cretaceous) of Central Texas**

*Gail R. Bergan, Reservoirs, Inc., 1151-C Brittmore Rd., Houston, TX 77043, (713) 932-7183; Jeffrey G. Pittman, Zycor, Inc., Austin. Saturday, October 27. Cost: \$35 (1 L). Limit: 40.*

A one-day trip is planned to visit classic exposures and dinosaur tracks in the type area of the Glen Rose Formation. Bluffs exposed along the Paluxy River reveal sand-flat, fluvial-creek, mud-dominated intertidal flat, and nearshore lagoon sediments deposited in a seaward-fining tidal-flat-salt-marsh complex. Interesting features include the *Corbula martinae* oyster beds and the *Salenia texana* zone (dividing the lower and upper Glen Rose), bored hardgrounds, serpulid worm "patch reefs," oyster beds, salt-tolerant land plants, and ichnofossils, including abundant theropod and sauropod dinosaur tracks. The trip will progress from subtidal to supratidal environments as we observe the final waning of Cretaceous Glen Rose seas. Local facies and depositional environments will be discussed with reference to age-equivalent rocks exposed elsewhere along the Gulf Coastal Plain outcrop and to correlative subsurface beds. Discussion topics will also include periodic offshore gypsum precipitation and the nature of regionally extensive dinosaur-track-bearing beds.

**9. Dinosaur Tracks in the Cretaceous Glen Rose Formation of Central Texas**

*Ronnie J. Hastings, Waxahachie Independent School District, Waxahachie, TX 75165, (214) 937-3861; Robert T. Clarke, Mobil Research & Development Corp.—DRL, Dallas. Sponsored by the History of Geology Division. Sunday, October 28. Cost: \$35 (1 L). A reduced price of \$25 is offered for accompanying guest and/or child. Limit: 40.*

This field day excursion is designed as a "fun trip" for participants of all ages. Meeting attendees, spouses, and their children will find it an ideal trip for a family outing before the GSA technical sessions begin. Tracks excavated from the Glen Rose site in the early 1940s are still on display at the American Museum of Natural History in New York City and at other museums around the country. Discussions in the museum at Dinosaur Valley State Park and at the track sites will cover

paleoclimate, paleoenvironment, types of track makers, their stride length, speed, and the "human-track" controversy, to name just a few.

**10. Geology, Hydrology, and Engineering Aspects of the Superconducting Super Collider Site, Ellis County, Texas**

*Donald F. Reaser, Dept. of Geology, University of Texas, Arlington, TX 76019, (817) 273-2984; Priscilla P. Nelson, Geotechnical Engineering Center, Austin; Joe C. Yelderman, Baylor University. Sunday, October 28. Cost: \$35 (1 L). Limit: 40. (Note: A GSA Short Course, "Site Selection for Critical Facilities—The Earth Science Perspective" is being offered on Saturday, October 27.)*

This one-day trip in the Dallas area will visit Upper Cretaceous Eagle Ford Shale, Austin Chalk, and Taylor Marl, exposed in the area of the site selected for the Superconducting Super Collider. Structural features associated with the collider tunnel as well as the geohydrologic and engineering characteristics of the Cretaceous host rocks will be the main focus of discussions. A stop at the proposed future excavation for the injector complex near the town of Maypearl is anticipated.

**11. Archaeological Geology of the Upper Trinity River Drainage Basin, Texas**

*C. Reid Ferring, Institute of Applied Sciences, University of North Texas, P.O. Box 13078, Denton, TX 76203, (817) 565-2694. Sponsored by the Archaeological Geology Division. Sunday, October 28. Cost: \$35 (1 L). Limit: 40.*

Participants will get an overview of the late Quaternary geology, paleoenvironments, and archaeology of the Upper Trinity River Basin. Field stops will include deep exposures of late Pleistocene and Holocene alluvium, spring, and lacustrine deposits and a mid-Holocene sand-dune locality. Archaeological data from these localities (ranging from Paleoindian to Late Prehistoric) will enable discussions of site preservation, site prediction, and site formation processes.

**12. Clastic and Carbonate Shelf Deposition, Late Albian–Early Cenomanian, North Texas**

*Alton Brown, ARCO Oil and Gas Co., Research Center, 2300 W. Plano Pkwy., Plano, TX 75075, (214) 754-6217; Joe McGowen, ARCO Oil and Gas Co., Plano. Sunday, October 28. Cost: \$42 (1 L). Limit: 20.*

The Upper Washita Group of the Lake Texoma region comprises interbedded shale, sandstone, and limestone deposited in a wide spectrum of environments within the general shelf setting. The purpose of this trip is to examine the lithologic sequences and interpret the depositional environments of Upper Washita units. Discussions will center on process-oriented sedimentology as interpreted from hydrodynamic and biogenic structures, paleontology, and rock textures. Outcrop data will be integrated with regional data to interpret possible causes of changes from clastic to carbonate to marl sedimentation. The upper Weno, Pawpaw, Mainstreet, and Grayson formations will be examined. The gently dipping units crop out in long cliff exposures along the Lake Texoma shoreline. Short hikes to outcrops will be necessary.

**POSTMEETING**

**13. Structure and Stratigraphy of the Marathon Basin, Big Bend Park and Vicinity, Trans-Pecos Texas**

*William R. Muehlberger, Dept. of Geological Sciences, University of Texas, Austin, TX 78713-7909, (512) 471-4885; Patricia W. Dickerson, Newmont Exploration, Ltd., Elko, Nevada. Thursday, November 1 (evening)–Sunday, November 4. Trip ends in Midland, Texas. Cost: \$385 (3 ON, 2 B, 3 L, 1 D, airfare Dallas to Midland); \$320 without airfare. Limit: 30.*

The western end of the 1000-km-long Ouachita system is best exposed in the Marathon Basin. Exposures to be studied include the middle and upper Paleozoic units that constitute the upper two of three recognized lithotectonic units that partition the thrust belt into distinct domains. A traverse from Marathon to Persimmon Gap at the entrance to Big Bend National Park will demonstrate the structural and lithological changes from the frontal thrust to the innermost exposures of the thrust belt. Big Bend Park lies mainly within the southern continuation of the Rio Grande Rift. The rift structures are nearly all superposed on Laramide structures. Late Eocene–early Oligocene caldera-related volcanism is widespread. Major walking stops include Persimmon Gap, Boquillas and Santa Elena canyons, and between Lajitas and Terlingua.





**14. Geological and Hydrological Studies of Evaporites in the Northern Delaware Basin for the Waste Isolation Pilot Plant (WIPP)**

*Dennis W. Powers, Consulting Geologist, Star Route Box 87, Anthony, TX 79821, (915) 581-8636; Norbert Rempe, Westinghouse-WIPP Project; Robert Holt, International Technology Corp., Carlsbad, New Mexico; Richard Beauheim, Sandia National Laboratories. Thursday, November 1 (evening)–Sunday, November 4. Trip ends in Midland, Texas. Cost: \$310 (3 ON, 3 B, 3 L, airfare Dallas to Midland); \$245 without airfare. Limit: 40.*

The WIPP, located east of Carlsbad, New Mexico, is being developed 2150 feet deep in bedded salt of the Salado Formation as the repository for transuranic radioactive waste from U.S. defense programs. It should receive the first shipments of waste in 1990. The geology and hydrology of the late Permian evaporites in the northern Delaware Basin have been extensively studied during the last 15 years. Core and log studies show that depositional environments of the Castile, Salado, and Rustler formations are much more varied than previously described. The hydrogeology of the Rustler Formation varies greatly between areas of syndepositional dissolution and recent dissolution. Dual porosity and overall low permeability are shown in single-well and multi-well experiments with pumping tests and tracers. The field trip will include studies of outcrops, cores of these evaporites, geochemical experiments showing large-scale creep deformation, underground workings, and hydrogeological studies.

**15. Hydrogeology of the Blaine Gypsum-Dolomite Karst Aquifer, Southwestern Oklahoma**

*Kenneth S. Johnson, Oklahoma Geological Survey, University of Oklahoma, Norman, OK 73019-0628, (405) 325-3031; Donna L. Runkle, USGS, Oklahoma City; John Bozeman and Sue Bozeman, Oklahoma City. Thursday, November 1 (evening)–Saturday, November 3. Cost: \$160 (2 ON, 2 B, 2 L, 1 D). Limit: 40.*

On a two-day trip to the Hollis Basin of southwestern Oklahoma, we will examine outcrops, groundwater production, recharge, and the hydrologic regime of a major karst aquifer in the Permian Blaine Formation. It is unique in being the only significant freshwater aquifer developed in evaporite rocks in the United States. On the first part of the trip, we will examine geologic outcrops and exposures of karst features in the Blaine, including sinkholes, caves, disappearing streams, and springs. During the rest of the trip, we will examine groundwater distribution, chemistry, production, and recharge. In addition to examining natural recharge, the group will also visit artificial recharge sites where excess runoff is diverted to sinkholes or recharge wells.

**16. Structure and Stratigraphy of the Arbuckle Mountains, Southern Oklahoma**

*Rodger E. Denison, Mobil Research & Development Corp., P.O. Box 819047, Dallas, TX 75381-9047, (214) 851-8172; Nowell Donovan, Texas Christian University. Thursday, November 1 (evening)–Saturday, November 3. Cost: \$140 (2 ON, 2 B, 2 L). Limit: 40.*

Rocks ranging in age from Middle Proterozoic to Pennsylvanian are exposed in the Arbuckle Mountains of south-central Oklahoma. These strata are representative of sedimentation through much of the southern interior, particularly during early and middle Paleozoic time. These thick shelf sediments were intensely deformed in the Pennsylvanian; however, the driving force for this deformation remains a controversial subject. Southern Oklahoma is underlain by the best contained and most accessible aulacogen in North America. The Arbuckle Mountains lie at the northern edge of the aulacogen. A long interdependent geologic history ties Precambrian events with Paleozoic sedimentation and structural style.

**17. NOAM-CARIB Plate Boundary in Guatemala**

*Richard C. Finch, Dept. of Earth Sciences, Tennessee Technological University, P.O. Box 5062, Cookeville, TN 38505, (615) 372-3121; Gabriel Dengo, Centro de Estudios Geológicos de America Central, Guatemala City. Friday, November 2–Wednesday, November 7. Trip ends in Houston, Texas. Cost: \$750 (5 ON, 3 L, airfare Dallas to Guatemala City to Houston). Limit: 16.*

Participants on this trip will visit an active transform boundary in Guatemala. Tertiary-Quaternary sinistral faulting and effects of the February 1976 earthquake will be seen in Motagua Valley. We will examine evidence for an earlier history as a Late Cretaceous suture zone: eclogite and serpentinite bodies, thrusts, and pillow basalts associated with radiolarian cherts in an ophiolite suite.

**18. Reefal Development in a Terrigenous Province—The Reefs of Veracruz, Mexico, and Eocene-Miocene Analogues of the Tampico-Misantla Basin, Mexico**

*Paul R. Krutak, Basin Research Institute, Louisiana State University, Baton Rouge, LA 70803-4101, (504) 388-8328; Raul Gio-Argaez, Director de Investigación y Vinculación, Mexico; Clif F. Jordan, Mobil Research & Development Corp., Dallas. Friday, November 2–Tuesday, November 6. Cost: \$720 (4 ON, 4 B, 5 L, 5 D, round-trip airfare Dallas to Mexico City). Limit: 16.*

The three basic objectives of this trip are (1) to examine in the field a modern example of reefal buildup in a terrigenous environment, (2) to analyze three specific stratigraphic criteria (carbonate-terrigenous facies variation, volcanoclastic-carbonate diagenesis, and biogeographic provincialism) that served to characterize such accumulations throughout the Phanerozoic Eon, and (3) to collect samples of classic Eocene-Oligocene-Miocene reefal and nonreefal microfossiliferous beds (Chapapote, Palma Real, Meson, Escolin, and Tuxpan formations) of the Tampico-Misantla basin, Mexico. We also plan a visit to the pre-Totonac archaeological site (9th–13th centuries) of El Tajin near Papantla, Veracruz.



**19. The Lampasas Cut Plain—Evidence for the Cyclic Evolution of a Regional Landscape, Central Texas**

*O. T. Hayward, Dept. of Geology, Baylor University, Waco, TX 76798-7354, (817) 755-2361; Peter Allen, Baylor University; David Amsbury, NASA, Houston. Friday, November 2–Saturday, November 3. Cost: \$120 (1 ON, 2 B, 2 L). Limit: 40.*

The Lampasas Cut Plain is a region of buttes, mesas, and broad, complex valleys, north of the Llano Basin and west of the Brazos River. To date, interest in the Cut Plain has been directed almost entirely to Fredericksburg (Comanchean-Cretaceous) stratigraphy. The landscapes have been considered the product of a simple and clearly defined erosional history of relatively short duration. However, evidence of at least five major cycles of erosion and stillstand has recently been recognized in the Cut Plain landscape. The implications of this history extend far beyond the Cut Plain. The purposes of the two-day trip are (1) to study the Lampasas Cut Plain, a specific example of evolution of "Erosional Landscapes of the South-Central United States" (a theme session at the Dallas meeting), (2) to gain an understanding of the processes that have shaped this landscape, and (3) to consider a tentative chronology of very broad regional events.

**20. Carboniferous Geology and Tectonic History of the Southern Fort Worth (Foreland) Basin and Concho Platform**

*Robert C. Grayson, Jr., Dept. of Geology, Baylor University, Waco, TX 76798, (817) 755-2361; Matthew J. Pranter, Baylor University; Lance L. Lambert, University of Iowa, Iowa City; Glen K. Merrill, University of Houston—Downtown College. Friday, November 2–Saturday, November 3. Cost: \$120 (1 ON, 2 B, 2 L). Limit: 40.*

Carboniferous rocks exposed in the triangular area north of the Llano uplift region record a complex interaction of the North America craton and the evolving Ouachita tectonic system. Subsidence related to Ouachita tectonic activity established the Fort Worth foreland basin. Carbonate depositional systems developed on the less rapidly subsiding Concho platform. Deltas sourced by the emergent Ouachita Mountains filled the basin and caused deltaic systems to prograde westward across the basin and onto the

Concho platform. Depositional models will be proposed to interpret vertical sequences and regional relations. Application of conodont biostratigraphy to the interpretation of the depositional history will be demonstrated.

**21. Engineering and Urban Geology of the Dallas–Fort Worth Metroplex**

*Christopher C. Mathewson, Dept. of Geology, Texas A&M University, College Station, TX 77843-3115, (409) 845-2488; Aubrey D. Henley, Mason Johnston and Associates, Dallas, Texas. Sponsored by the Engineering Geology Division. Friday, November 2. Cost: \$40 (1 L). Limit: 40.*

Participants on this trip will first visit the Dallas underground freight facility, urban redevelopment areas, and the historical districts. Progressing westward through a newly developed, planned residential and commercial community, we will end up at the site of the 1983 spillway erosion problem at the Grapevine Reservoir. A tour and inspection of the construction geology at the Dallas–Fort Worth Regional Airport follows. From the airport we travel to Fort Worth, "the biggest small town in Texas," to compare the urbanscape with that of Dallas.

A Texas-style range barbecue lunch will be served at the historic Stockyards Hotel at the Fort Worth stockyards, followed by a chance to collect Texas souvenirs. We will visit a landfill project where the wastes are being placed in deep drilled shafts, the White Rock Escarpment, the Grand Prairie Water Treatment Plant, and a 96" sewer pipeline crossing of the Trinity River before our return to Dallas. Each stop will be highlighted with a poster display and plenty of time for photographs.

**22. Hydrogeology of the Jewett Lignite Mine, East Texas**

*W. R. Kaiser, Bureau of Economic Geology, University of Texas, University Station, Box X, Austin, TX 78713, (512) 471-7721; Marc J. Norris, Northwest Resources Co., Jewett, Texas; W. Douglas Hall, Hall Southwest Water Consultants, Inc., Austin. Sponsored by the Hydrogeology Division. Friday, November 2. Cost: \$40 (1 L). Limit: 40.*

This one-day trip will examine aspects of the regional and local hydrogeology of the Jewett Mine, where lignite is surface mined from the heterogeneous Wilcox-Carrizo fluvial aquifer system, a major aquifer in Texas. The Jewett Mine has one of the largest mine dewatering operations

in the country, enabling mining to depths in excess of 200 ft. Aquifer heterogeneity and geometry in the Wilcox-Carrizo will be studied in outcrops and mine highwall exposures. At the outcrop, aquifer channel-fill sands will be observed to document their architecture and regional hydrogeologic setting. At the mine we will examine further the effects of aquifer heterogeneity and geometry, stratigraphic sequence, mining depth, and topography on ground-water circulation, highwall blowouts, dewatering, depressuring, well-field design, well construction, and well maintenance (iron scaling).

**23. Lower Cretaceous Vertebrates in Central Texas**

*Louis Jacobs, Dept. of Geological Sciences, Southern Methodist University, Dallas, TX 75275, (214) 692-2773; Dale Winkler, Southern Methodist University; Phillip Murry, Tarleton State University, Stephenville, Texas. Sponsored by the Society of Vertebrate Paleontologists. Friday, November 2. Cost: \$40 (1 L). Limit: 40.*

This field trip will visit the classic Comanchean section of Texas with emphasis on the Aptian through mid-Albian Trinity Group. Terrestrial to marine environments are represented. Stops include the famous Glen Rose dinosaur track sites and dinosaur bone concentrations at Proctor Lake and Doss Ranch. Facies changes between the marine transgressive Glen Rose Formation and terrestrial Twin Mountains Formation will be examined.

**HALF-DAY MINI-TRIPS  
(held during the meeting)**

**24. Tour of Mobil Research & Development Corp., Dallas Research Laboratory**

*Robert T. Clarke, Mobil Research & Development Corp.—DRL, P.O. Box 819047, Dallas, TX 75381-9047, (214) 851-8481. Monday, October 29 (morning). Cost: \$10 (1 L). Limit: 20.*

Exploration and production activities are conducted at this Mobil Research and Development facility. Discussion of the research activities in both disciplines will be followed by a tour of the laboratory.

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**25. Information Resources at the Dallas Research Laboratory, Mobil Research & Development Corp.**

Joseph Fou, Mobil Research & Development Corp.—DRL, 13777 Midway Rd., Dallas, TX 75244-4390, (214) 851-8597; Marie Dvorzak, University of Wisconsin—Madison, (608) 262-8956. Sponsored by the Geoscience Information Society. Wednesday, October 31 (morning). Cost: \$10. Limit: 20.

This tour will focus on the gathering, processing, and dissemination of information at the Dallas Research Laboratory. Included will be a tour of the library and several other information activities at the laboratory.

**SEG-SPONSORED FIELD TRIP**

**Industrial Mineral Resources of the Delaware Basin, Texas and New Mexico**

J. Richard Kyle, Dept. of Geological Sciences, University of Texas, Austin, TX 78713, (512) 471-4351. Wednesday, October 24 (evening)—Saturday, October 27 (afternoon). Trip begins and ends in El Paso, Texas. Cost: \$300 (3 ON, 3 B, 3 L, 2 D, guidebook). Limit: 30. For additional information and to register, contact Kenneth F. Clark, Economic Geology Publishing Co., P.O. Box 637, University of Texas at El Paso, TX 79968-0637, (915) 533-1966, or fax 915-544-7416.

This trip will be devoted to the industrial rock and mineral resources of the Delaware Basin of west Texas and southeastern New Mexico. Planned stops include the Carlsbad potash district (George Austin), Carlsbad Caverns (Bill Bourbon), Culberson sulfur deposit (Joseph Mussey), Seven Heart Gap barite deposit (Rich Kyle), Castile gypsum (Rich Kyle), and Allamoore talc district (Bill Bourbon). Participants should plan to arrive in El Paso on the evening of October 24 and should schedule flights departing El Paso after 5 p.m. on October 27. Preregistration fees for the trip are due by August 25. (Refundable if trip is canceled, but \$50 penalty for cancellation by participant after August 25.)

**CUSHMAN FOUNDATION and SEPM-SPONSORED FIELD TRIP**

**Cretaceous Microfossils of North-Central Texas**

Emile A. Pessagno, Jr., Programs in Geosciences, University of Texas at Dallas, P.O. Box 830688, Richardson, TX 75083-0688, (214) 690-2430. Friday, October 26. Cost: \$30 (1 L, guidebook not included). Limit: 25. For additional information and to register, contact Emile A. Pessagno, Jr.

Informal collecting trip for Foraminifera and other microfossil samples for comparative material from measured sections and described localities in Lower and Upper Cretaceous strata within a 200-mile radius of Dallas. Participants must supply their own sample bags. Fees must be sent to the leader by October 1, 1990.



**PROFESSIONAL HORIZONS**

**GSA SHORT COURSES**

Would you like to learn something new, brush-up on the latest, or refresh yourself on the basics? GSA short courses will be held immediately before the Annual Meeting and are open to members and nonmembers. Registration for the meeting is not required.

Preregistration is recommended; on-site registration is \$25 additional.

You may register for GSA courses on the Annual Meeting Preregistration Form.

**PREREGISTRATION DEADLINE—SEPTEMBER 28**

**FOR MORE INFORMATION CONTACT GSA COURSE REGISTRAR**

**Cancellation**

Registration substitutions may be made at any time. Requests for refunds must be received in writing by GSA no later than October 5.

**1. Site Selection for Critical Facilities—The Earth Science Perspective**

Saturday, October 27, 10:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel. Cosponsored by the Engineering Geology Division. (Note: A related GSA field trip, "Geology, Hydrogeology, and Engineering Aspects of the Superconducting Super Collider Site, Ellis County, Texas" is being offered on Sunday, October 28.)

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

This course is recommended for those teaching environmental and engineering geology or for the earth scientist in industry. Geologically dependent factors dominate selection criteria for the siting of many large and critical facilities. The increasing involvement of geologists in site selection demands that faculty understand the principles of this activity. Those in industry will benefit from this course because site selection is ever more important in aspects of the extractive as well as construction industries. Topics covered:

- defining the geographic area of interest
- scope of the project
- creating an ideal geotechnical profile for the project
- selecting candidate sites
- investigations to establish confidence
- integration of geotechnical and other siting factors; ranking
- selling the site.

Faculty: Norman R. Tilford, Center for Engineering Geosciences, Texas A&M University.

Limit: 50. Fee: \$110 (includes course manual and lunch).

**2. Coastal Land Loss**

Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Houston Airport Marriott.

This course is not aimed at experts in the field of coastal geology, but rather at professionals who need to deal with the subject in a classroom, in the field, or, possibly, in a courtroom. Consulting geologists and engineers involved in coastal erosion problems will benefit from an organized, systematic presentation of information relating to the causes and solutions of an almost ubiquitous national

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problem that grows worse each year. The course will include one day of lecture in Houston and one day in the field in Galveston. Topics covered:

- factors affecting land loss
- sea-level rise
- responses to the land-loss problem
- measuring and predicting land-loss
- regional land loss perspective.

Faculty: Joseph T. Kelley, Maine Geological Survey, University of Maine; Robert A. Morton, Bureau of Economic Geology, University of Texas, Austin; Orrin H. Pilkey, Jr., Dept. of Geology, Duke University; Shea Penland, Chief Coastal Geologist, Louisiana Geological Survey.

Limit: 30. Fee: \$170 (includes course manual, ground transportation to Galveston late Saturday afternoon, lunch on Sunday, and ground transportation to Dallas on Sunday evening).

### 3. Contaminant Hydrogeology: Practical Monitoring, Protection, and Cleanup

*Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel. 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 Hydrogeology Division.

For newcomers and entry-level professionals who are interested in practical contaminant hydrogeology as it is applied daily to soil and ground-water contamination problems. This course heavily emphasizes the working approach to solving hydrogeologic problems of data collection, interpretation, and remediation as required by regulation. Topics covered:

- theoretical and practical elements of geologic and hydrogeologic investigations
- subsurface-drilling procedures and sampling
- monitoring well construction
- water-sampling techniques
- contaminant transport and fate—general concepts
- data interpretation
- aquifer analysis
- criteria for selecting monitoring and remediation procedures
- site cleanup
- regulations
- client and budgetary considerations.

Case histories explore the application of techniques in LUST, CERCLA, and RCRA projects, siting of hazardous-waste landfills, leaking underground tanks, and contaminated properties in several states.

Faculty: Christopher M. Palmer, Senior Geologist, GeoStrategies, Inc., Hayward, California; Jeffrey L. Peterson, Senior Hydrogeologist, GeoStrategies, Inc., Hayward, California.

Limit: 40. Fee: \$195 (includes course manual and lunch both days).

### 4. Creating Geological Applications with Macintosh HyperCard

*Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel. Cosponsored by the National Association of Geology Teachers.*

For all academic and industry geoscientists, including graduate students. Only limited computer experience is required. This hands-on course introduces the capabilities of HyperCard, Apple Computer's innovative and versatile software for the Macintosh, demonstrates applications, and provides a foundation for its use. Hundreds of HyperCard stacks have appeared since 1987 and are used increasingly by educators, businesses, and researchers. Topics covered:

- organizing and using information in stacks; stack design guidelines
- developing new stacks; creating backgrounds, incorporating graphics, designing fields, and working with buttons; creating new cards and modifying existing cards
- introduction to scripting; programming in HyperTalk, basic commands, card scripting, visual effects, manipulating information in fields
- linking HyperCard to other computer programs, databases, spreadsheets, animation software
- using HyperCard to control videodisc and CD-ROM players, incorporating sound
- examples of stacks used in the geosciences for research, teaching, lectures, and presentations
- creating your own stack.

Faculty: H. Robert Burger, Dept. of Geology, Smith College; J. Ritchie Boyd, Dept. of Geology and Geophysics, University of Wyoming.

With appreciation, GSA acknowledges Apple Computer, Inc. for providing the Macintosh computers used in this course.

Limit: 40. Fee: \$195 (includes course manual, disks containing several stacks, tools, and scanned images to prepare your own stacks, and lunch both days).

### 5. Metamorphic Pressure-Temperature-Time Paths

*Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel. Cosponsored by the Mineralogical Society of America.*

Aimed at the first-year graduate student, this introductory course is designed to be practical, using hands-on applications. Both petrologists and structural geologists will be introduced to the techniques used in the determination and interpretation of metamorphic pressure (*P*)-temperature (*T*)-time paths. These techniques require relatively sophisticated mathematics and cannot be accomplished without the use of computer programs. The course will make extensive use of computer applications that have been developed by the authors. In addition to the theoretically oriented course notes, each participant will be supplied with software and exercises describing its application. More than half of the course will be spent doing these exercises and examining the results of calculations. Topics covered:

- theoretical description of petrologic systems
- geothermometry and geobarometry: theory and application to *P-T* path calculations
- differential thermodynamics (the Gibbs method): Applications to *P-T-X-M* phase equilibria and *P-T* path calculations
- pitfalls in *P-T* path calculations: diffusion, closure temperature, chemical zoning, garnet consumption, plagioclase textures
- heat flow: theory, analytical solutions, and numerical methods
- thermal aspects of contact metamorphism
- thermal models and *P-T* paths of crustal thickening and thinning
- subduction zone metamorphism.

Faculty: Frank S. Spear, Dept. of Geology, Rensselaer Polytechnic Institute; Simon M. Peacock, Dept. of Geology, Arizona State University.

Limit: 60. Fee: \$225 (includes course manual, computer disks, and lunch both days).





## 6. Phanerozoic Plate-Tectonic Reconstructions

Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., University of Texas, Arlington.

Designed for advanced students, professionals, and anyone interested in Earth history, this course will review the plate-tectonic development of the ocean basins and continents during the past 600 million years. Fifty global plate-tectonic reconstructions, based on recent compilations of seafloor linear magnetic anomalies, paleomagnetic poles, satellite altimetry, and paleoclimatic and biogeographic data, will be presented. A "hands-on" laboratory is planned in which participants will be able to build their own plate-tectonic models. The material presented in this course is based on the work that is being carried out by the PALEOMAP Project, a joint IUGG/IUGS Program. Topics covered:

- technical basis of the reconstructions (how we know what we know)
- problematic Precambrian supercontinent
- assembly and breakup of Pangea
- the role of terranes
- plate-tectonic events that changed the course of Earth history
- inferences about the driving mechanism of plate tectonics.

Faculty: Christopher R. Scotese, Senior Research Geologist, Shell Development Co., Houston, Texas.

Limit: 30. Fee: \$195 (includes course manual, format atlas of Phanerozoic plate-tectonic reconstructions, computer disk of the program *Terra Mobilis: A Plate Tectonics Program for the Macintosh*, and lunch both days).

7. **Seismic Expression of Structural Styles**  
Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel.  
Cosponsored by the Structural Geology and Tectonics Division.

This course will be of interest to all geoscientists who want to learn about the structural interpretation of seismic data. Participants with little experience in seismic interpretation gain an appreciation for the interpretational process, and those with interpretation experience gain insight into the ambiguities and pitfalls in the structural analysis of seismic data. Topics covered:

- basic acquisition and processing procedures for seismic data
- seismic distortions and pitfalls
- interpretation approaches
- seismic characteristics of structural styles
- seismic modeling.

Faculty: Albert W. Bally, Dept. of Geology, Rice University; Martha Oliver Withjack, Research Associate, Mobil Research & Development Corp., Dallas; Kristian E. Meisling, Principal Research Geologist, ARCO Oil and Gas Co., Plano, Texas; David A. Fisher, Senior Research Geophysicist, ARCO Oil and Gas Co., Plano.

Limit: 50. Fee: \$145 (includes course manual and lunch both days).

## 8. Computer Modeling of Cyclic Carbonate Sequences

Sunday, October 28, 8:00 a.m. to 5:00 p.m., Hyatt Regency Hotel.

Of interest to stratigraphers and sedimentologists in both academia and industry, this course will discuss the facies architecture of small scale (1 to 30 m) carbonate sedimentary cycles, how these are packaged into third-order Vail sequences (1–10 m.y. duration), techniques for quantitatively defining various controls on cycle formation using field data, and one- and two-dimensional modeling approaches used to generate stratigraphic sections and cross sections of carbonate platforms. Topics covered:

- types of carbonate cycles
- subsidence vs. sea-level components
- sedimentation rates, water depths, lag
- platform slopes and antecedent topography
- one-dimensional modeling of stratigraphic sequences
- two-dimensional modeling of carbonate platforms.

Faculty: J. Fred Read, Maya Elrick, and David A. Osleger, Dept. of Geological

Sciences, Virginia Polytechnic Institute and State University.

Limit: 75. Fee: \$140 (includes course manual, precourse reception on Saturday evening, and lunch on Sunday).

9. **Practical Tracing of Ground Water, with Emphasis on Karst Terranes**  
Sunday, October 28, 8:00 a.m. to 5:00 p.m., Hyatt Regency Hotel.  
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 Hydrogeology Division.

Aimed at the professional geologist or hydrologist, this course will introduce participants to applications of tracer tests and practical mechanics of how to conduct ground-water tracing 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. Topics covered:

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

Faculty: James F. Quinlan, Senior Hydrogeologist, ATEC Environmental Consultants, Nashville, Tennessee; E. Calvin Alexander, Jr., Dept. of Geology and Geophysics, University of Minnesota.

Limit: 60. Fee: \$130 (includes course manual and lunch).

## 10. Recent Sediments of the Northwest Gulf Coast Region

Sunday, October 28, 8:00 a.m. to 5:00 p.m., Sheraton Dallas Hotel.

Over the past three decades, thousands of geologists have benefited from the courses taught by Rufus J. LeBlanc, whose vast knowledge, humor, and colorful personality speak for themselves. This well-known basic course will appeal to sedimentologists, petroleum geologists, environmentalists, and coastal zone managers. The accompanying course



manual includes 430 references and is based upon the original research results by the original researchers. Topics covered:

- Recent meander belt and floodplain sediments of the Mississippi River Alluvial Valley
  - the Mississippi River Deltaic Plain complex
  - transgressive marine sedimentation
  - the Recent Cheniers and Chenier Plain of southwest Louisiana
  - Recent sediments of the Texas coast
  - barrier island complexes
- (the systems above will be demonstrated with SP log shapes)
- late Quaternary geological history of the northwest Gulf Coast region
  - literature summary—selected references on Recent clastic sediments of the northwest Gulf Coast region.

Faculty: Rufus J. LeBlanc, Sr., The Rufe LeBlanc School of Clastic Sediments, Houston, Texas.

Limit: 100. Fee: \$80 (includes course manual and lunch).

## MSA-SPONSORED COURSE

### Mineral-Water Interface Geochemistry Short Course

Friday, October 26 through Sunday, October 28. Tanglewood Resort and Conference Center, Pottsboro, Texas. Sponsored by the Mineralogical Society of America.

Class will be held in the morning and early evening, leaving afternoons free for recreation. A welcoming reception will be held Thursday evening, October 25.

This three-day short course is being convened by Michael F. Hochella, Jr., Stanford University and Art F. White, USGS, Menlo Park. Speakers from the United States, Canada, Australia, and Switzerland will discuss fundamental aspects of chemical processes that occur at mineral-water interfaces, including adsorption, dissolution, ion exchange, precipitation, catalysis, electron transfer (oxidation-reduction, including photo-redox), and organic interaction. Applications of these topics to more applied subjects, such as the geochemical cycling of certain elements, the mobility of solutes in ground-water systems, ore deposit formation, weathering processes, mineral growth, and froth flotation will be explored. A companion text will be written by the short course lecturers.

Preregistration required. Limit: 115. Cost: MSA member—\$465 (double room), \$575 (single room); MSA student member—\$300; nonmember—\$505 (double room), \$615 (single room); student nonmember—

\$320. 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 through lunch on Sunday. Bus service will be provided from the Dallas-Fort Worth 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.

## SEPM-SPONSORED COURSE

### Integrated Stratigraphic Analysis Short Course

Saturday, October 27, 8:00 a.m. to 5:00 p.m., Sunday, October 28, 8:00 a.m. to 5:00 p.m., Hyatt Regency Hotel, Regency Ballroom A. Sponsored by SEPM.

Detailed analysis of stratigraphic architecture and facies distribution is facilitated by using multiple data sets. This course provides a hands-on experience in integrating data and interpreting facies distribution patterns. The data sets used include high-resolution seismic lines, well logs, biostratigraphic checklists, and organic geochemistry and isotopic analyses. The field area is offshore Texas where the Pliocene-Pleistocene stratigraphy is dominated by progradational cycles across a tectonic framework of basin-margin subsidence and salt withdrawal. The course is organized for geologists and geophysicists with introductory knowledge of stratigraphy and sedimentation. A sequence of exercises will expose participants to (1) depositional systems, (2) facies analysis, (3) integrating data sets, (4) local vs. global patterns, and (5) application of the integrated approach to stratigraphic problems. (Credit: 1.5 C.E.U.)

Faculty: John M. Armentrout, Mobil Research & Development Corp., Dallas Research Laboratory, Dallas, Texas.

Preregistration required. Limit: 30. Fee: \$245 (includes course notes). For information and registration: SEPM Business Office, P.O. Box 4756, Tulsa, OK 74159; (918) 743-9765.

## PS-SPONSORED COURSE

### Marine and Terrestrial Radiations of the Arthropods

Sunday, October 28, 8:00 a.m. to 5:00 p.m., Hyatt Regency Hotel, Reunion Ballroom F. Sponsored by the Paleontological Society.

This course will focus on the paleobiology of arthropods in relation to their marine and terrestrial radiations

during the Paleozoic. New discoveries, concepts, ideas, and methodology will be utilized to present an up-to-date overview of these important evolutionary events in the history of life. The course is directed toward a wide audience, including specialists, students, and educators.

Faculty: D. G. Mikulic, B. S. Beall, D.E.G. Briggs, B.D.E. Chatterton, M. J. Emerson, R. M. Feldmann, R. A. Fortey, J. Kluesendorf, C. C. Labandeira, R. E. Plotnick, F. R. Schram, W. A. Shear, S. E. Speyer, and S. R. Westrop.

No cost or registration. Course notes will be available on-site for approximately \$15. For information: Donald G. Mikulic, Illinois State Geological Survey, Natural Resources Bldg., 615 E. Peabody Dr., Champaign, IL 61820; (217) 244-2518.

## INTERAGENCY COORDINATING GROUP FOR CONTINENTAL SCIENTIFIC DRILLING FORUM

### Continental Scientific Drilling Forum

Sunday, October 28, 9:00 a.m. to 5:00 p.m. and Tuesday, October 30, 7:30 to 10:30 p.m. (if interest requires second session), Hyatt Regency Dallas, Reunion Ballroom A. Sponsored by the Interagency Coordinating Group for Continental Scientific Drilling (DOE, NSF, USGS).

This forum is to nurture the preparation of proposals for the national Continental Scientific Drilling Program by serving as a focus where project concepts can originate or mature and where scientists can coordinate their scientific drilling efforts. A nine-member organizing committee of research drilling experts will facilitate open discussion of projects in various stages of development. A representative of the ICG will also be present. Emphasis will be on shallow to intermediate depth holes, and on holes of opportunity.

The forum is open to all interested scientists and will be divided into two parts. The first is a review of ongoing projects and fully developed proposals ready for implementation. The second is an in-depth discussion of developing proposals not yet formally submitted to agencies. The discussion, in which both the committee and audience participate, will cover timeliness and value of objectives, engineering feasibility, desirable additions or collaborations, and appropriate agencies to approach for guidance and support.

FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020  
GSA, P.O. BOX 9140, BOULDER, CO 80301

To put a project on the forum's agenda, leaders should prepare a one-page abstract describing their objectives and approach. Indicate whether the project is developing, formally proposed, or in progress. Send to: John C. Eichelberger, CSD Forum Organizing Committee, Sandia National Laboratories—Orgn. 6233, Albuquerque, NM 87185-5800.

## GIS/GEOREF-SPONSORED WORKSHOPS/FORUMS

### GeoRef Beginners Workshop

*Tuesday, October 30, 8:00 to 11:00 a.m., Hyatt Regency Hotel. Sponsored by the Geoscience Information Society and GeoRef.*

Learn how to search AGI's GeoRef on-line database of over a million references to the geological literature from 1785 to the present. The workshop will teach beginning and prospective searchers about (1) the GeoRef database and its subject coverage, (2) Boolean logic used for combining search terms, (3) on-line search commands, and (4) designing effective search strategies. Sample searches will be used to illustrate the points, and the GeoRef Thesaurus and other on-line searching tools will be described. General discussion and questions from the attendees will follow.

No cost or registration. For information: Barbara DeFelice, Dartmouth College, Kresge Physical Sciences Library, Hanover, NH 03755; (603) 646-3845.

### GeoRef Advanced Workshop

*Wednesday, October 31, 1:30 to 4:30 p.m., Hyatt Regency Hotel. Sponsored by the Geoscience Information Society and GeoRef.*

The workshop is designed for the searcher who would like to acquire the advanced skills and knowledge needed to search the GeoRef database more effectively. Special subject searching techniques on the different vendors' search systems will be discussed, as well as in-depth use of search tools such as the GeoRef Thesaurus. A group of expert searchers will be available for questions from the attendees.

No cost or registration. For information: Barbara DeFelice, Dartmouth College, Kresge Physical Sciences Library, Hanover, NH 03755; (603) 646-3845.

### GIS Database Forum

*Thursday, November 1, 9:00 to 11:00 a.m., Hyatt Regency Hotel. Sponsored by the Geoscience Information Society.*

This forum will focus on end-user searchable databases in a variety of formats including CD-ROM, on-line, and floppy disks. Representatives of several databases will provide an overview of the contents and search system of the databases. In addition, they will describe access for users. Most disciplines in the geosciences will be interested in at least one of these databases.

No cost or registration. For information: Charlotte Derksen, Stanford University, Branner Earth Sciences Library, Mitchell Building, Stanford, CA 94305; (415) 723-1093.

## GSA GEOLOGY AND PUBLIC POLICY COMMITTEE

### Geology and Public Policy Forum *Future Energy Needs and Utilization of Fossil Fuels: Implications for National Security, Environmental Controls, and Geoscience Employment*

*Tuesday, October 30, 11:30 a.m. to 1:30 p.m., Dallas Convention Center. Sponsored by the GSA Geology and Public Policy Committee. No cost or registration.*

The primary energy needs of the United States will continue to be met with oil, gas, and coal resources well into the 21st century. However, the ongoing dismantling of the nation's energy supply infrastructure threatens the future availability of these domestic resources, and hence, the energy security, international competitiveness, and standard of living to which we have become accustomed.

Even though existing domestic oil and gas reservoirs in the United States contain a huge untapped resource base, we continue to meet a growing part of our critical energy needs with imported oil. To offset our declining domestic production, new interdisciplinary approaches focused on development of technologies required for improving recovery efficiency from existing reservoirs must be developed and implemented. There is a growing recognition in both industry and government that advanced research and development can play a significant role in arresting the decline of our domestic oil and gas production.

Oil and gas research should be given top priority because these fuels play a dominant role in energy usage in the United States and because the major energy problem of the future is a shortage

of domestic liquid transportation fuels. No other domestic energy supply can meet the demand, in a cost-effective way, for liquid hydrocarbon fuels, at the rate needed, in case of a disruption in supply of imported oil.

Coal is the nation's most abundant fossil fuel and a leading source of domestic energy supply. More than half of domestic electric power is derived from coal. However, key environmental issues are related to increased utilization of coal for supplying our energy. Concerns for air pollution related to coal combustion were addressed in the Clean Air Act of 1970, and proposed amendments to the legislation are currently being debated in Congress.

Geoscience research also offers opportunities to increase efficiency in future use of coal in electric power generation, liquid fuel conversion, gasification, and in situ coal-bed methane extraction. Because coal usage faces significant environmental issues, opportunities for expanding its use have been limited. At the same time, use of oil shale is not on the horizon, because of its relatively high cost and environmental concerns.

Over the years the majority of our nation's geoscientists have been employed in the fossil fuels resource industry. There will continue to be a demand for resource geoscientists to meet future industry needs. In the United States energy industry, longer term emphasis will be on improving efficiency in development and exploitation of fossil resources rather than on exploration and discovery. Future geoscientists in the fossil energy industry will have to focus on interdisciplinary team approaches for improved characterization and efficiency of recovery of fossil fuel resources.

### Meet the GSA Congressional Science Fellow

*Wednesday, October 31, 12:15 to 1:15 p.m., Dallas Convention Center. Sponsored by the GSA Geology and Public Policy Committee.*

The Geology and Public Policy Committee of GSA invites you to meet with Daniel R. Sarewitz, who has spent one year working in the Office of Congressman George E. Brown, Jr. (36th District, California). Some of the issues that Sarewitz has dealt with are earthquake hazard mitigation, science education, international scientific cooperation, and federal support of research development.

The Fellowship, which is for a one-year term, is jointly sponsored by funds from GSA and a grant from the U.S. Geological Survey.

FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020



# EXHIBITORS DALLAS CONVENTION CENTER, WEST HALL



*Some  
is us now!*

## Daily food and beverage service during exhibit hours

SUNDAY OCTOBER 28	MONDAY OCTOBER 29	TUESDAY OCTOBER 30	WEDNESDAY OCTOBER 31	THURSDAY NOVEMBER 1
6:00 p.m. to 9:00 p.m.	9:00 a.m. to 5:00 p.m.	9:00 a.m. to 5:00 p.m.	8:00 a.m. to 4:00 p.m.	Sorry, we're closed

An increasing number of companies have joined the list of GSA's exhibitors. Here they are, as we went to press:

AAPG Bookstore  
AAPG Visiting Petroleum Geologists Program  
Academic Press, Inc.  
Activation Laboratories Limited  
Alaska Oil and Gas Association  
American Geological Institute  
American Geophysical Union  
American Institute of Professional Geologists  
Applied Research Lab/Fisons Instruments  
Arizona Geological Society  
Artcraft Imports  
ASC Scientific  
Association of Geoscientists for International Development  
Association of American State Geologists  
Baylor University  
Ben Meadows Company  
Blackwell Scientific Publications  
Blake Industries, Inc.  
Bureau of Economic Geology  
Cal Graeber Minerals  
Cambridge University Press  
Cameca Instruments, Inc.  
Center for Earthquake Research & Information  
Circum-Pacific Map Project  
CJS Sciences Limited  
Coastal Science Laboratories, Inc.  
Colorado School of Mines  
Columbia University Press  
Computer Oriented Geological Society  
Cushman Foundation  
Custom Scientific Glass Blowing  
Dapple Systems  
Desert Research Institute  
Digital Magnetic Systems, Inc.  
Donald K. Olson Minerals  
Dynamic Graphics, Houston  
Earth Enterprises  
Economic Geology Publishing Company  
Elsevier Science Publishing Company  
F. Jay Phillips  
Finnigan MAT  
Gem and Jewelry  
General Supply Corporation  
Geographics  
Geological Association of Canada  
Geology Stuff  
Geoscience Information Society  
Geoscience Resources, Inc.

Geotech Computer Systems  
GSA—DNAG  
GSA 1991 Annual Meeting—San Diego  
GSA Bookstore  
GSA Combined Publishers Display  
GSA Foundation  
GSA Geology & Public Policy Committee  
GSA International Division  
GSA Planetary Geology Division  
GSA SAGE Program  
Gulf Coast Association of Geological Societies  
Howard Minerals  
IBM  
IKON Mining & Exploration  
Interactive Concepts  
Intermagnetics General/Magstream  
International Association for Mathematical Geology  
International Geologic Correlation Program  
JCPDS  
JEOL USA, Inc.  
Jet Propulsion Laboratory  
Joint Oceanographic Institute  
Kendall/Hunt Publishing Company  
Kentucky Geological Survey  
Kevex Corporation  
Komodo Dragon Treasures  
Krueger Enterprises, Inc.  
Landmark Graphics  
Link Analytical  
Louisiana State University  
Lubrecht and Cramer Limited  
Magellan Systems Corporation  
Merrill/Macmillan Publishing Company  
Micro-Innovations  
Micromeritics Instrument Corporation  
Mineralogical Society of America  
Mountain Press Publishing Company  
National Association of Geology Teachers  
National Science Foundation  
National Earth Science Teachers Assn.  
Natural History Books  
Nature's Own  
Nebraska Geological Survey  
Nikon, Inc., Instrument Group  
New Mexico Bureau of Mines & Mineral Resources  
Ohio State University  
Oklahoma Geological Survey  
Online Computer Library Center  
Oxford University Press

Paleontological Society  
Pergamon Press, Inc.  
Philips Electronic Instruments, Inc.  
Pikes Peak Lithographing Company  
Prentice-Hall, Inc.  
Princeton University Press  
Refraction Technology, Inc.  
Rice University  
Rigaku, USA  
Rocklabs  
SEPM  
Saunders College Publishing  
Schonstedt Instrument Company  
Scintag, Inc.  
Siemens Analytical X-Ray Instrument  
Sigma Gamma Epsilon  
Society of Economic Geologists  
Southern Methodist University  
Spectrex Corporation  
Spex Industries, Inc.  
Springer-Verlag New York, Inc.  
STN International  
Sul Ross State University  
Texas A&I University  
Texas A&M University  
Texas Christian University  
THE Company  
University of Chicago  
University of Chicago Press  
University of Kentucky  
University of Oklahoma  
University of Texas at Dallas  
University of Texas, Arlington  
University of Wyoming  
Unwin Hyman, Inc.  
U.S. Bureau of Mines  
U.S. Department of Energy  
U.S. Forest Service  
U.S. Geological Survey  
Van Nostrand Reinhold  
VG Instruments, Inc.  
W. H. Freeman & Company  
Washington State University  
West Publishing Company  
Western Michigan University  
Wild Leitz USA  
Wiley & Sons, Inc.  
William C. Brown Publishers  
Williams & Heintz Map Corporation  
Wright State University  
X-Ray Assay Laboratories Limited  
Zeiss, Inc.



## SPECIAL EVENTS

### Dallas Welcoming Reception

*Sunday, October 28, 6:00 to 9:00 p.m.  
Dallas Convention Center, West Hall*

This is the time and place to relax with your friends and colleagues and enjoy the opening of the 1990 Geoscience Exhibit. For your convenience, registration will be open until 7:00 p.m. in the ground level lobby. Shuttle buses will be servicing the GSA hotels from the Dallas Convention Center until 9:30 p.m.

We suggest you make dinner reservations for Sunday evening. A Restaurant Guide will be in the registration packets, or ask at your hotel for recommendations. Also a hostess will be on hand in the Registration Area during the Welcoming Reception to provide information on dining facilities and to help you make reservations.

### GSA Presidential Address and Awards Ceremony

*Monday, October 29, 5:30 to 6:30 p.m.  
Hyatt Regency Dallas, Reunion Ballroom*

President Raymond A. Price's address, "The Southern Canadian Rockies and the Western Canada Sedimentary Basin—A Tectonic Tale of Thrusts, Transforms, and Terrane Accretion" will be followed immediately by the GSA Awards Ceremony. After his address, President Price will present the following awards:

Young Scientist Award (Donath Medal)  
Dr. Leigh H. Royden

GSA Distinguished Service Award  
Dr. William B. Heroy, Jr.

Day Medal  
Dr. William S. Fyfe

Penrose Medal  
Dr. Norman D. Newell

Recognition will also be given to newly elected Honorary Fellows Dr. German K. Müller and Dr. B. P. Radhakrishna. Everyone is invited to congratulate the medalists during the cocktail reception that follows immediately.

### Alumni Night

*Monday, October 29, 7:00 to 9:30 p.m.  
Hyatt Regency Dallas, Reunion Ballroom  
Reunion Station, Grand Hall*

More than 60 universities and colleges will be represented in the alumni receptions. If you would like your university to hold a reception, contact the Events Coordinator, GSA headquarters. This is a good night to get together with friends.

### 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.

This is a special year for the Geoscience Information Society. The Society was organized 25 years ago and will celebrate its silver anniversary at the Dallas Annual Meeting. On Tuesday evening, October 30, GIS will hold a Gala 25th Dinner at which speakers will review the founding and history of the society. You may register for this special dinner on the GSA Registration Form.

### T.A.C. (Thursday Afternoon Club) Party

*Thursday, November 1, 3:30 to 5:00 p.m.  
Dallas Convention Center, West Hall*

The Dallas meeting starts and ends with a party. Speakers giving papers after 3:00 p.m. on Thursday are invited to a free beer and music celebration. Each speaker will receive the highly prized "I Survived" button. Friends of survivors and everyone else can join the fun.

### Wild West Barbecue and Dance

*Wednesday, October 31, 7:00 to 10:30 p.m., Longhorn Ballroom*

Come for some true Texas hospitality at the Wednesday evening *Wild West Barbecue and Dance* at the Texas-sized Longhorn Ballroom, close to downtown Dallas and the Convention Center. This low-cost, informal event will feature a lip-smacking beef and chicken barbecue with all the fixin's, served chuckwagon style in a saloon setting. Beer, wine, and mixed drinks will be available for purchase at reasonable prices. Dance and listen all evening to your favorite country-western music at the dance hall made famous by country-western greats. If that isn't enough, Texas style entertainers will keep you jumping.

Shuttle buses will continue their regular daytime routes and will add the Longhorn Ballroom as a stop beginning at 6:30 p.m. Bus service will run continuously to and from the Longhorn Ballroom from 6:30 to 11:00 p.m.

So bring your best cowboy hat, shirt, boots, and appetite to Dallas, round up your guests and friends for the biggest and best barbecue and dance this side of the Trinity River!

Tickets: \$15 (includes complete barbecue dinner, dancing, listening, entertainment, and transportation).

**Longhorn**  
BALLROOM





## SPORTS EVENTS

### Doubles Tennis Tournament

Sunday, October 28, 8:30 a.m. to 1:30 p.m.  
Samuell Grand Tennis Center

Pack your racket and tennis shoes for a light-hearted doubles tournament. Meet at the Hyatt Regency at 8:30 a.m. for departure to the Samuell Grand Tennis Center. Entry will be limited to the first 40 registrants. *This event is by preregistration only.* Awards will be given to the top four players.

If you have any questions on Sunday morning, call or visit the GSA Annual Meeting office either at the Hyatt Regency, Executive Room, or the Convention Center any time after 8:00 a.m.

Fee per person: \$15 (includes court fees, balls, refreshments, and transportation).

### Dallas Cowboys Football

Sunday, October 28, 12:00 to 3:00 p.m.  
Texas Stadium

If you have free time on Sunday and enjoy football, watch the Dallas Cowboys take on the Philadelphia Eagles. For GSA special-price tickets, call (214) 579-4800 and identify yourself as a GSA Annual Meeting attendee. You will receive information and an order form. Upon return of your order and payment, the Cowboys' ticket office will mail your tickets directly to you. Tickets may be ordered by phone with a credit card. Orders must be placed by October 19. Transportation to and from the game is up to you.

Fee: \$19.

### Bachman Lake Fun Runs (5K/10K)

Wednesday, October 31, 6:30 to 9:00 a.m.  
Bachman Lake

Peaceful Bachman Lake in the heart of Dallas is the location for this year's 5K and 10K runs. Runners will race on the pathways encircling the lake. The lake's various waterfowl will be on hand to cheer you along. Late October weather should be clear, but it could be breezy, so bring your windbreaker.

Buses will transport runners from the Dallas Convention Center to Bachman Park (about 5 miles) and back after the races. Buses will depart from the Dallas Convention Center at 6:30 a.m. The race will be professionally directed and timed by Running Trails Race Management. Water will be provided on the course and 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 Dallas Convention Center.

Fee: \$17 (includes shirt, refreshments, and transportation).

### Health/Fitness

Downtown Dallas offers a complete athletic and fitness center at The Texas Club, 800 Main St., 15th Floor, (214) 761-6300. The club offers state-of-the-art equipment, programs, and facilities. You will enjoy the pleasant atmosphere and convenience, just four blocks from the Convention Center. Guest passes are \$8 per visit or just \$25 for five visits. Hours are 9:00 a.m. to 6:00 p.m. weekends, and 6:00 a.m. to 9:00 p.m. weekdays.

## SCIENCE THEATER

Science Theater 1990 will feature the best of the earth science videos on the market today. An exciting and full range of topics will be previewed, from the most recent Kilauea eruptions to the Loma Prieta earthquake. For your convenience, viewing will be available both in the Science Theater, Room W111—Level II of the Convention Center, and in the Level III lounge. Whether you are a teacher previewing videos for class or a discriminating couch potato, the excellent scientific and graphic qualities of these videos should not be missed.



## EMPLOYMENT SERVICE

Do you need qualified scientists to fill staff needs? Or are you looking for employment in the earth-sciences fields? If so, you are invited to participate in the GSA Employment Interview Service which will be conducted in the Dallas Convention Center, Level III, West Hall.

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. The minimum fee for a printout of two specialty listings is \$150.

Interview booths may be rented at the meeting for a nominal fee in half-day increments from Monday through Wednesday, October 29-31. 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

FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020  
GSA, P.O. BOX 9140, BOULDER, CO 80301

one-year registration fee is \$30 for GSA Members and Student Associates; for nonmembers it is \$60. This applicant fee also includes the interview service at the annual meeting.

Applicants who sign up with the Employment Service by August 15, 1990, will be included in the information that employers receive prior to the meeting. So submit your forms early to receive maximum exposure—and don't forget to indicate on your application form that you would like to interview in October.

Employment Service forms are in the February and June 1990 issues of *GSA News & Information*, or you may obtain them by contacting the Membership Services department at GSA headquarters.

### **GSA EMPLOYMENT SERVICE FORUM: FUTURE EMPLOYMENT OPPORTUNITIES IN THE GEOLOGICAL SCIENCES**

*Monday, October 29, 1:00 to 3:00 p.m.  
Hyatt Regency Hotel*

Are you interested in salary scales, tips for successful interviews, and an overview of employment opportunities? What are the current trends in academia, government, industry, and consulting and the impact of federal legislation on job demand? Attend the GSA Employment Service Forum to hear from seven experts. Each panel member will speak briefly on the outlook in his or her special area and answer questions from the audience. The 1990 speakers will include:

Chairman Dick Paull, University of Wisconsin—Madison

Kathleen C. Duckett, John Mathes & Associates, Columbia, Illinois

Charles Mankin, Oklahoma Geological Survey, Norman

Bill Greenwood, USGS, Reston

Norm L. McIver, Shell Oil Company, Houston

Steve Stow, Oak Ridge National Laboratory, Oak Ridge, Tennessee

For further information: GSA Membership Services Manager, GSA headquarters.



## **GUEST PROGRAM**

Come see Big D—diverse, dynamic Dallas! The Guest Committee cordially welcomes you to Texas and especially to Dallas. All guest registrants are invited to visit the Hospitality Room, located in the Regency Ballroom of the Hyatt Regency Hotel. Join us in the Hospitality Room to greet old friends, meet new friends, and learn about the interesting tours and seminars we have planned for you. We will be serving a tempting array of light refreshments throughout the day and our hostesses will be happy to answer your questions. Please remember to wear your GSA badge and bring your gift certificate in so you can receive your registration gift.

#### **Hours:**

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

**Monday–Thursday** 8:00 a.m. to 4:30 p.m.

### **GUEST SEMINARS**

No registration or cost.

#### **Welcome to Dallas**

*Monday, October 29, 9:00 to 9:30 a.m.*

Margie Rufford, Guest Committee Chair, and a representative of Kaleidoscope Tours will welcome you to Dallas and give you a preview of what there is to see and do in Big D.

#### **GTT—Gone To Texas**

*Monday, October 29, 10:00 to 11:00 a.m.*

"GTT" was the simple sign early pioneers posted on their doors when they succumbed to the lure of Texas and headed south. Rose Mary Rumbley, actress, author and professional speaker, will entertain you with a funny, poignant, and spellbinding hour as she introduces you to the men and women who gave their time, energy, money, and often their lives to make Texas what it is today.

#### **Memory Power**

*Tuesday, October 30, 10:00 to 11:00 a.m.*

Remember to attend Jody Potts's seminar and you will never forget another name or anything else important to you. Dr. Potts will introduce you to easy to learn left- and right-brain memory techniques that are fun and immediately applicable.

#### **An Introduction to Texas Wine**

*Tuesday, October 30, 4:00 to 5:00 p.m.*

You may not know that Texas has a budding wine industry. Come sample acclaimed Ste. Genevieve wines, with appropriate nibbles, and hear a representative from Cordier Estates tell the tale of one of the newest industries in Texas.

#### **Holidays All Over the House**

*Wednesday, October 31, 10:00 to 11:00 a.m.*

Learn what's new and innovative in decorating for the holidays from Arnold's Gifts and Creations, Inc., a boutique craft and gift store that has been in business in Dallas for 27 years. Arnold's will show how to create your own holiday decorations, and send you home with detailed instructions.

### **GUEST TOURS**

Tours will leave from the base of the Reunion Tower outside the south entrance of the Hyatt Regency Hotel. Since space is limited, please be sure to preregister. Reservations for all tours will be accepted on a first-come, first-served basis.

#### **Las Colinas: A New Cityscape**

*Sunday, October 28, 1:00 to 4:30 p.m.*

Las Colinas, Dallas's satellite community, is a dream come true for city planners and a world of charming discoveries for visitors. Guides will show you the Communications Complex, where many recent movies have been made, and the Equestrian Center, the Southwest's finest state-of-the-art facility for horses and their owners. You will enjoy the magnificent bronze mustangs at Williams Square before ending the tour with time to shop or ride an imported water taxi on the Venetian style Mandalay Canal. This tour has been designed for guests and their spouses.

Cost: \$15 (includes transportation and guides).

**FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020**



### **Discover Dallas**

*Monday, October 29, 1:30 to 4:00 p.m.*

Get acquainted with Dallas and discover the city's unique, can-do spirit with this overview of landmarks, fascinating architecture, and points of interest. You will see the Kennedy Memorial, City Hall, Farmers Market, and the Reunion project. You will stop at the recently opened Sixth Floor John F. Kennedy Exhibit for a look back to November 22, 1963, at the former Texas School Book Depository.

Cost: \$20 (includes transportation, guides, admission to the museum, and audio cassette and headphone rental).

### **Waxahachie Gingerbread Trail**

*Tuesday, October 30, 9:00 a.m. to 3:00 p.m.*

Waxahachie is a step back into turn-of-the-century Texas located 30 minutes south of Dallas. This small town has the most sites on the National Registry of Historic Places and was the location for filming "Places in the Heart" and "A Trip to Bountiful." It is also the site chosen for the upcoming superconducting super collider. Enjoy riding down streets lined with parks and Victorian houses before touring a magnificent historic home maintained by the Ellis County Museum. The tour will be followed by lunch and shopping on the old town square.

Cost: \$35 (includes transportation, guides, admission, and lunch).

### **Autumn at the Arboretum**

*Tuesday, October 30, 12:00 noon to 3:00 p.m.*

Come see the Dallas Arboretum and Botanical Garden, a lovely acreage abundant with fall blooms, a fascinating history, and spectacular views of scenic White Rock Lake. You will also have time for a quick spin through the historic DeGolyer Estate, a renovated Spanish colonial estate located on the grounds. On the way home you will go down Swiss Avenue, a tree-lined boulevard of carefully restored mansions which was Dallas's first prestigious address. You will also see the Wilson Block, a row of 19th century homes resembling the narrow provincial dwellings of 17th century Europe.

Cost: \$25 (includes transportation, guides, Arboretum admission, and picnic lunch).

### **Fort Worth: "Where the West Begins"**

*Wednesday, October 31, 9:30 a.m. to 3:30 p.m.*

This tour of "Cowtown," as Fort Worth is affectionately known, will help you capture the spirit of the Old West as well as appreciate modern Fort Worth's dedication to the arts. You will stop at the historic Stockyards area where you can mosey down wooden sidewalks, shoot the breeze with real cowboys, and browse through western stores. A Tex-Mex lunch at world-famous Joe T. Garcia's will be followed by tours of the Sid Richardson Collection of Western Art, the Amon Carter Museum, which emphasizes American art, and the renowned Kimbell Art Museum, which

features masterpieces by El Greco, Rembrandt, Cezanne, and Picasso.

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

### **The Aerobics Center: Walk Don't Run**

*Wednesday, October 31, 9:00 a.m. to 1:30 p.m.*

Recent research at The Aerobics Center, a world renowned institution founded 20 years ago by Dr. Kenneth H. Cooper, indicates that a regular program of walking is preferable to jogging and can be all the exercise you need to promote good health. See The Aerobics Center's beautiful 30-acre "campus" where Dr. Susan Johnson will tell you how to start a walking program, and Mr. Casey Meyers will have you participating in a walking clinic. Wear a loose-fitting sweat suit and tennis shoes. Following your walk, you will be treated to a delicious lunch (including dessert!).

Cost: \$25 (includes transportation, book on walking programs, chance for the door prize drawing, and lunch).

### **A Date With Dallas**

*Wednesday, October 31, 2:30 to 4:30 p.m.*

Tour the new Morton H. Meyerson Symphony Center, a magnificent structure designed to perfection by I. M. Pei. Inside the facility you will see Pei's vision from top to bottom, including the noted sound system. From the downtown Arts District you will travel to nearby McKinney Avenue with its brick streets and trolley cars. Here you can enjoy an opportunity to browse through unique shops full of antiques from around the world, and all under one roof.

Cost: \$15 (includes transportation and guides).



# DALLAS

# GSA OFFICIAL HOUSING REQUEST FORM

Your Housing Request Form must be received BY OCTOBER 5. Please complete and either

1. Mail to: GSA Housing  
1201 Elm Street, Suite 2000  
Dallas, TX 75270
2. Fax to: Dallas Convention & Visitors Bureau/GSA Housing  
1-214-746-6799
3. Call: Dallas Housing Bureau  
Hours: Monday-Friday, 8 a.m.-5 p.m., CST  
(214) 746-6681 or 1-800-972-1029

## HOTEL PREFERENCE: (Please print or type all information below)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Rate requested \$ \_\_\_\_\_ (NOTE: All rooms are subject to a 13% tax)

## TYPE OF ACCOMMODATION NEEDED:

- |                                     |                            |
|-------------------------------------|----------------------------|
| _____ Single (1 bed, 1 person)      | _____ 1-Bedroom Suite      |
| _____ Double (1 bed, 2 persons)     | _____ 2-Bedroom Suite      |
| _____ Dbl/Dbl (2 beds, 2-4 persons) | _____ Add rollaway to room |

ARRIVAL DAY/DATE \_\_\_\_\_ TIME \_\_\_\_\_ a.m./p.m.

DEPARTURE DAY/DATE \_\_\_\_\_ TIME \_\_\_\_\_ a.m./p.m.

## NAMES OF OCCUPANTS:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

## MAIL CONFIRMATION TO:

Name \_\_\_\_\_ Telephone ( ) \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_  
State \_\_\_\_\_ ZIP \_\_\_\_\_ Country \_\_\_\_\_

## GUARANTEED ROOM RESERVATION AUTHORIZATION:

All GSA hotels require a first night's deposit to make a reservation. I understand that the hotel may bill me for one night's housing if I fail to properly cancel a guaranteed reservation. Please check one:

- \_\_\_\_\_ Credit card information provided below to guarantee my reservation.  
\_\_\_\_\_ My guarantee will be made directly to the hotel *after* I have received my hotel confirmation.

Please guarantee my room reservation with the following:

\_\_\_\_\_ American Express \_\_\_\_\_ MasterCard \_\_\_\_\_ VISA

NAME (as listed on credit card) \_\_\_\_\_

SIGNATURE \_\_\_\_\_

CARD NUMBER \_\_\_\_\_ EXP. DATE \_\_\_\_\_

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





## HOUSING

GSA has blocked rooms at seven downtown hotels that are offering special convention rates to GSA meeting attendees. GSA endorses these hotels for quality, safety, cleanliness, and service. The GSA shuttle will service all seven downtown hotels.

For student housing, GSA has also blocked rooms at five metro-area motels. *These motels are out of the downtown area, and will not be serviced by the GSA shuttle service. You must have your own transportation.*

### TO MAKE YOUR HOTEL RESERVATION

There are three possible ways to make your housing reservation: (1) mail, (2) fax, or (3) phone. Please refer to the address and phone numbers shown on the Housing Request Form. All reservations must be RECEIVED BY FRIDAY, OCTOBER 5. For phone calls, please call between 8:00 a.m. and 5:00 p.m. Central Standard Time. *Do NOT send your Housing Form in after you call. This will result in a duplicate reservation.*

AFTER FRIDAY, OCTOBER 5, you can try to go through the Dallas Housing

Bureau. They will do what they can or explain the best option. Note that many hotels will be filled at this time, and hotels will only be able to offer the special GSA rate on an as-available basis.

### ASSIGNMENT

Hotel rooms will be assigned on a first-come, first-served basis as they are received by the Housing Bureau. Once your request is received, the Bureau will send an acknowledgment to you and your assigned hotel.

You will then receive a confirmation from the hotel. This is a notice that the hotel received the information from the Housing Bureau and that the reservation has been entered into their system. Please check it carefully.

### ROOM DEPOSITS/GUARANTEES

All GSA hotels require a first night's room deposit. Deposits can be made by (1) providing a credit card number and expiration date on the housing form, or (2) sending payment directly to the hotel once you have received your confirmation from the hotel. The deposit amount should be the cost of one night's stay at your assigned hotel. Note that the Housing Bureau will ONLY accept credit cards, *not* checks or cash. *When making payment directly to the hotel, be sure to give your confirmed reservation number.*

Once the hotel receives your deposit, it automatically guarantees your reservation. The guarantee assures you that no matter

what time you arrive on your scheduled arrival day, your room will be held until at least midnight.

### CHANGES AND CANCELLATIONS

Changes and cancellations BEFORE and AFTER the OCTOBER 5 deadline should be communicated to the Housing Bureau, either by phone, fax, or mail. Supply your confirmed hotel reservation number for any change or cancellation.

Within 72 hours of your scheduled arrival, please contact the hotel directly with any changes. A cancellation notice must be received AT LEAST 48 HOURS in advance to receive a full refund on your first night's room deposit. Please show courtesy as a professional geologist by notifying the hotel if your plans change.

NOTE: All rooms are subject to 13% tax.

### STUDENT HOUSING

GSA has negotiated convention rates with five motels outside of the downtown area. These motels are less expensive than the downtown hotels. *They will not be serviced by the GSA shuttle. Please provide your own transportation.*





**Please make your reservation with the Dallas Housing Bureau.**  
**Note: All rooms are subject to 13% occupancy tax.**  
**All hotels require a first night's deposit.**

**1 THE ADOLPHUS**

1321 Commerce Street, Dallas, TX 75202  
 (214) 742-8200 (250-room block)  
 4 blocks from the Dallas Convention Center  
 Single: \$110 Double: \$125

Dallas's only five-diamond hotel offers 78 years of elegant tradition. The hotel features three restaurants, including a five-star gourmet French restaurant. Enjoy one of four lounges, daily afternoon tea, or the relaxing lobby entertainment. Laundry and valet service, gift shop, beauty shop, and barber shop. Indoor parking at \$10 per day. The first night's deposit is \$100. This is payable by check after you receive your confirmation from the hotel.

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

**2 ARISTOCRAT CLARION**

1933 Main Street, Dallas, TX 75201  
 (214) 741-7700 (85-room block)  
 8 blocks from the Dallas Convention Center  
 Single: \$85 Double: \$95 Jr. Suite: \$109

European style hotel that is also an historical landmark. Recently renovated, well-appointed property. All guests receive complimentary continental breakfast, newspaper, and parking. The hotel bar/restaurant offers casual dining for breakfast, lunch, and dinner. Many of the sleeping rooms are junior suites.

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

**3 DALLAS PARK PLAZA**

1914 Commerce Street, Dallas, TX 75201  
 (214) 747-7000 (600-room block)  
 8 blocks from the Dallas Convention Center  
 Single: \$49 Double: \$61

20-story hotel just one block from the original Neiman Marcus store. Two restaurants, lounge, roof-top jacuzzis, exercise equipment, barber shop, and gift shop. Indoor parking with in/out privileges for \$5. 205 double rooms offer two full bathrooms.

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

**4 DAYS HOTEL**

1011 South Akard, Dallas, TX 75215  
 (214) 421-1083 (150-room block)  
 2 blocks from the Dallas Convention Center  
 Single: \$60 Double: \$68

Recently renovated 240-room property boasting that it is only 366 steps from the Convention Center. Heated indoor pool, sauna, and exercise equipment. Hair dryer in each room. Restaurant and lounge offer a skyline view of Dallas. Free parking for hotel guests.

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

**5 HOLIDAY INN—DOWNTOWN**

1015 Elm Street, Dallas, TX 75202  
 (214) 748-9951 (200-room block)  
 6 blocks from the Dallas Convention Center  
 Single: \$60 Double: \$65

300-room property located within easy walking distance to the West End Historical District. This area offers a variety of restaurants, night clubs, entertainment, and shops. The Holiday Inn has one restaurant, which serves breakfast, lunch, and dinner at reasonable prices. Cocktail lounge on the ninth floor. Rooftop pool. All parking is indoors for \$5.40.

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

**6 HYATT REGENCY DALLAS—HEADQUARTERS**

300 Reunion Boulevard, Dallas, TX 75207  
 (214) 651-1234 (650-room block)  
 7 blocks from the Dallas Convention Center  
 Single: \$90 Double: \$98

One of Dallas's finest full service hotels with three restaurants for casual to elegant dining, two lounges, and 24-hour room service. Located next to Reunion Tower and Union Station, the 1914 vintage train station. Sleeping and meeting rooms surround an 18-story atrium. Complete fitness center with outdoor swimming pool, jacuzzi, saunas, outdoor running track, lighted tennis courts and exercise equipment. Self-parking \$2-\$6 per day or valet parking \$8 per day. Concierge, laundry, valet service, and gift shop. In-room video check-out and breakfast ordering.

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

**7 SHERATON DALLAS HOTEL**

400 North Olive Street, Dallas, TX 75201  
 (214) 922-8000 (400-room block)  
 12 blocks from the Dallas Convention Center  
 Single: \$72 Double: \$82

500-room attractive, comfortable hotel in the downtown Arts District. Connecting skywalk to shopping and dining. Restaurant, cocktail lounge, 24-hour room service, valet laundry. Public parking directly across the street begins at \$4.50. Sheraton valet parking is \$11. Executive club floors, full-service concierge, and complimentary health facility. Newspaper and gift shop.

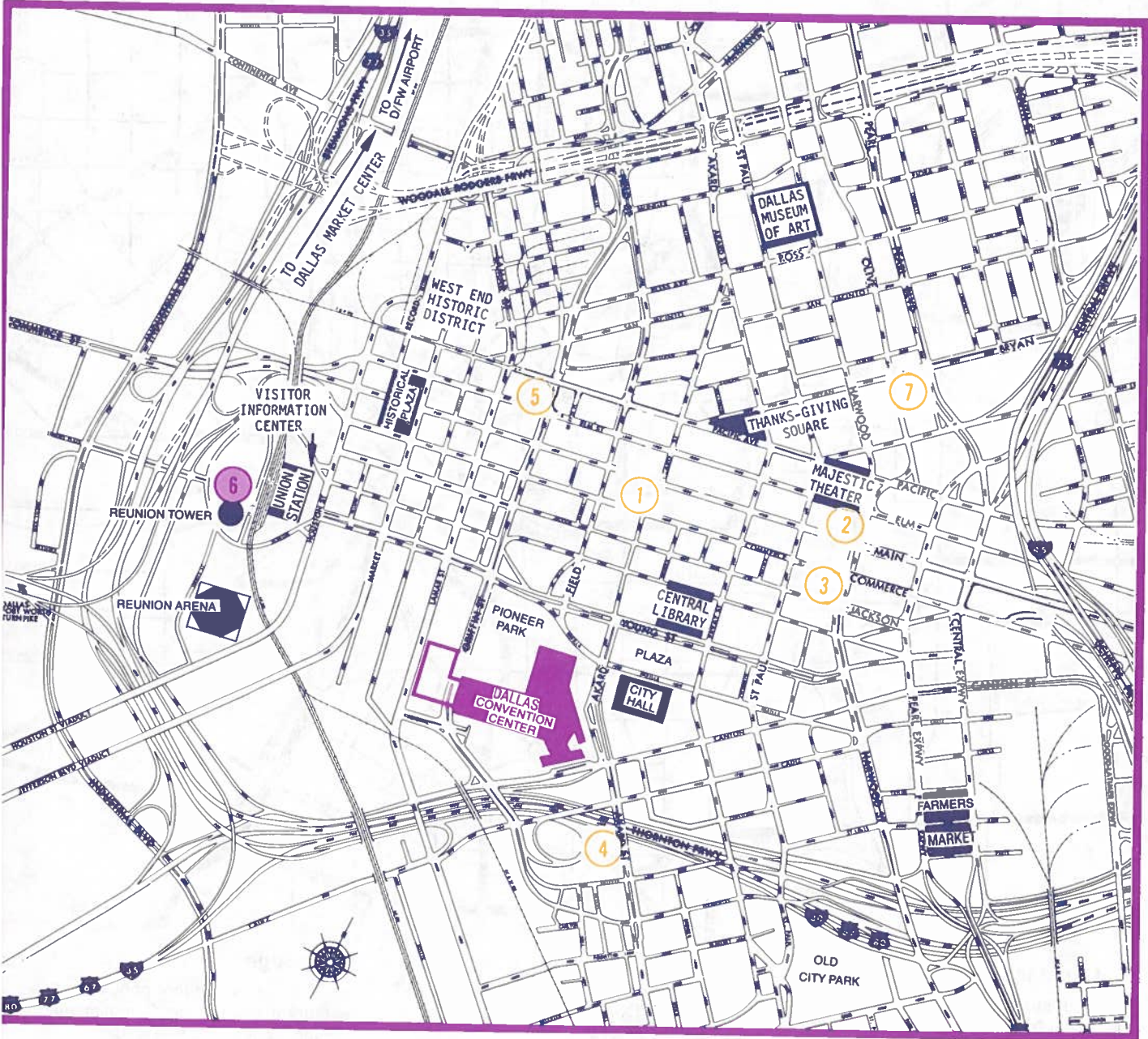
Check-in: 3 p.m. Check-out: 1 p.m. CC: AX, CB, D, DC, MC, V

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**Credit Card (CC) Codes:** AX = American Express, V = Visa, M = MasterCard, C = Carte Blanche, DC = Diners Club, D = Discovery, E = Enroute.



# DOWNTOWN DALLAS



## HOTELS

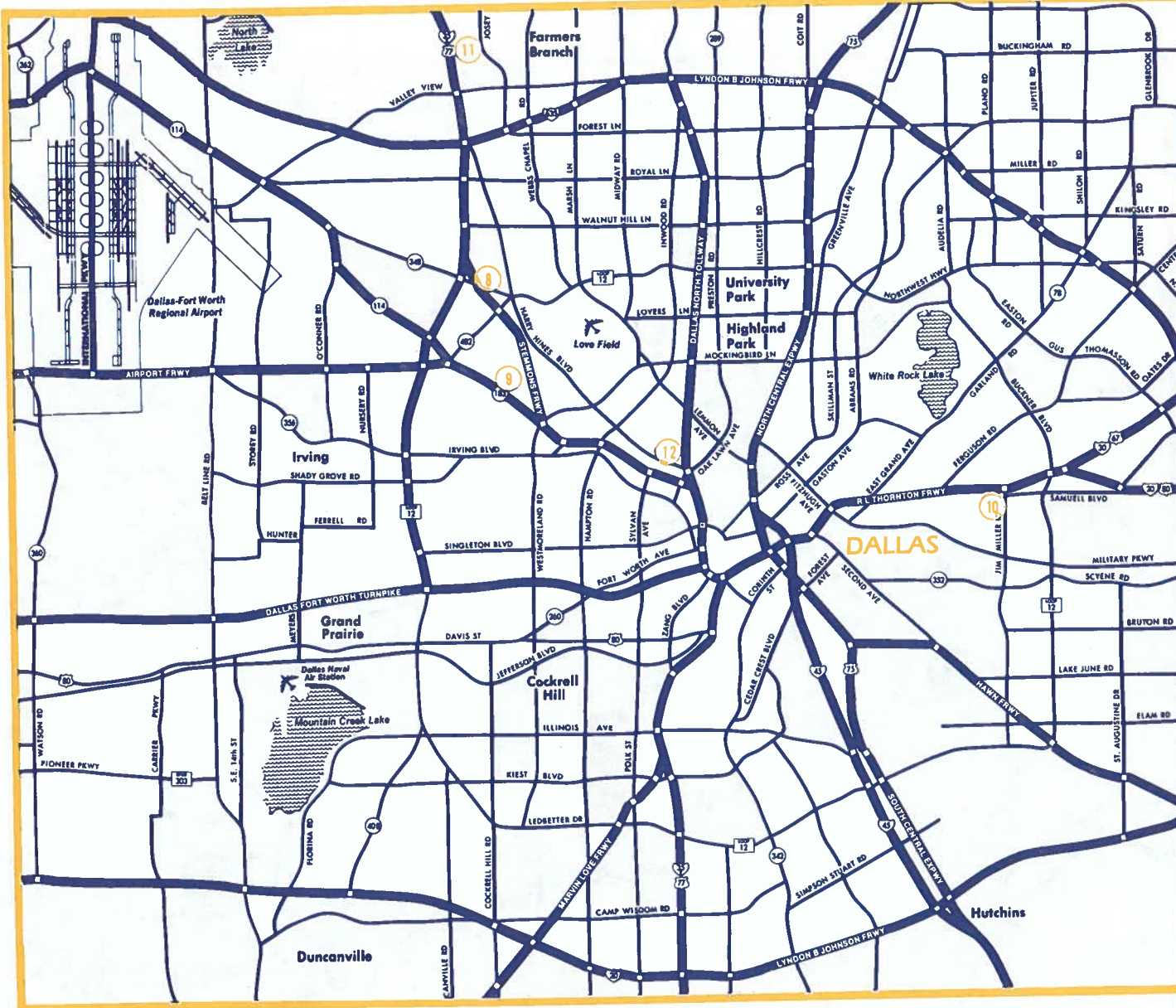
1. ADOLPHUS HOTEL
2. ARISTOCRAT CLARION HOTEL
3. DALLAS PARK PLAZA
4. DAYS HOTEL
5. HOLIDAY INN DOWNTOWN
6. HYATT REGENCY
7. SHERATON DALLAS HOTEL

Dallas Convention Center public parking is readily available in the underground garage entering off Griffin Street. The Convention Center also offers public parking at the intersection of Griffin and Young Streets, and on Lamar Street. All Dallas Convention Center parking is \$4 per day, with no in and out privileges. In addition, there are other public parking lots in the vicinity.





# METRO DALLAS



## Red Roof Inns

Four student motels are Red Roof Inns. They offer free parking, morning coffee, newspaper, in-room movies, and restaurant service within walking distance. Single or Double: \$39.95 flat (1-4 people), Check-in: 1:00 p.m., Check-out: 12 noon, CC: AX, CB, DC, MC, V, D.

GSA has a block of 50 rooms at each of the following Red Roof Inns.

8. **Red Roof Inn—Dallas Northwest**  
10335 Gardner Road  
Dallas, TX 75220  
(214) 506-8100  
9 miles from Dallas Convention Center
9. **Red Roof Inn—Dallas Market Center**  
1550 Empire Central Drive  
Dallas, TX 75235  
(214) 638-5151  
7 miles from Dallas Convention Center
10. **Red Roof Inn—Dallas East**  
8108 E.R.L. Thornton Freeway  
Dallas, TX 75228  
(214) 388-8741  
5 miles from Dallas Convention Center
11. **Red Roof Inn—Dallas Carrollton**  
1720 South Broadway  
Carrollton, TX 75006  
(214) 245-1700  
11 miles from Dallas Convention Center

## Travelodge

Offering an outdoor pool, casual restaurant, and lounge. Complimentary parking, coffee, and newspaper. Single or Double: \$50 flat (1-4 people), Check-in: open, Check-out: open, CC: AX, CB, DC, MC, V, D.

GSA has a block of 100 rooms at the following hotel:

12. **Dallas Market Center Travelodge Hotel**  
4500 Harry Hines Blvd.  
Dallas, TX 75219  
(214) 522-6650  
3 miles from Dallas Convention Center





## TRANSPORTATION

### AIR

*40% off—  
Convenience and Discount*

GSA's official travel agent, Cain Travel Group, has negotiated discounted rates of 40% or more with the major Dallas carriers: American, Delta, TWA, USAir, and United. For already discounted fares, Cain will offer 5% off. In addition, Cain will meet or beat any fare offered by another travel agency.

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 28 preregistration deadline.*

Advance bookings with Saturday night stayovers are the best route to lowest fares. So call today for best availability.

To make a reservation:

- Call 1-800-346-4747 (toll-free outside Colorado) or (303) 443-2246 (collect from Colorado or Canada); fax 1-303-443-4485.
- Hours: Monday through Friday 8:00 a.m. to 5:30 p.m., Mountain Daylight Time.
- Identify yourself as a GSA traveler.
- Be sure that you understand the restrictions on the type of ticket you purchase.
- Tickets can be paid for by check (payable to Cain Travel), or major credit card, or be invoiced to your company. Final payment must reach Cain Travel no later than ten 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.
- Cain Travel will have an on-site Customer Service Desk at the Dallas Convention Center.

### GROUND

#### GSA Shuttle

GSA will operate a free shuttle service between the *downtown* GSA hotels and the Dallas Convention Center during meeting hours. (Reminder: the shuttle will not be serving the student housing motels outside of the downtown area.) Shuttle service will be provided at frequent intervals each day (Sunday, October 28, through Thursday, November 1). The service will continue into the evening for the special events. Shuttle schedules will be posted in GSA hotel lobbies and in all registration packets.

*The Dallas—Fort Worth International Airport is 17 miles from the Dallas Convention Center and the downtown area (an approximately 30-minute ride).*

#### SuperShuttle

Airport to hotel. Operates 24 hours a day, seven days a week. Call SuperShuttle from the Ground Transportation Board in the baggage claim area. A reservation agent will then give you instructions on where to board SuperShuttle. Look for the blue and yellow signs and vans.

Hotel to airport. Call 24 hours in advance for reservations, (817) 329-2000. For your convenience, a SuperShuttle booth is located (1) in the

Registration Area at the Dallas Convention Center, and (2) in the lobby of the Hyatt Regency Hotel. SuperShuttle picks up at all hotels, but a reservation is necessary. Cost: \$8 to/from the Hyatt, \$10 to/from other downtown hotels.

#### Taxicabs

Sixteen taxicab companies service the Dallas—Fort Worth International Airport. All vehicles are metered and regulated. Charges are \$2.30 for the first mile and \$1.00 for each additional mile. Approximate cost from the airport to downtown is \$20. Our advice: share a cab.

#### Dallas Area Rapid Transit (DART)

Take the Dallas—Fort Worth Airport Terminal Shuttle Bus to the South Shuttle Parking Lot and board the DART bus #9 (King Center). Disembark at Parkland Hospital, and wait to board any bus going downtown. Approximate cost from the airport to downtown is \$1.50.

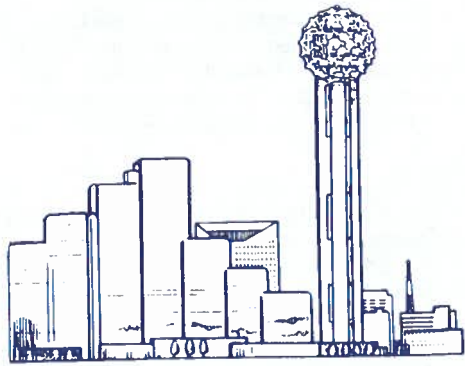
DART's distinctive yellow and white buses serve the Dallas metropolitan area. DART's inexpensive Hop-A-Bus offers convenient downtown service with stops at the West End Historic District, Dallas City Hall, and The Dallas Museum of Art. For general information, call DART at 979-1111.

#### Car Rental

Alamo is the official car rental agency for the meeting. Identify yourself as a GSA delegate by giving Group Identification #63641 and Plan Code G5, to get guaranteed, discounted, daily/weekly rates as follows: economy \$24/\$75; compact \$25/\$99; midsize \$27/\$119; standard \$29/\$149; luxury \$34/\$179. Unlimited mileage. Add \$3 per day for four-door models. Advance reservations are recommended. Call Alamo at 1-800-732-3232.



FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020



## REGISTRATION

### PREREGISTER TODAY!

#### PREREGISTRATION DEADLINE: SEPTEMBER 28

1. There is a 15% 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 shuttle 10:00 a.m., Sunday through 5:00 p.m. Thursday.
3. Registration discounts are given to GSA or Associated Society members. Associated Societies that qualify for this discount are indicated on the registration form. Please indicate your affiliation(s) and member number and 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 the preregistration form. If using a charge card, please recheck the card number given—errors will delay your registration. The confirmation card will be your receipt for charge card payments. No other receipt will be sent.
5. Register one professional or student per form. Copy the form for your records.
6. Guest registration is required for guests 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.

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.

### CANCELLATIONS, CHANGES, AND REFUNDS

All requests for registration additions, changes, and cancellations must be made

in writing and received by October 5. GSA will refund advance registration fees for cancellations received in writing by **OCTOBER 5. 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.

### REGISTRATION FEES

	Advance (by Sept. 28)	On-Site	One-Day
Professional—Member	\$130	\$150	\$ 75
Professional—Nonmember	\$170	\$190	\$ 95
Student—Member	\$ 50	\$ 60	\$ 30
Student—Nonmember	\$ 70	\$ 80	\$ 40
Guest	\$ 55	\$ 65	N/A

### ON-SITE REGISTRATION SCHEDULE DALLAS CONVENTION CENTER, LEVEL II

*Friday, October 26	2:00 p.m. to 6:00 p.m.
*Saturday, October 27	7:30 a.m. to 2:30 p.m.
Sunday, October 28	10:00 a.m. to 7:00 p.m.
Monday, October 29	7:30 a.m. to 5:00 p.m.
Tuesday, October 30	7:30 a.m. to 5:00 p.m.
Wednesday, October 31	7:30 a.m. to 2:00 p.m.
Thursday, November 1	7:30 a.m. to 12:00 p.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, the \$40 basic dues you pay will equal the \$40 you'll save on the member registration fee for the meeting. It's like joining GSA for free. Even professional registrants who pay the *nonmember* registration fee and apply for membership by March 31, 1991, can take advantage of this opportunity. Simply attach a copy of your meeting registration form to your membership application and submit it to GSA headquarters.

Likewise, students who pay the basic membership dues of \$20 to become a Student Associate will receive a \$15 discount on their Annual Meeting registration. It's almost like becoming a new GSA Student Associate for free!

The \$40 registration discount for members, mentioned above, applies to professional members of GSA. 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 Registration Area of the Dallas Convention Center.

FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020  
GSA, P.O. BOX 9140, BOULDER, CO 80301



# PREREGISTRATION FORM

Annual meeting  
October 29-  
November 1

Preregistration must be RECEIVED by September 28. Payment and form MUST accompany each pre-registration request. Unpaid purchase orders NOT accepted as valid registration. One form per registrant. Cancellation deadline: October 5. No refunds on cancellations received after this date.

Please print \*\* Make a copy for your records

Name (Last) \_\_\_\_\_ (First) \_\_\_\_\_

Institution/Employer \_\_\_\_\_

Mailing Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP code \_\_\_\_\_

Country \_\_\_\_\_ Business phone \_\_\_\_\_ Home phone \_\_\_\_\_

Guest/Spouse Name (Last) \_\_\_\_\_ (First) \_\_\_\_\_

City \_\_\_\_\_ State/Country \_\_\_\_\_

Circle Member Affiliations: (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 technical sessions)	Price (Check One)		Column A	
	Full	One	Qty	Amount
Professional Member	(1) \$130	(2) \$75	1	\$
Professional Nonmember	(3) \$170	(4) \$95	1	\$
Student Member	(5) \$50	(6) \$30	1	\$
Student Nonmember	(7) \$70	(8) \$40	1	\$
Guest (fill in name above for badge)	(9) \$55	N/A		\$

Las Colinas	Oct 28	\$ 15	\$
Discover Dallas	Oct 29	\$ 20	\$
Waxahachie Gingerbread Trail	Oct 30	\$ 35	\$
Autumn at the Arboretum	Oct 30	\$ 25	\$
Fort Worth	Oct 31	\$ 30	\$
Aerobics Center	Oct 31	\$ 25	\$
Date with Dallas	Oct 31	\$ 15	\$
Tennis Tournament	Oct 28	\$ 15	\$
5K Run (check T-shirt size — S — M — L — XL)	(41)	\$ 17	\$
10K Run (check T-shirt size — S — M — L — XL)	(42)	\$ 17	\$
*Wild West Barbecue and Dance	(43)	\$ 15	\$
Total Column A			\$

Remit in U.S. funds, payable to 1990 GSA Annual Meeting, or charge:

American Express  Diners Club/ Carte Blanche  MasterCard  VISA

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## \*TICKETED MEAL FUNCTION

Geochemical Society Luncheon	Oct 29	(61)	\$ 19
Sedimentary Geology Division Breakfast	Oct 30	(62)	\$ 13
Association for Women Geoscientists Breakfast	Oct 30	(63)	\$ 13
Geophysics Division Luncheon	Oct 30	(64)	\$ 19
History of Geology Division Luncheon	Oct 30	(65)	\$ 19
Hydrogeology Division Luncheon	Oct 30	(66)	\$ 19
Mineralogical Society of America Luncheon	Oct 30	(67)	\$ 19
Paleontological Society Luncheon	Oct 30	(68)	\$ 19
Geoscience Information Society Dinner	Oct 30	(69)	\$ 30
Coal Geology Division Luncheon	Oct 31	(70)	\$ 19
National Association of Geology Teachers Luncheon	Oct 31	(71)	\$ 19
Society of Economic Geologists Luncheon	Oct 31	(72)	\$ 19

1 Sedimentation and Diagenesis, E-Central Mexico	Oct 24-28	(100)	\$725
2 Hydrogeology of Trans-Pecos, Texas w/Air	Oct 25-28	(101)	\$305
2a Hydrogeology of Trans-Pecos, Texas w/o Air	Oct 25-28	(102)	\$235
3 Petrologic Evolution, SE San Juan w/Air	Oct 25-28	(103)	\$265
3a Petrologic Evolution, SE San Juan w/o Air	Oct 25-28	(104)	\$220
4 Remote Sensing Techniques, S-Central OK	Oct 25-28	(105)	\$240
5 Geology, Geochem., Structure, Wichita Mtns	Oct 25-28	(106)	\$235
6 Coal Geology, Western Region KS, MO, OK	Oct 25-28	(107)	\$210
7 Carbonate and Siliciclastic, N-Central TX	Oct 27-28	(108)	\$115
8 Nearshore Clastic-Carbonate Facies, Central TX	Oct 27	(109)	\$ 35
9 Dinosaur Tracks, Central Texas	Oct 28	(110)	\$ 35
9a Dinosaur Tracks (accompanying guest/child)	Oct 28	(111)	\$ 25
10 Super Collier Geol., Hydrol., Engineering	Oct 28	(112)	\$ 35
11 Archaeological Geology, Upper Trinity River	Oct 28	(113)	\$ 35
12 Clastic and Carbonate Shelf Deposition, N TX	Oct 28	(114)	\$ 42
13 Structure and Stratig., Big Bend Area w/Air	Nov. 1-4	(115)	\$385
13a Structure and Stratig., Big Bend w/o Air	Nov. 1-4	(116)	\$320
14 WIPP Site Geology and Hydrology w/Air	Nov. 1-4	(117)	\$310
14a WIPP Site Geology and Hydrology w/o Air	Nov. 1-4	(118)	\$245
15 Hydrogeology, Blaine Gypsum-Dolomite, SW OK	Nov. 1-3	(119)	\$160
16 Structure and Stratigraphy, Arbuckle Mtns, OK	Nov. 1-3	(120)	\$140
17 NOAM-CARIB Plate Boundary, Guatemala	Nov. 2-7	(121)	\$750
18 Reefal Development, Terrigenous Prov., Mexico	Nov. 2-6	(122)	\$720
19 Lampasas Cut Plain Cyclic Evolution, Central TX	Nov. 2-3	(123)	\$120
20 Carboniferous Geol., Tectonic Hist., Ft Worth	Nov. 2-3	(124)	\$120
21 Engineering Urban Geology, Dallas-Ft Worth	Nov. 2	(125)	\$ 40
22 Hydrogeology, Jewett Lignite Mine, East Texas	Nov. 2	(126)	\$ 40
23 Lower Cretaceous Vertebrates, Central Texas	Nov. 2	(127)	\$ 40
24 Tour Mobil Research Laboratory	Oct 29	(128)	\$ 10
25 Information Resources at Mobil Research Lab	Oct 31	(129)	\$ 10

## \*FIELD TRIPS

1 Site Selection for Critical Facilities	Oct 27	(150)	\$110
2 Coastal Land Loss	Oct 27-28	(151)	\$170
3 Contaminant Hydrogeology	Oct 27-28	(152)	\$195
4 Geological Applications, Macintosh Hypercard	Oct 27-28	(153)	\$195
5 Metamorphic Pressure-Temperature-Time Paths	Oct 27-28	(154)	\$225
6 Phanerozoic Plate-Tectonic Reconstructions	Oct 27-28	(155)	\$195
7 Seismic Expression of Structural Styles	Oct 27-28	(156)	\$145
8 Computer Modeling of Cyclic Carbonate Sequences	Oct 28	(157)	\$140
9 Practical Tracing of Ground-Water, Karst Terranes	Oct 28	(158)	\$130
10 Recent Sediments, Northwest Gulf Coast	Oct 28	(159)	\$ 80

## \*SHORT COURSES

Total Column B	\$
Total Column A	\$
Column A + B = Total Remittance (full payment must be enclosed)	\$

\*Meeting registration not required

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## CONVENIENCE INFORMATION

### INFORMATION/MESSAGES

GSA information and message desks will be located at both the Dallas Convention Center and the Hyatt Regency Hotel, Friday, October 26, through Thursday, November 1.

Dallas Convention Center  
 Information ..... (214) 658-7219  
 Messages ..... (214) 658-7218  
 Hyatt Regency ..... (214) 651-1234

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.

### CHILD CARE

GSA will offer a cooperative child-care service. UNTIL OCTOBER 12, the GSA Meetings Coordinator will accept names, addresses, and phone numbers of interested participants. You may also include information on your children and where you will be staying. ON OCTOBER 16, the information will be mailed to everyone who has responded. Participants are responsible for contacting one another.

Dallas has several private child-care agencies. Although GSA cannot endorse any of these agencies, we are happy to give the names and phone numbers to you. Call the Meetings Coordinator. You may also call your hotel for local child-care services.

### NEWS ROOM

Sunday-Thursday, October 28-November 1  
 Dallas 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.

### WEATHER

The average daytime temperatures for late October in Dallas are about 75 high and 55 low. Light-weight clothing with a sweater or jacket is recommended for evening. Rainwear may be needed.

### TEXAS INFORMATION

Abundant information and friendly service are available at the following contact numbers:

Texas Department of Commerce  
 Tourism Division  
 P.O. Box 12008  
 Austin, TX 78711  
 (512) 320-9419

Dallas Convention & Visitors Bureau  
 1201 Elm Street, Suite 2000  
 Dallas, TX 75270  
 (214) 746-6677

## FUTURE GSA ANNUAL MEETING SITES

### SAN DIEGO

October 21-24 ..... 1991

### CINCINNATI

October 26-29 ..... 1992

### BOSTON

October 25-28 ..... 1993

### SEATTLE

October 24-27 ..... 1994

# DALLAS

FOR INFORMATION: GSA MEETINGS DEPT. (303) 447-2020





# ABSTRACTS WITH PROGRAMS

Volume 22, Number 7

## 1990 Annual Meeting

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Only members and nonmembers residing in the U.S., 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 via first-class mail. The price includes first-class postage.

**Members and nonmembers residing outside the U.S., Canada, and Mexico:** Due to the prohibitive costs of air mail postage and postal delays in overseas mailing we regret that we are unable to make this special advance copy purchase offer available to you. You may purchase a copy at the meeting.

**No refunds for duplicate orders** will be given. Members, check your records carefully to make sure that you have not previously purchased a copy of this publication on your 1990 membership dues statement or through GSA Publication Sales.

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Use the form provided to place our advance copy order. **Prepayment is required.** Orders must be received by GSA Publication Sales no later than Friday, September 14.

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### ON-SITE PURCHASE

Meeting attendees may also purchase copies of *Abstracts with Programs* on-site in the registration area of the Dallas Convention Center. Price: \$20.00, while limited supply lasts.

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# Geological Society of America 1990 ANNUAL MEETING



# DALLAS

October 29–November 1, 1990

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