

GSA  
NEWS &  
INFORMATION

G.S.A. ARCHIVES

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1988 CENTENNIAL CELEBRATION

1888. Geological Society of America. 1988



DENVER, COLORADO ■ OCTOBER 31 to NOVEMBER 3, 1988

DENVER CONVENTION COMPLEX

ASSOCIATED SOCIETIES MEETING WITH GSA

Association for Women Geoscientists ■ Cushman Foundation ■ Geochemical Society ■ Geoscience Information Society  
Mineralogical Society of America ■ National Association of Geology Teachers ■ Paleontological Society ■ Sigma Gamma Epsilon  
Society of Economic Geologists ■ Society of Vertebrate Paleontologists

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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 Centennial Celebration Committee, associated societies, speakers, exhibitors, sponsors, and volunteers. To each and every one a special thanks from GSA's Council and staff.*

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### GSA NEWS & INFORMATION Vol. 10, no. 8, AUGUST 1988

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Prepared from contributions from the staff and membership. Executive Director: F. Michael Wahl; Managing Editor: Faith Rogers; Associate Editor: Lee Gladish; Production and Advertising Manager: James R. Clark; Marketing/Advertising Assistant: Ann H. Crawford; Assistant Production Manager: Meredith L. Larson; Production Assistants: Mona T. Gonzales, Joan E. Manly, and Barbara F. Smith.

\* **Advertising:** Contact James R. Clark or Ann H. Crawford (303) 447-2020.



## A SPECIAL THANKS TO:

- Jack Rathbone, photographer
- Colorado Scientific Society
- Rocky Mountain Association of Geologists
- Society of Paleontologists and Mineralogists, Rocky Mountain Chapter
- Denver Metro Convention and Visitors Bureau

## CONTRIBUTORS AND SPONSORS

For the Centennial meeting, many corporations have contributed to a general fund or to specific events/exhibits, or have partially underwritten staffing of specific activities. GSA is most appreciative of this support and thanks the following companies and individuals:

### General Fund:

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Partial support of the exhibit Corridor of Time at the Denver Museum of Natural History:

- Chevron USA, Inc.

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## ASSOCIATED SOCIETIES MEETING WITH GSA

Association for Women Geoscientists  
Cushman Foundation  
Geochemical Society

Geoscience Information Society  
Mineralogical Society of America  
National Association of Geology Teachers  
Paleontological Society

Sigma Gamma Epsilon  
Society of Economic Geologists  
Society of Vertebrate Paleontologists



W. Spanish Peak from NW Giant's Staircase.

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# 100

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## WELCOME

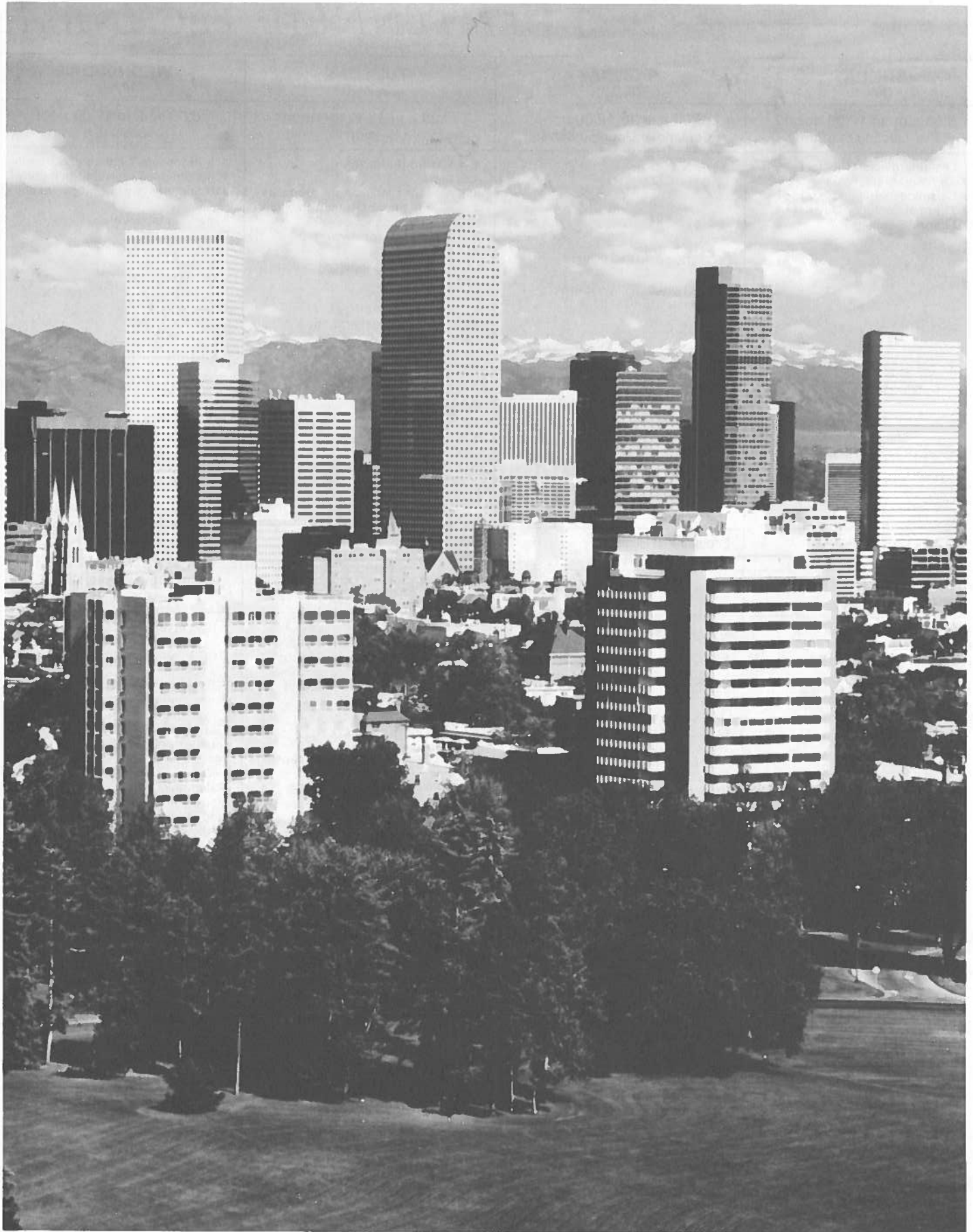
*ONLY ONCE IN A HUNDRED YEARS . . . When the Geological Society of America celebrates its 100th anniversary in Denver, October 31 through November 3, it will be a tribute not only to the Society but also to the science of geology. Unique events will be a part of this tribute.*

*More than 6000 geoscientists are expected during the Celebration. All segments of the geologic professions will be represented. Registrants will have the opportunity to participate in new technical formats and special programs, to view unique Centennial displays, to exchange ideas with colleagues, to familiarize themselves with exhibitor products, and to expand professionally through seminars and field trips.*

*General Chairman Robert J. Weimer, Professor Emeritus, Colorado School of Mines, chairs a committee of 17 members from the Denver area. An additional group of 400 volunteers will participate in hosting and assisting at meeting functions. Colorado's major scientific and geologic associations and corporations are lending their support to the occasion. More than 18 Denver corporations and institutions have become sponsors.*

### Denver

*Denver provides one of the most varied geologic settings of any major American city and is an extraordinary location in which to celebrate GSA's 100th year. Denver is situated where the vast interior plains of the United States meet the spectacular Front Ranges of the Rocky Mountains. The topographic and structural basin beneath the city is an important source of hydrocarbons in the Rocky Mountain foreland region. The Front Ranges to the west are characterized by colorful upper Paleozoic sedimentary rocks, which bring tourists to the Garden of the Gods and to the Red Rocks Amphitheater, and by the Precambrian igneous and metamorphic rocks of the Colorado Mineral Belt, whose mining districts are now historical sites. The ranges also mark the eastern edge of the geologically complex Cordilleran mountain system that extends from Alaska to Tierra del Fuego. This is indeed a special place for a special year.*



*A five year building boom has seen Denver nearly double in size.*



# 1988 CENTENNIAL TECHNICAL

SUNDAY OCT. 30	MONDAY OCT. 31	TUESDAY NOV. 1	WEDNESDAY NOV. 2
8:00 a.m. to 12:00 noon Pre-meeting Session	8:00 a.m. to 12:00 noon Centennial Opening Session	8:00 a.m. to 12:00 noon Session 2	8:00 a.m. to 12:00 noon Session 4
#17 Last Interglacial/Glacial I #19 Andean Magmatism I #21 Seismicity Faulting Hazards I #22 Thermal Evolution Sevier I #23 Mineral Deposits I	OPENING CEREMONIES  CENTENNIAL SYMPOSIUM: NORTH AMERICA IN 4-D	# 4 Hazard Reduction # 5 Mars # 6 Modern Glaciomarine Deposits # 8 History Frame/Human Evolution #13 Work Stations #24 EEZ-SCAN (posters)  Coal/Tectonics/Geophysics II Economic II Geochemistry II Metamorphic petrology II Mineralogy/Crystallography I Paleontology II Structural II Tectonics II Volcanology I  PRECAMBRIAN SEDIMENTARY PETROLOGY STRATIGRAPHY I TECTONICS I TECTONICS/GEOPHYSICS I	# 3 Processes Continental Growth #14 Computer Assisted Phylogeny I #16 Sedimentary Petrology Teaching  Experimental petrology Geochemistry IV Igneous petrology II Marine I Paleontology III Precambrian II Quaternary II Sedimentology I Structural III Tectonics IV  <i>8. Secular Variation in Sedimentary Record I</i>  MICROPALAEONTOLOGY MINERALOGY/CRYSTALLOGRAPHY PALEONTOLOGY I PETROLEUM REMOTE SENSING TECTONICS II TECTONICS/GEOPHYSICS II
<b>LUNCHEONS:</b>	Engineering, History	Geophysics, GIS, Hydrogeology, MSA, NAGT, PS	Coal, GS, QG&G, SEG
1:00 p.m. to 5:00 p.m. Pre-meeting Session	1:00 p.m. to 5:00 p.m. Session 1	1:30 p.m. to 5:30 p.m. Session 3	1:30 p.m. to 5:30 p.m. Session 5
#17 Last Interglacial/Glacial II #18 Supercollider #19 Andean Magmatism II #20 Siljan Ring Well #21 Seismicity Faulting Hazards II #22 Thermal Evolution Sevier II #23 Mineral Deposits II	# 2 Cretaceous Coals #11 Chemistry & Physics Mantle #15 Case Histories Mineral Discoveries #25 Dynamics of Climate Change  Archaeology Economic I Geochemistry I Metamorphic petrology I Paleontology I Precambrian I/Theme 1 Quaternary I Structural I Tectonics I Tectonics/Geophysics I  <i>1. Diagenesis of Lacustrine Rocks</i>  ENGINEERING EXPERIMENTAL PETROLOGY GENERAL GEOLOGY EDUCATION GEOSCIENCE INFORMATION IGNEOUS PETROLOGY MARINE OCEANOGRAPHY PLANETARY SEDIMENTOLOGY I	# 1 Phanerozoic Tectonics N.A. # 7 Ancient Glaciomarine Deposits # 9 New World Geoarchaeology #12 A Tale of Two Cratons #28 Solution Collapse Breccias  Economic III Engineering/Tectonics/ Geophysics III General/Planetary/Remote sensing Geochemistry III Geology education I/History Igneous petrology I Metamorphic petrology III Mineralogy/Crystallography II/ Sedimentary petrology I Tectonics III  ARCHAEOLOGY COAL HYDROGEOLOGY SEDIMENTOLOGY II STRATIGRAPHY II STRUCTURAL I	#10 Problems of Contaminant Transport #14 Computer Assisted Phylogeny II  Economic IV/Theme 7 Geoscience information/ Metamorphic petrology IV Glacial/Geology education II Igneous petrology III Marine II/Micropaleontology I/ Oceanography Paleontology IV Petroleum/Theme 8 II Sedimentary petrology II Sedimentology II Stratigraphy I Structural IV Tectonics V  <i>7. Physics &amp; Chemistry Mylonites I</i> <i>8. Secular Variation in Sedimentary Record II</i>  ECONOMIC I ENVIRONMENTAL I GEOCHEMISTRY I GEOMORPHOLOGY GLACIAL HISTORY TECTONICS/GEOPHYSICS III
Exhibits Open Welcoming Reception	GSA Presidential Address and Awards Ceremonies Awards Reception and Alumni Parties	Geology & Public Policy Forum GSA Centennial Orchestra	CENTENNIAL BIRTHDAY BASH!

**Key:** # = symposia (invited and open)  
 color = oral sessions (volunteered)  
 italics = theme sessions (volunteered)  
 upper case = poster sessions (volunteered)

Combined sessions shown with slash.  
 Contents listing shows full title of symposia and theme sessions.  
 Symposia, theme, and volunteered sessions may be in either oral or poster mode.

# PROGRAM SCHEDULE

<b>THURSDAY</b> NOV. 3	
8:00 a.m. to 12:00 noon Session 6	
#26 Accumulation of Organic Matter #27 Late Proterozoic Evolution N.A. #29 Fractals in Geology  Economic V Geochemistry V Geomorphology I/Theme 6 Hydrogeology I Igneous petrology IV Sedimentology III Structural V/Volcanology II Tectonics VI  3. <i>Geophysical Patterns in N.A. I</i> 4. <i>Global Sedimentary Geology</i> 6. <i>Paleontologic Constraints/Terranes</i> 7. <i>Physics &amp; Chemistry Mylonites II</i>  ECONOMIC II ENVIRONMENTAL II METAMORPHIC PETROLOGY PALEONTOLOGY II QUATERNARY	
1:00 p.m. to 5:00 p.m. Session 7	
#27 Later Proterozoic Evolution N.A. (posters) #29 Fractals in Geology (posters) #30 Apparent Polar Wander Paths  Economic VI Environmental/Theme 3 Geochemistry VI Geomorphology II Hydrogeology II Igneous petrology V Micropaleontology II Paleontology V/Quaternary III Paleontology VI/Sedimentology IV Stratigraphy II Tectonics VII Tectonics VIII  2. <i>Geology &amp; Public Policy</i> 3. <i>Geophysical Patterns N.A. II (oral &amp; posters)</i>  GEOCHEMISTRY II STRUCTURAL II VOLCANOLOGY	

## SYMPOSIA

<b>NORTH AMERICA IN 4-D, OPENING SYMPOSIUM</b>		
1. Phanerozoic Tectonics of North America	Nov. 1	Oct. 31
2. Controls on the Distribution and Quality of Cretaceous Coals	Oct. 31	
3. Processes of Continental Growth: Geophysical and Geologic Evidence	Nov. 2	
4. Hazard Reduction in the 21st Century	Nov. 1	
5. Mars: Geologic Analyses and Future Missions	Nov. 1	
6. Modern Glaciomarine Deposits: Polar vs. Temperate Environments	Nov. 1	
7. Ancient Glaciomarine Deposits: Polar vs. Temperate Environments	Nov. 1	
8. History of the Establishment of a Geologic Framework for Human Evolution	Nov. 1	
9. New World Geoarchaeology	Nov. 1	
10. Use of Geophysical Methods for Hydrogeologic Characterization and for Problems of Contaminant Transport	Nov. 2	
11. The Chemistry and Physics of Minerals in the Mantle	Oct. 31	
12. A Tale of Two Cratons: Contrasts in Crust-Mantle Evolution	Nov. 1	
13. Individual Work Stations: Information Supermarkets for Geoscientists	Nov. 1	
14. Computer-Assisted Phylogeny Programs in Research and Teaching—Parts I & II	Nov. 2	
15. Case Histories of World-Class Mineral Discoveries	Oct. 31	
16. Sedimentary Petrology: Old Foundations and New Implications for Teaching	Nov. 2	
17. Last Interglaciation/Glaciation Transition (122–64 ka) in North America—Parts I & II	Oct. 30	
18. The Role of Geology in the Superconducting Super Collider Site-Selection Process	Oct. 30	
19. Andean Magmatism and Its Tectonic Setting—Parts I & II	Oct. 30	
20. Siljan Ring Well, Sweden: Deep Drilling in Crystalline Rocks	Oct. 30	
21. Seismicity, Quaternary Faulting, and Earthquake Hazards in the Rocky Mountain Region—Parts I & II	Oct. 30	
22. Thermal Evolution of the Sevier Hinterland—Parts I & II	Oct. 30	
23. Historical Perspectives and Future Directions in Mineral Deposits Research and Major Metals Utilization—Parts I & II	Oct. 30	
24. EEZ-SCAN: Results of the U.S. Geological Survey GLORIA Survey Program (Posters)	Nov. 1	
25. The Dynamics of Climate Change	Oct. 31	
26. Productivity, Accumulation, and Preservation of Organic Matter: Recent and Ancient Sediment Records	Nov. 3	
27. Late Proterozoic Evolution of Western North America: A Re-Evaluation (Oral & Posters)	Nov. 3	
28. Mineral Resources of Solution-Collapse Breccias and Filled Sinkholes	Nov. 1	
29. Fractals in Geology (Oral & Posters)	Nov. 3	
30. Paleomagnetism and North American Apparent Polar Wander Paths: Cenozoic to Precambrian	Nov. 3	

## THEME SESSIONS

1. Diagenesis of Lacustrine Rocks	Oct. 31
2. Geology and Public Policy for the 21st Century	Nov. 3
3. Geophysical Patterns in North America (oral and posters)—Parts I & II	Nov. 3
4. Global Aspects of Sedimentary Geology	Nov. 3
5. Organic Compounds in Groundwater will not be held	
6. Paleontologic Constraints on Accreted Terranes	Nov. 3
7. Physics and Chemistry of Mylonites—Part I	Nov. 2
Part II	Nov. 3
8. Secular Variation in Sedimentary Record—Parts I & II	Nov. 2

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# CENTENNIAL OPENING CEREMONIES & SYMPOSIUM

The Centennial program officially begins on Monday morning, October 31, 8:00 to 9:00 a.m. with the Opening Ceremonies. Held in Denver's Auditorium Arena, the ceremonies will honor GSA's history, but more importantly, will inspire the audience to meet the challenges of the next century. Special audio-visual effects will enhance the opening moments of the Celebration. Addressing the audience will be Robert J. Weimer, Colorado School of Mines and 1988 Centennial Celebration General Chairman; Randolph Bromery, University of Massachusetts and GSA President nominee; Raymond Price, Geological Survey of Canada and GSA Vice-President nominee; Harrison H. Schmitt, consultant and astronaut; and James H. Zumberge, President, University of Southern California.

The Centennial Symposium, "North America in 4-D," will immediately follow the Opening Ceremonies from 9:00 a.m. to noon. This megasymposium is being organized by convener Albert W. Bally, GSA's President. The symposium's content envelopes the breadth of geologic knowledge of North America. Speakers and topics include:

Don L. Anderson

*From Crust to Core, a Tomographic Global Dynamic View*

Brian E. Tucholke

*The Oceans Surrounding North America*

Albert W. Bally

*North America: The Last 600 Million Years*

Paul F. Hoffman

*Precambrian Evolution of North America*

Brian J. Skinner

*A Century of Resource Use: Can the Next Century's Feast Be As Rich?*

# TECHNICAL PROGRAM

On Monday afternoon, concurrent technical sessions will begin. The presentation of more than 2000 reviewed papers will occur during 112 sessions from Monday through Thursday, plus programs on Sunday. Session formats represent a spectrum of alternatives between entirely invited to entirely volunteered papers. For the Centennial, the newest formats will include **open symposia (partly invited, partly volunteered; indicated by asterisk)** and theme sessions (entirely volunteered, but on a specified, pre-announced topic).

The symposia are listed below. Volunteered papers were submitted by the June 10 deadline in 34 geologic classifications ranging from archaeology to volcanology. The program schedule appears on page 206.

- \*4. **Hazard Reduction in the 21st Century**—Engineering Geology Division; T. L. Holzer, USGS, Menlo Park; F. B. Leighton, Leighton and Associates.
5. **Mars: Geologic Analyses and Future Missions**—Planetary Geology Division; R. E. Arvidson, Washington University.
- \*6. **Modern Glaciomarine Deposits: Polar vs. Temperate Environments**—Quaternary Geology and Geomorphology Division; G. M. Ashley, Rutgers University; J. B. Anderson, Rice University.
- \*7. **Ancient Glaciomarine Deposits: Polar vs. Temperate Environments**—J.M.G. Miller, Vanderbilt University; C. Eyles, McMaster University.
8. **History of the Establishment of a Geologic Framework for Human Evolution**—History of Geology Division; L. F. Laporte, University of California, Santa Cruz.



Hagerman Peak & Snowmass Lake near Aspen, CO.

## Symposia

1. **Phanerozoic Tectonics of North America**—Structure and Tectonics Division; A. W. Snoke, University of Wyoming; G. A. Davis, University of Southern California.
- \*2. **Controls on the Distribution and Quality of Cretaceous Coals**—Coal Geology Division; P. J. McCabe, USGS, Denver; J. T. Parrish, University of Arizona.
- \*3. **Processes of Continental Growth: Geophysical and Geologic Evidence**—Geophysics Division; W. D. Mooney, USGS, Menlo Park; A. G. Green, Geological Survey of Canada, Ottawa.
9. **New World Geoarchaeology**—Archaeological Geology Division; Fekri Hassan, Washington State University; C. R. Ferring, North Texas State University.
10. **Use of Geophysical Methods for Hydrogeologic Characterization and for Problems of Contaminant Transport**—Hydrogeology Division; S. W. Wheatcraft, University of Nevada, Reno.
11. **The Chemistry and Physics of Minerals in the Mantle**—Mineralogical Society; H.O.A. Meyer, Purdue University.



- 12. A Tale of Two Cratons: Contrasts in Crust-Mantle Evolution**—Geochemical Society; P. A. Mueller, University of Florida; J. L. Wooden, USGS, Menlo Park.
- 13. Individual Work Stations: Information Supermarkets for Geoscientists**—Geoscience Information Society and International Association of Mathematical Geology; J. V. Lerud, Montana College of Mineral Science and Technology; D. C. Ward, University of Illinois, Urbana.
- 14. Computer-Assisted Phylogeny Programs in Research and Teaching**—Paleontological Society and Society of Vertebrate Paleontologists; K. Padian and D. Lindberg, University of California, Berkeley.
- 15. Case Histories of World-Class Mineral Discoveries**—Society of Economic Geologists; R. W. Hutchinson, Colorado School of Mines.
- 16. Sedimentary Petrology: Old Foundations and New Implications for Teaching**—National Association of Geology Teachers; M. D. Picard, University of Utah.
- 17. Last Interglaciation/Glaciation Transition (122–64 ka) in North America**—P. U. Clark, University of Illinois, Chicago; P. Lea, University of Colorado.
- \*18. The Role of Geology in the Superconducting Super Collider Site-Selection Process**—K. V. Luza and N. H. Suneson, Oklahoma Geological Survey.
- \*19. Andean Magmatism and Its Tectonic Setting**—North American Working Group, IGCP 249; I.W.D. Dalziel, University of Texas, Austin; S. M. Kay, Cornell University.
- 20. Siljan Ring Well, Sweden: Deep Drilling in Crystalline Rocks**—J. R. Castano, Consultant, Houston, Texas.
- \*21. Seismicity, Quaternary Faulting, and Earthquake Hazards in the Rocky Mountain Region**—I. G. Wong, Woodward-Clyde Consultants; W. P. Rogers, Colorado Geological Survey.
- 22. Thermal Evolution of the Sevier Hinterland**—K. V. Hodges, Massachusetts Institute of Technology; J. F. Sutter, USGS, Reston.



Highway bridge Florence-Victor Road Colorado #67. Site of Florence, Cripple Creek RR.

- 23. Historical Perspectives and Future Directions in Mineral Deposits Research and Major Metals Utilization**—R. W. Hutchinson, Colorado School of Mines.
- 24. EEZ-SCAN: Results of the U.S. Geological Survey GLORIA Survey Program**—M. L. Holmes, University of Washington; G. W. Hill, USGS, Reston.
- \*25. The Dynamics of Climate Change**—D. K. Rea, University of Michigan, Ann Arbor; M. Leinen, University of Rhode Island.
- 26. Productivity, Accumulation, and Preservation of Organic Matter: Recent and Ancient Sediment Records**—J. W. Farrington, University of Massachusetts, Boston; J. K. Whelan, Woods Hole Oceanographic Institution.
- \*27. Late Proterozoic Evolution of Western North America: A Reevaluation**—G. M. Ross, Geological Survey of Canada, Calgary; N. Christie-Blick, Lamont-Doherty Geological Observatory.
- \*28. Mineral Resources of Solution-Collapse Breccias and Filled Sinkholes**—K. J. Wenrich and H. A. Tourtelot, USGS, Denver.
- 29. Fractals in Geology**—C. C. Barton and G.C.P. King, USGS, Denver.
- \*30. Paleomagnetism and North American Apparent Polar Wander Paths: Cenozoic to Precambrian**—J. W. Geissman, University of New Mexico; R. F. Butler, University of Arizona.

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## FIELD TRIPS

Denver provides an ideal opportunity for many fine field trips, both in the local area and throughout the West. The trips, summarized below, will provide a look at all aspects of western geology, with something of interest and value for each geoscience specialty. Several trips, in keeping with the Centennial of GSA, emphasize and revisit areas and topics covered by the great western surveys of the late 19th century and the early pioneer geologists who assembled knowledge about the geologic framework we now take for granted.

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

Trip costs include transportation for the trip itself and guidebook. It also may include costs of other services as noted by the following symbols: B—Breakfast; L—Lunch; D—Dinner; S—Snack; and ON—Overnight lodging. For some premeeting trips, group-rate airfares have been arranged to get participants to Denver at the termination of the field trip. If you do *not* wish to take advantage of this air travel, please register using the fee listed without airfare for that trip.

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

**PREREGISTRATION DEADLINE:** Must be RECEIVED at GSA headquarters no later than October 7.

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. On-site registration MAY be possible for postmeeting trips during the meeting at the Field Trip Desk, Denver Convention Complex and Currigan Hall A.

**CANCELLATION DEADLINE IS OCTOBER 14.** No refunds will be given for cancellations received after this date. If GSA must cancel a field trip because of logistics or registration requirements, a full refund will be issued to trip registrants as soon as possible after the meeting. Also, please be aware of cancellation deadlines and penalties imposed by airlines if you wish to change your flight arrangements because 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 Colorado School of Mines, Publications Office, Golden, CO 80401, (303) 273-3000.

For further trip information, contact the Field Trip Chairman, Gregory S. Holden, Dept. of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401; (303) 273-3800; Field Trip Co-Chairman, Frances Wahl Pierce, Branch of Resource Analysis, USGS, MS 937, Box 25046, Denver, CO 80225; (303) 236-5707; or GSA Registration Coordinator.

## Premeeting

1. **Crust of a Young Earth—Guide to the Precambrian Continental Core of Southeast Wyoming.** George L. Snyder, USGS, MS 913, Box 25046, Denver, CO 80225, (303) 236-1233; B. Ronald Frost, University of Wyoming, Laramie; James A. Grant, University of Minnesota, Duluth; Donald H. Lindsley, SUNY, Stony Brook; Zell E. Peterman, USGS, Denver. 3½ days, October 27 (evening) to October 30 (late evening). Cost: \$250 (3 ON, all meals). Limit: 50.

Well-exposed Precambrian basement rocks in southeast Wyoming preserve a long history of crustal formation and later development. This field trip will emphasize examination of metamorphosed fossiliferous Archean greenstone belt rocks and their remobilized granitic basement and its Early Proterozoic peridotite intrusives; Middle Proterozoic intrusive rocks of the Laramie Anorthosite Complex and their cooked contact rocks; and contrasting Archean sedimentary hematite ore and Proterozoic intrusive magnetite ore. Stops will be in the Hartville uplift and central Laramie Mountains of southeast Wyoming.



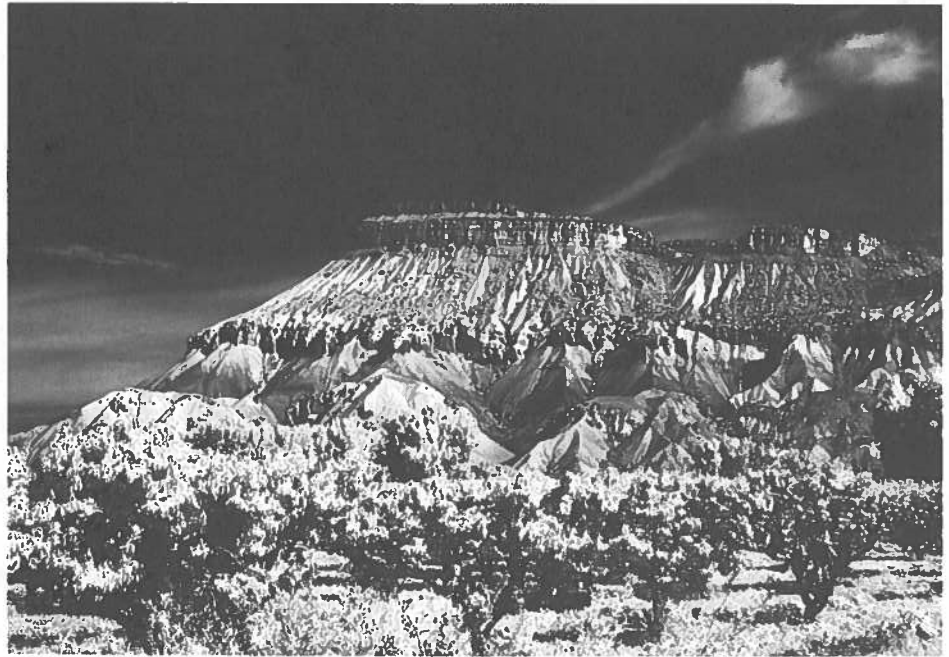
The quiet beauty of Rocky Mountain National Park is found just 70 miles from downtown Denver.



**2. Proterozoic Plutons and Pegmatites of the Pikes Peak Region, Colorado.**

Reinhard A. Wobus, Dept. of Geology, Williams College, Williamstown, MA 01267, (413) 597-2470; Robert M. Hutchinson, Colorado School of Mines, Golden. 3 days, October 28 (morning) to October 30. Cost: \$275 (2 ON, all meals). Limit: 36.

Examine three generations of Proterozoic granitic plutons (calc-alkalic, peraluminous, and subalkalic) of the Southern Front Range, with emphasis on the petrology and structure of the 1.0 Ma anorogenic composite Pikes Peak batholith and its associated sodic and potassic stocks and ring complexes. Collecting stops will be made at amazonite- and smoky quartz-bearing pegmatites of the Lake George (Crystal Peak) district. Weather permitting, a trip will be made by van to the summit of Pikes Peak (14,110') to view exceptional exposures of granite-tectonic structures and lithologic zoning along the road above timberline.



Mt. Garfield, north of Palisade, CO; Mesa Verde at top; Cozelle, Corcoran beds 1/2 way up.

**3. An Integrated View of Depositional Systems of the Early Tertiary Coal Measures, Powder River Basin, Montana and Wyoming.**

Romeo Flores, Coal Geology Branch, USGS, MS 972, Box 25046, Denver, CO 80225, (303) 236-7774; Timothy Moore, University of Kentucky, Lexington; Peter Warwick, USGS, Reston, Virginia. Trip begins and ends in Casper, Wyoming. 3 days, October 27 (evening) to October 30. Cost: \$305 (3 ON, 3 L, 1 D). Limit: 35.

The focus will be on the depositional environments of clastic sediments as well as the petrology, geochemistry, palynology, and paleobotany of coal deposits of the Paleocene Tongue River Member of the Fort Union Formation and Eocene Wasatch Formation in the Powder River Basin, Montana and Wyoming. Economic coals, particularly the anomalously thick beds, are interpreted as deposits in swamps of fluvial systems that consisted of meandering and anastomosing streams in the basin proper and braided streams and alluvial fans in the basin margin. The nature of these depositional systems and associated swamp environments will be examined in open-pit mines and outcrops.

**4. In search of Hayden's Tertiary Lakes of the High Plains: The White River Formation Revisited.**

Robert H. Blodgett, Dept. of Geological Sciences, University of Texas at Austin, TX 78713, (512) 471-5759; James B. Swinehart, University of Colorado, Boulder; Russell C. Anderson, U.S. Soil Conservation Service, Des Moines, Iowa. Trip begins in Casper, Wyoming. 3 1/4 days, October 27 (evening) to October 30. Cost: \$195 (3 ON, 3 L, 1 D). Limit: 33.

This trip focuses on the Oligocene White River Formation that composes part of the classic "gangplank" shed eastward from the Laramie and Front Ranges of the Rocky Mountains. A traverse from Douglas, Wyoming, to northeastern Colorado examines excellent exposures of fluvial, lacustrine, and eolian deposits. On the way, largely unpublished work by Evanoff, Blodgett, and Shepherd, this trip evaluates Oligocene sedimentation in the context of modern fluvial and eolian sedimentology, paleoecology, and paleopedology. Highlights include a major paleo-valley fill, diverse terrestrial molluscan fauna, the internal architecture of braided stream facies, calcareous paleosols and soil trace-fossils, and exhumed meandering-stream channels.

**5. Geology and Hydrogeology of the Nebraska Sand Hills.**

James B. Swinehart, Conservation and Survey Division, University of Nebraska, 113 Nebraska Hall, Lincoln, NE 68588-0517, (402) 472-7529; Thomas C. Winter, USGS, Lakewood, Colorado; James Goetze, Conservation Survey Division, North Platte, Nebraska. 3 days, October 28 (morning) to October 30. Cost: \$247 (2 ON, all meals). Limit: 40.

Examine the geologic framework and hydraulic characteristics of the Nebraska Sand Hills, the largest dune field in North America. The pre-dune stratigraphic sequence and the interaction of modern and ancient fluvial systems with the dune field will be covered. Focus is on the morphology, internal stratification, and chronology of the dune field, with a lengthy stop at Merritt Reservoir, where a mile of

lakeshore exposures allows inspection of the internal structure of 50-m-high barchanoid ridge dunes. The hydrology of Crescent Lake National Wildlife Refuge will be emphasized. A variety of studies will be examined including infiltration, groundwater recharge and related flow systems in a dune-lake system.

**6. Paleohydrology and Hydrogeology of the Carbonate Rock Province of the Great Basin (East-Central Nevada to Southern Nevada).**

M. D. Mifflin, Mifflin and Associates, Inc., 2700 E. Sunset Road, Suite C25, Las Vegas, NV 89120, (702) 798-0402; J. Quade, University of Utah, Salt Lake City. 3 days, October 27 (evening) to October 30. Trip begins in Elko, Nevada. Cost: \$305 (3 B, 3 L, 2 D, 3 ON, airfare to Denver); \$210 without airfare. Limit: 40.

Review the evidence and current understanding of 570 miles of ground-water hydrology and paleohydrology in the carbonate rock province of the Great Basin. Large interbasin flow systems, some with the Toth flow cell configurations, are postulated. Compare late Pleistocene age sediments formed by ground-water discharge in southern Nevada with modern analogs of ground-water discharge (the same sedimentation and faunal patterns) in east-central Nevada. Observe (and swim in) large springs associated with interbasin ground-water flow. See Pleistocene lake shorelines, and a major basin without ground-water discharge. Follow the course of the Pleistocene White River. For hydrogeologists, Quaternary geologists, and micropaleontologists.

**7. From the Basin and Range to the Edge of the Plains in the Tracks of Wheeler, Powell, and Hayden.** *R. L. Langenheim, Jr., Dept. of Geology, University of Illinois, 245 NHB, 1301 W. Green Street, Urbana, IL 61801, (217) 333-3540; C. Pius Weibel, Illinois State Geological Survey, Champaign. Trip begins in Las Vegas, Nevada. 4½ days, October 26 (evening) to October 30. Cost: \$380 (4 ON, 4 L). Limit: 30.*

Emphasis will be on the stratigraphic and structural changes from the eastern Basin and Range to the margin of the Great Plains and how our understanding of these geologic provinces has developed since the pioneering explorations of Wheeler, Powell, and Hayden. Stops at the Buffington Pocket (Muddy Mountain thrust), the Virgin Gorge (Grand Wash fault), the Hurricane fault scarp, Zion, Bryce (Sevier and Paunsagunt faults), the Aquarius Plateau and Capitol Reef, north of the La Sal Mountains, the Uncompaghre Plateau at the Colorado National Monument, De Beque Canyon, the Grand Hogback and Glenwood Canyon, Middle Park, and the Front Range hogbacks.

**8. Pennsylvanian and Permian Depositional Systems and Cycles in Eagle Basin (Vail to Glenwood Springs), Northwest Colorado.** *Samuel Y. Johnson, USGS, MS 939, Box 25046, Denver, CO 80225, (303) 236-1545; Christopher J. Schenk, USGS, Denver; John A. Karachewski, Colorado School of Mines, Golden. 2 days, October 29 (morning) to October 30. Cost: \$135 (1 ON, 2 L). Limit: 36.*

Focus on Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwest Colorado. Strata to be examined include the Minturn Formation,

the Eagle Valley evaporite, the Maroon Formation, the Schoolhouse Tongue of the Weber Formation, and the sandstone of Frying Pan River. Facies of these units were deposited in an unusually broad spectrum of environments that include deep evaporite basins, carbonate reefs, fan deltas, terminal fluvial fans, and eolian sand sheets, loess fields, and local dune fields. Principal emphasis will be on (1) recognition of the distinctive sedimentologic characteristics of each facies, (2) recognition (and correlation) of eustatic, climatic, and tectonically controlled cycles, and (3) reconstruction of basin paleogeography.

**9. Archaeological Geology in the Colorado Piedmont and High Plains of Southeastern Wyoming.** *Vance T. Holliday, Dept. of Geography, Science Hall, University of Wisconsin, Madison, WI 53706, (608) 262-6300; Adrienne B. Anderson, National Park Service, Denver; George C. Frison, University of Wyoming, Laramie. 2½ days, October 28 (evening) to October 30. Cost: \$175 (2 ON, 2 L). Limit: 40.*

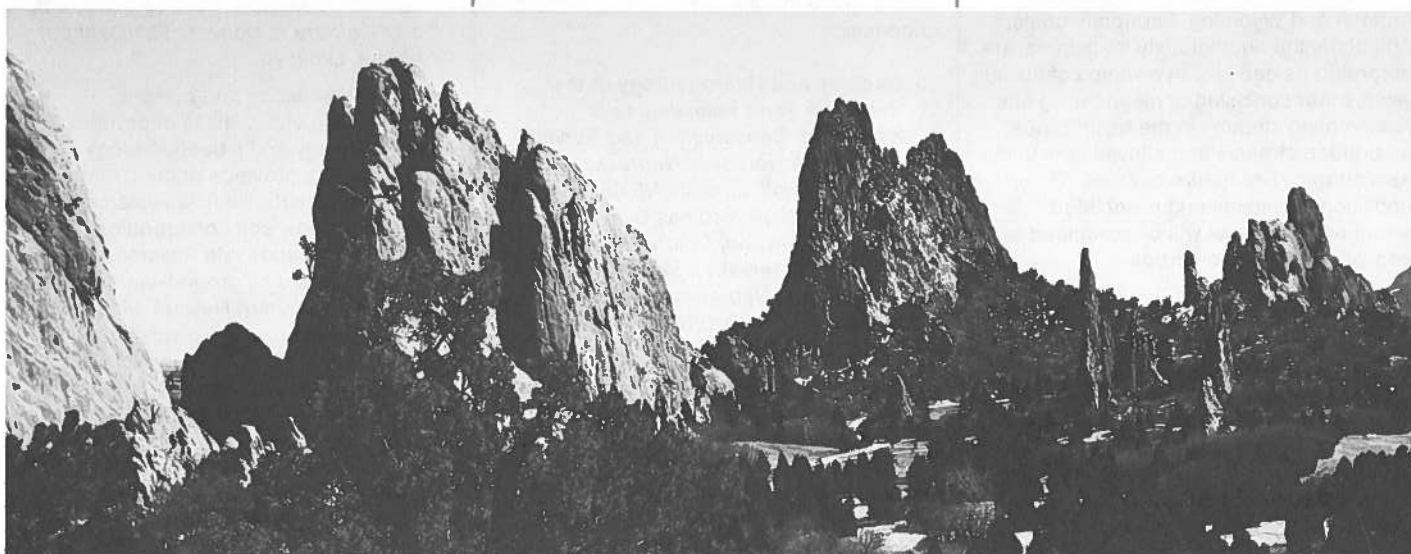
Focus will be primarily on the late Quaternary stratigraphy and geomorphology at several classic archaeological sites including, in Wyoming, the Hell Gap paleo-Indian site and some stone-tool quarry sites in the same area and, in Colorado, the famous Lindemeier Folsom site and, along the South Platte River, the Jurgens, Frazier, and Dent sites. All of these localities were the sites of pioneering research in archaeological geology as well as being outstanding archaeological sites. This trip should be of interest to archaeological geologists, Quaternary geologists, and geomorphologists.

**10. Northeastern Front Range Revisited: Compression and Crustal Wedging in a Classic Locality for Vertical Tectonics.** *Eric Erslev, Dept. of Earth Resources, Colorado State University, Fort Collins, CO 80523, (303) 491-5661. 1 day, October 30. Cost: \$55 (1 L). Limit: 28.*

Plunging Laramide structures along the northeastern margin of the Front Range expose characteristic changes in geometry and deformation mechanisms of basement-cored foreland uplifts. This trip will evaluate previous models involving vertical uplift by examining exposures of faults and folds at multiple structural levels. Geometric constraints of restorability of both cover and basement will be illustrated with analog models and integrated with field data into a regional model for the Front Range uplift.

**11. Geomorphology and Quaternary Geology of Canyonlands, Utah.** *Deborah Harden, Dept. of Geology, San Jose State University, San Jose, CA 95192, (408) 924-5021; Steven Colman, USGS, Woods Hole. Trip begins and ends in Grand Junction, Colorado. 3 days, October 28 (noon) to October 30. Cost: \$190 (2 ON, 2 B, 2 L, 2 D). Limit: 40.*

View the spectacular erosional landscape of the Canyonlands area and the Quaternary history of the region. Examine incised meanders and terraces of the Colorado River system, Quaternary salt deformation, calcic soils, and the pediments, arches, cliffs, and canyons that characterize the region. Stops include Fisher Valley, Needles Overlook, Colorado River terraces, Spanish Valley, Arches National Park, and abandoned meanders of the Green River.



*Garden of the Gods.*



**12. In the Footsteps of G. K. Gilbert—Lake Bonneville and Neotectonics of the Eastern Basin and Range Province.**

Michael Machette, USGS, MS 966, Box 25046, Denver, CO 80225, (303) 236-1243; Don Currey, University of Utah, Salt Lake City; Charles Oviatt, Kansas State University, Manhattan; William McCoy, University of Massachusetts, Amherst; William Scott, Ted Barnhard, Alan Nelson, Steve Personius, David Schwartz, and Richard Van Horn, USGS, Denver; William Lund, Utah Geological Mineral Survey, Salt Lake City. Trip begins and ends in Salt Lake City, Utah. 3½ days, October 27 (evening) to October 30 (4:00 p.m.). Cost: \$195 (3 ON, 3 B, 3 L, 1 D); \$105 without lodging, for Salt Lake City residents. Limit: 40.

The field trip will emphasize three topics studied by G. K. Gilbert 100 years ago: Lake Bonneville geomorphology, stratigraphy of the Bonneville lacustrine cycles, and neotectonics of the eastern Basin and Range province, especially the Wasatch fault zone. Visit some of Gilbert's classic stratigraphic localities and photographic sites and review data from several new sites which have modified his original work. A considerable body of research has been generated in the past 35 years. Although the trip will draw from this body of research, the main focus will be G. K. Gilbert, his pioneering studies of 100 years ago, and his legacy to contemporary earth scientists.

**13. Hydrogeology and Phytogeomorphology of the Mountains and Foothills near Denver, Colorado.**

K. E. Kolm, Dept. of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401, (303) 273-3800; J. C. Emerick, Colorado School of Mines. 1 day, October 30. Cost: \$67 (1 L). Limit: 40.

Prepare to explore the geomorphic, botanical, and hydrogeologic aspects of the diverse ground-water and surface-water systems of the mountains and foothills near Guanella Pass, west of Denver, Colorado. The headwaters and ground-water systems of Geneva Creek, part of the North Fork of the South Platte River system, will be explored. Geomorphic systems will include weathering, Holocene

mass movements, and Pleistocene glacial and Holocene fluvial erosional and depositional features. Phytogeomorphic systems will include the alpine, subalpine, montane, and riparian.

**14. Geology and Vertebrate Paleontology of Western Colorado and Eastern Utah.**

William L. Chenoweth, Grand Junction Geological Society, Grand Junction, CO 81506, (303) 242-9062; Robert G. Young and Harley J. Armstrong, Grand Junction Geological Society. 3 days, October 26 (evening) to October 29. Trip begins and ends in Grand Junction, Colorado. Cost: \$230 (3 ON, 3 L). Limit: 40.

The Dinosaur Triangle of western Colorado and Northeastern Utah contains world famous dinosaur museums and quarries. This trip will visit many of the most important and review the geology of this unique area. The itinerary will include the Rabbit Valley Quarry, San Rafael swell, Cleveland-Lloyd quarry, Book Cliffs, Utah Field House of Natural History, Dinosaur National Monument, Douglas Creek Arch, and Dinosaur Hill and Riggs Hill quarries.

**15. Major Landslides and Geotechnical Construction Problems in the Mountains of Colorado.**

William P. Rogers, Colorado Geological Survey, 1313 Sherman Street, Suite 715, Denver, CO 80203, (303) 866-2611; Bruce Stover and Jim Soule, Colorado Geological Survey, Denver. 2 days, October 28 (morning) to October 29. Cost: \$170 (1 ON, 2 L, 1 D). Limit: 40.

This trip will examine geologic hazards and engineering geology of landslides, rockfall areas, debris flows, and highway construction in hazardous canyons of western Colorado. Highlighting the trip are stops at the Dowds Junction landslide complex near Vail, Colorado, a tour of geotechnical aspects of interstate highway construction through Glenwood Canyon, and a stop at the giant 180 million m<sup>3</sup> Muddy Creek landslide complex, which reactivated in spring 1986.



Albert Falls near Bear Lake, Rocky Mountain National Park.

**16. Precious-Metal Telluride Deposits at Gold Hill, Boulder County, Colorado.**

Bruce Geller, Dept. of Geological Science, University of Colorado, Campus Box 250, Boulder, CO 80309, (303) 492-8141; W. W. Atkinson, Jr., University of Colorado, Boulder; Jeff Kurtz, University of Colorado, Denver. 1 day, October 29. Cost: \$66 (1 L, 1 D). Limit: 20.

This trip will examine epithermal precious metal mineralization in the Boulder Telluride Belt, northwest of Boulder, Colorado. The Gold Hill district was possibly the oldest gold discovery in Colorado. Stops to examine Tertiary intrusive rocks, Precambrian basement, and several mines will give a general genetic picture of the belt. Underground tours will be possible at some mines.

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## Postmeeting

- 17. In the Presence of Eternity: An Illustration, Using the Area Around Boulder, Colorado.** *A. R. (Pete) Palmer, Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020. 1 day, November 4. Cost: \$25 (1 L). Limit: 24.*

Boulder, Colorado, has a unique set of outcrops, including recent stream gravels, steeply dipping fluvial sandstones at the base of a thick homoclinal sequence of sedimentary rocks, and two angular unconformities (Pennsylvanian/Precambrian; Quaternary/Cretaceous), all within sight of each other, that illustrate the basic principles of stratigraphy and help demonstrate to a lay audience how geologists know that the Earth's history is vast. A one-day trip using these outcrops has been an effective way to begin a constructive dialog with creationists and others who have trouble with a universe that has infinite time dimensions as well as space dimensions.

- 18. Styles and Deformation of the Cordilleran Orogenic Belt and the Mid-Tertiary Tectonic Overprinting, Southeast Arizona.** *Harald Drewes, USGS, MS 905, Box 25046, Denver, CO 80225, (303) 236-5647; Steven Reynolds, Arizona Geological Survey, Tucson. Trip ends in Tucson, Arizona. 3½ days, November 3 (8:00 p.m.) to November 6. Cost: \$330 (3 ON, 3 B, 3 L, 2 D, airfare to Tucson); \$230 without airfare to Tucson. Limit: 30.*

Focus on the field evidence for the complex compressional styles of Cordilleran orogenic age (Late Cretaceous-Paleocene) in three key ranges. We will walk 4-5 hours each day, mainly on trails and jeep tracks. In the Dragoon Mountains, we will see two main thrust plates of metamorphosed, upended, oppositely facing thrust platelets, which are overlain by a third plate of unmetamorphosed, gently dipping rocks. There is also evidence of telescoping of sedimentary facies between the top and bottom main plates. In the Santa Rita Mountains evidence will be shown for closely dating two phases of Cordilleran thrust faulting. Movement on the younger phase, of a few kilometers, is associated with reactivation

of older strike-slip faults. In the Rincon Mountains evidence will be shown for differences in age and style of deformation between deep Cordilleran thrust faults and shallow Miocene gravity faults. Fabric contrasts across the Rincon gneiss-cored dome suggest that the early phase of dome development overlapped with the last movement on thrust faults on which minimum movement was tens of kilometers.

- 19. Glacial-Marine Sedimentation, Mineral Fork Formation (Proterozoic III), Utah.** *Nicholas Christie-Blick, Lamont-Doherty Geological Observatory, Palisades, NY 10964, (914) 359-2900; Paul Karl Link, Idaho State University, Pocatello. 2½ days, November 3 (evening) to November 5. Trip begins and ends in Salt Lake City, Utah. Cost: \$190 (2 ON, 1 B, 2 L, 1 D). Limit: 30.*

Glacial-marine strata of the Mineral Fork Formation were deposited in erosional valleys as much as 850 m deep at the edge of an extensional intracratonic basin. The excursion will focus on the interpretation, in a stratigraphic context, of processes of sedimentation in a temperate glacial-marine environment at varying distances from the grounding line of the ice sheet, especially ice-rafting, suspension

deposition, sediment gravity flow and sliding, and bottom-current activity. The trip will consist of two day-long traverses over spectacular exposures in the central Wasatch Range near Salt Lake City. Consult with the field trip leaders if you have any questions about the degree of physical difficulties.

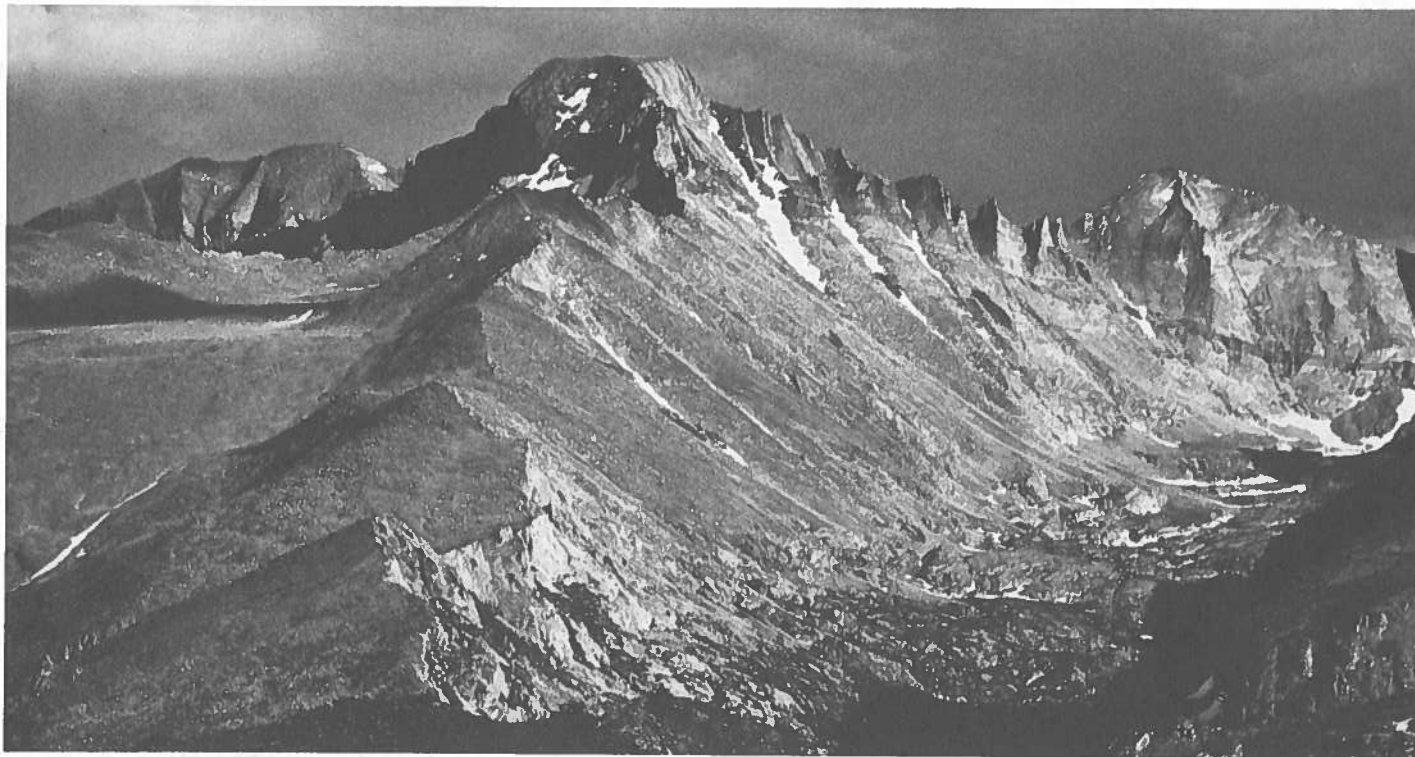
- 20. Upper Cretaceous Shannon, Frontier, and Haystack Mountains Formations Shelf Sandstones.** *Roderick W. Tillman, 4555 S. Harvard, Tulsa, OK 74135, (918) 749-3184; Randi S. Martinsen, University of Wyoming, Laramie; Marilyn Huff, Louisiana State University, Baton Rouge. 3½ days, November 3 (5:00 p.m.) to November 6. Cost: \$370 (3 ON, 3 B, 3 L, 1 D). Limit: 30.*

Emphasis will be on interpretation of shelf sandstone facies, shelf-ridge geometry, and recognition of depositional processes. Wave (Frontier), storm (Shannon, HMF), and fair-weather-current (Frontier and HMF) deposited sandstones will be observed in excellent outcrops near Midwest (Salt Creek) and Rawlins, Wyoming. Differences in architecture of different shelf sand-body types and nature of stacking will be stressed in outcrop and subsurface examples. All outcrops to be visited are accessible on all-weather roads.



St. Elmo.





Longs Peak from Trail Ridge Road.

**21. Dinosaur Trackways and Red Beds of the Purgatoire Valley: Early Mesozoic Depositional Environments and Paleoecology of Southeastern Colorado.**

*Nancy K. Prince, Jacobs Engineering Group, 12600 W. Colfax, Lakewood, CO 80215, (303) 232-7093; Martin G. Lockley and Kelly Conrad, University of Colorado, Denver. 2½ days, November 3 (5:00 p.m.) to November 5. Cost: \$220 (2 ON). Limit: 27.*

Visit normally inaccessible Jurassic outcrops of the remote and scenic Purgatoire Valley. Highlight of the trip will be a visit to North America's Largest dinosaur track site in the Morrison Formation. Emphasis will be on how ichnological and paleoecologic studies have increased our knowledge of lacustrine, fluvial flood plain, and depositional environments in this area.

**22. Cretaceous-Tertiary Boundary in the Raton Basin—Evidence of Asteroid Impact.**

*Charles L. Pillmore, USGS, MS 913, Box 25046, Denver, CO 80225, (303) 236-1240; Romeo Flores, USGS, Denver; R. Farley Fleming, Littleton, Colorado; Glen A. Izett, USGS, Denver. 2½ days, November 3 (5:00 p.m.) to November 5. Cost: \$200 (2 ON, all meals). Limit: 36.*

The Raton Basin contains 20 known sites where a worldwide chronostratigraphic marker, the Ir-rich Cretaceous-Tertiary (K-T) boundary impact clay layer, can be observed in continental rocks. The boundary, which is defined by the abrupt

disappearance of several fossil pollen taxa, occurs at the top of a thin kaolinitic clay bed 1–2 cm thick. This K-T pollen break is exactly coincident with the K-T boundary impact clay layer (½ cm thick) that contains abundant shock-metamorphosed mineral grains and high Ir concentrations. The K-T boundary claystone and its associated impact layer are preserved in a carbonaceous interval of rocks in a flood-plain sequence of mudstones and sandstones in the lower coal zone of the Raton Formation. The stratigraphy and field characteristics of the K-T boundary interval will be discussed, and opportunities will be provided to compare tonsteins to the boundary clay and for sampling and detailed study.

**23. Geology and Mineral Resources of Central Colorado.** *Bruce Bryant, USGS, MS 913, Box 25046, Denver, CO 80225, (303) 236-1234; John C. Reed, Jr., and P. K. Sims, USGS, Denver; D. W. Beaty, Canyon Resources Corp., Golden, Colorado; T.L.T. Grose, Golden, Colorado; W. W. Mallory, USGS, Denver; S. R. Wallace, Lakewood, Colorado. 2 days, November 4 (morning) to November 5. Cost: \$140 (1 ON, all meals). Limit: 40.*

This trip, sponsored by the Colorado Scientific Society, will examine the Proterozoic through Neogene tectonic features of central Colorado which furnish the geologic setting of mining districts in the northeastern part of the Colorado Mineral Belt. Stops at the Central City–Idaho Springs, Georgetown–Silver

Plume, Climax, Leadville, and Gilman Mining districts and at Precambrian basement rock outcrops will integrate newly acquired data with previous studies, and stops on the flanks of the Front Range and Sawatch Range uplifts will give an overview of regional geology.

**24. Pleistocene and recent Floods in the Big Thompson River Drainage, Northern Colorado Front Range.**

*William H. Hoyt, Dept. of Earth Sciences, University of Northern Colorado, Greeley, CO 80639, (303) 351-2487; Robert D. Jarrett, USGS, Lakewood, Colorado. 1 day, November 4. Cost: \$35 (1 L). Limit: 36.*

Recent floods in the Big Thompson River drainage of the northern Colorado Front Range have provided excellent opportunities for the hydrologic and geomorphic study of life-threatening, catastrophic floods. Good evidences of floods start just east of the canyon mouth at an elevation of about 5500' and continue west to the Horseshoe Park area in Rocky Mountain National Park at an elevation of about 8500'. Of particular interest to sedimentologists, geomorphologists, and hydrologists is the debris fan deposited during the draining of Lawn Lake in the 1982 event. As time and weather conditions allow, we will run a transect across this interesting fan from the proximal to the distal end.



View SW from Trail Ridge Road, Rocky Mountain National Park.

## Half-Day Mini-Trips (held during the meeting)

**25. Tectonics and Sedimentation—Phanerozoic Rocks, Golden-Morrison Area, Colorado.** Stephen A. Sonnenberg, 1950 Glen Dale Drive, Lakewood, CO 80215, (303) 292-1314. Cosponsored by Rocky Mountain Chapter—SEPM. ½ day, October 31 (1:00 p.m.). Cost: \$16. Limit: 45.

This trip is designed to examine outcrops of the Phanerozoic rocks along the Colorado Front Range, Golden-Morrison area, Colorado. Tectonic influence on sedimentation in three types of basins are observed. Each sequence records different aspects of basin development and associated orogeny in the continental plate.

**26. Rocks and Structure of the Proterozoic Core, Central Front Range, Colorado.** Mitchell W. Reynolds, USGS, MS 905, Box 25046, Denver, CO 80225, (303) 236-5620. Cosponsored by Colorado Scientific Society. ½ day, November 1 (8:00 a.m.). Cost: \$16. Limit: 45.

The field trip will examine relations between Phanerozoic sedimentary rocks west of Denver and Proterozoic metamorphic rocks in the core of the Front Range. Structure and rock types in the metamorphic rocks will be examined along two different routes between Denver and Idaho Springs and return.

**27. Dinosaurs near Denver.** Martin Lockley and Mark Jones, Dept. of Geology, University of Colorado, Denver, CO 80202, (303) 556-4884. Cosponsored by Colorado Scientific Society. ½ day, November 2 (8:00 a.m.). Cost: \$16. Limit: 45.

The Denver area is historically famous for late-19th-century dinosaur discoveries. The discovery of dinosaur bones in the Morrison Formation by Arthur Lakes in 1877 initiated the greatest and most successful dinosaur hunt in the annals of paleontology. New dinosaur discoveries and track-bearing beds recently have been correlated extensively along the Front Range indicating a dinosaur throughway in the Dakota Group. This trip will visit some of the more famous footprint and bone localities.

**28. Denver's Geologic Setting.** Glenn Scott, USGS, 60 Estes Street, Lakewood, CO, (303) 233-4568 and Don Trimble, USGS, Denver. Cosponsored by Colorado Scientific Society. ½ day, November 3 (8:00 a.m.). Cost: \$16. Limit: 40.

This half-day trip will examine some of the more famous geologic localities in the Denver area, including the section of sedimentary rocks ranging from Pennsylvanian to early Tertiary age. The famous Red Rocks Park at the boundary between the sedimentary and Precambrian rocks will also be visited. History of sedimentation, structural development, and geomorphic history of the Denver area will be discussed in relation to the outcrops visited. A stop at the Genessee overlook will provide a panoramic view of the continental divide and the mid-Tertiary erosion surface developed on the Precambrian rocks.

## SEG-SPONSORED FIELD TRIPS

### Epithermal Precious-Metal and Base-Metal Systems, San Juan Mountains, Colorado.

Robert M. Hutchinson, Dept. of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401, (303) 273-3813; C. R. Ponchak, Western Mining, Ouray, Colorado; William B. Goodhard, Sunnyside Gold Corp., Silverton, Colorado; F. Doug Taylor, Gold King Consolidated, Inc., Silverton, Colorado. Trip begins and ends in Montrose, Colorado. 3½ days, October 26 (afternoon) to October 29. Cost: \$350 (3 ON, 3 B, 3 L, 3 D). Limit: 25. Send trip registration fees to Robert M. Hutchinson (address above).

This trip will be devoted to underground inspection of middle to late Tertiary precious-metal and base-metal systems in three producing mines: Camp Bird Mine, Sunnyside Gold Mine, and Gold King Mine. Time-space relations of visible paragenetic assemblages (vein phases) being actively mined will be examined. Underground and surface inspection will emphasize local and regional geologic setting of vein systems of each mine relative to the Silverton and Lake City calderas. Surface inspection will also be made of lithologies and alteration halos associated with the National Belle breccia pipe on Red Mountain Pass. Underground traversing at Camp Bird and Sunnyside mines will be about two miles in each mine at elevations of 9000'–11,000'. Trip can be physically rigorous. Participants flying into Montrose on October 26 should take United flight 3933, leaving from Denver at 3:10 p.m., arriving in Montrose at 4:10 p.m. The trip officially leaves from the Montrose airport.



Out-of-state residents are encouraged to attend; participation by Colorado residents will be limited. Another trip will be run in the future for Colorado residents unable to make this trip. Further information will be supplied once your registration is received.

#### **Deposits of the Colorado Mineral Belt:**

**Leadville and Gilman Areas.** *Tommy Thompson, Dept. of Earth Sciences, Colorado State University, Fort Collins, CO 80523, (303) 491-5430; David W. Beaty, Canyon Resources Company, Golden, Colorado. 2 days, October 29 to October 30. Cost: \$150 (1 ON, 1 B, 2 L, 1 D). Limit: 24. Send trip registration fees to Dick Grauch, USGS, MS 973, Box 25046, Denver, CO 80225, (303) 236-5551.*

Day one will be spent in the Gilman area visiting outcrops of the Leadville dolomite and Pando porphyry as well as viewing core through mineralized intercepts in the Eagle mine, Gilman district. An evening lecture/poster session will be held to discuss Leadville district geology, ore deposits, stable isotope geochemistry, and fission-track dating of igneous rocks and ore deposits. Day two will include a Leadville district surface tour and half-day underground visit to the Black Cloud mine.

#### **Epithermal Precious-Metal Deposits Associated with an Island-Arc**

**Environment: Japan.** *Shunso Ishihara, Government Industrial Research Institute, Tohoku, 2-1, 4-Chome, Nigatake, Sendai 983 Japan; telephone (022)237-5211; Richard W. Hutchinson, Colorado School of Mines, Golden, (303) 273-3039. 10 days, November 4 to November 13. Cost: \$3000. Limit: 25 (minimum 10). Send trip registration fees to Dick Grauch, USGS, MS 973, Box 25046, Denver, CO 80225, (303) 236-5551.*

Three days will be spent in southern Honshu examining young volcanic fields and related epithermal gold deposits, including the rich veins of the Hishikari mine. Three days follow in the Green Tuff region of northern Honshu visiting surface geologic features and volcanogenic polymetallic base-metal sulfide deposits of this famous region. The field examinations will emphasize the comparative regional



Ranch house, Williams Fork River, South of Craig, CO.

geology and genetic processes of relatively young, volcanic-affiliated precious- and base-metal deposits in an island-arc tectonostratigraphic setting. A final half-day meeting with geologists of the Society of Mining Geologists of Japan is planned. Early registration is suggested, as participation is limited.

#### **The Ga, Ge, Cu, Pb, Ag, and U Deposits of Southwestern Utah and the Arizona Strip.**

*Erich Petersen, Dept. of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112, (801) 581-7238; Jim Rasmussen, Energy Fuels Nuclear Inc., Kanab, Utah. Trip begins and ends in Las Vegas, Nevada. 3 days, October 27 (7:00 a.m.) to October 29. Cost: \$250 (2 ON, 3 B, 3 L, 3 S). Limit: 30. Send trip registration fees to Dick Grauch, USGS, MS 973, Box 25046, Denver, CO 80225, (303) 236-5551.*

The trip will emphasize the geologic setting and genesis of the ore deposits of southwestern Utah and the Arizona strip. Evening lectures/discussions will cover district and local geology and geochemistry of the various ore deposits. Surface and/or underground trips are

planned to the Apex (Ga, Ge) mine, Kanab North (U) mine, the Escalante (Ag) mine and the Silver Reef district. Participants should be prepared for short uphill hikes and should bring safety boots (heavy hiking boots), hard hats, and safety glasses.

## **LSU-SPONSORED FIELD CAMP ALUMNI REUNION**

**Saturday, October 29, 8:00 a.m. to 10:00 p.m.**

The LSU Field Camp, the oldest continually run field camp in the United States, will host a reunion for all LSU field camp alumni and LSU alumni. Transportation to and from the field camp and hiking will be organized with department faculty. A box lunch and barbeque supper will be provided. For information: Libby Holt, Dept. of Geology and Geophysics, Louisiana State University, Baton Rouge, LA 70803-4101, (504) 388-3415. No cost for participation.

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# EXHIBITS

## Currigan Hall EXHIBIT HOURS

SUNDAY OCTOBER 30	MONDAY OCTOBER 31	TUESDAY NOVEMBER 1	WEDNESDAY NOVEMBER 2
6:00 p.m. to 9:00 p.m.	10:00 a.m. to 5:30 p.m.	9:00 a.m. to 5:00 p.m.	8:00 a.m. to 2:00 p.m.

Our exhibitors extend a warm Denver welcome and invite you to visit the GeoScience Exposition, view their new products or services, and register for prize drawings at their booths. Lounge areas with food and beverage service will be

provided in the hall for your convenience. FREE coffee will be available each morning during the first hour of the exhibit. All visitors to the exhibit hall must be registered for the meeting. Badges must be worn.

Exhibit space MAY still be available at this time, although the remaining spaces were limited as we went to press. To reserve space, please contact Kathy Ohmie, Exhibits Manager, at 1-800-GSA-1988.

### 1988 EXHIBITORS AS WE GO TO PRESS:

28th International Geological Conference\*  
AAPG Bookstore  
AAPG Visiting Petroleum Geologists Program  
Academic Press, Inc.  
American Geological Institute  
American Geophysical Union  
American Institute of Professional Geologists  
American Instruments, Inc.  
Analytical Services Company  
Arizona Geological Society  
Artcraft Imports\*  
Blackwell Scientific Publications\*  
Blake Industries, Inc.  
Brigham Young University  
Brinkmann Instruments Company  
Buehler Ltd.\*  
C West Gems & Minerals  
Cal Graeber Minerals  
Cambridge University Press  
Cameca Instruments, Inc.  
Canadian Society of Petroleum Geologists  
Carolina Biological Supply Company  
Chapman & Hall  
Chemex Labs Ltd.  
ChemPet Research—CPR  
Circum-Pacific Map Project  
CJS Sciences Ltd.  
Coastal Science Laboratories, Inc.  
Colorado School of Mines  
Colorado Scientific Society  
Computer Oriented Geological Society  
Comstock Creations, Inc.  
Cushman Foundation  
D. J. Minerals  
Dapple Systems  
Delsi, Inc.  
Denver Regional Exploration Geologists Society  
Desert Research Institute\*  
Earth in Motion Technologies  
Earth Observation Satellite Company\*  
Economic Geology Publishing Company  
Elsevier Science Publishing Company  
Finnigan MAT  
Francis Paul, Geoscience Literature  
W. H. Freeman\*  
General Supply Corporation  
Geochemical Services, Inc.  
Geographics  
Geological Association of Canada  
Geological Survey of Canada  
Geoscience Information Society  
Geoscience Resources, Inc.  
Geotech Computer Systems

Geotechnical Services  
Graphics Information, Inc.  
GSA—DNAG  
GSA 1989—St. Louis  
GSA Bookstore  
GSA Combined Publishers Display  
GSA Foundation  
GSA Sections  
Hillquist  
Howard Minerals  
Intermagetics General Corporation  
International Equipment Company  
International Union of Geological Sciences  
International Association for Mathematical Geology  
International Geologic Correlation Program  
JCPDS\*  
JEOL USA, Inc.  
Kendall/Hunt Publishing Company  
Kevex Corporation\*  
Krueger Enterprises, Inc.  
Link Analytical  
Logitech Ltd.  
Louisiana State University  
Lubrecht and Cramer Ltd.\*  
M. J. Systems  
Macmillan Publishing Company  
Ben Meadows Company  
Charles E. Merrill Publishing Company\*  
Mineralogical Record  
Mineralogical Society of America  
Montana Bureau of Mines & Geology  
Montana Geological Society  
Mountain Press Publishing Company  
National Association of Geology Teachers  
National Science Foundation  
Natural History Books  
Nature's Own\*  
Nebraska Geological Society\*  
New Mexico Bureau of Mines & Mineral Resources  
New Mexico Geological Society  
Nikon Inc., Instrument Group  
Nuclear Activation Service, Inc.  
Oklahoma Geological Survey\*  
Olympus Corporation  
Omnet, Inc.  
Oxford University Press  
Paleontological Society  
Pennsylvania Geological Survey\*  
Pergamon Press, Inc.\*  
Philips Electronic Instruments, Inc.  
Photovac, Inc.

Pikes Peak Lithographing Company  
Plenum Publishing Corporation  
Prentice-Hall, Inc.  
Princeton University Press\*  
Progressive Exploration\*  
Radix Instruments, Inc.  
Rice University  
Rigaku, USA  
Rocklabs\*  
RockWare, Inc.  
Rocky Mountain Association of Geologists  
S & M Microscopes  
SEPM  
Saunders College Publishing\*  
Schonsted Instrument Company\*  
Schweizerbart Publishing Company, Germany\*  
Scintag, Inc.\*  
Siemens\*  
Sigma Gamma Epsilon  
Society of Mining Engineers  
Society of Vertebrate Paleontology  
Sovran Gems  
Spectrex Corporation  
Spex Industries, Inc.  
SPI Supplies Division—Structurel Probe, Inc.  
Springer-Verlag New York, Inc.  
Steffen Robertson & Kirsten  
STN International  
Sunnywood Collections  
T. H. Peek, Publisher  
Teledyne Geotech  
The Mining Gallery  
Topaz Gem & Mineral  
Ulrich's Fossil Fish Gallery  
University of Arizona Press  
University of Colorado  
University of Kentucky  
University of Oklahoma  
Unwin Hyman, Inc.  
U.S. Bureau of Mines  
U.S. Geological Survey  
U.S. GeoSupply  
U.S. National Committee on Geology  
Van Nostrand Reinhold  
VG Instruments, Inc.  
Washington State University  
Wild Leitz USA  
Wildlife Supply Company  
John Wiley & Sons, Inc.  
William C. Brown Publishers\*  
Williams & Heintz Map Corporation\*  
X-Ray Assay Laboratories Ltd.

\* Hosts of the Centennial Welcoming Reception, Sunday evening, October 30.



# The Bash

WEDNESDAY, NOVEMBER 2  
7 TO 11 P.M.

MARRIOTT CITY CENTER  
COST \$19

PREREGISTRATION RECOMMENDED

## WESTERN PIONEER WALKABOUT CASINO AND HIGH COUNTRY HOEDOWN

In celebration of GSA's 100th Anniversary, you are invited to a Pioneer Birthday Bash, Casino, and High Country Hoedown. This will be the party all geologists remember.

Come ready to square dance, participate in "mining camp" contests, gamble in the Centennial Saloon and Dance Hall, and dine to a western menu.

### ENTERTAINMENT

- Fiddler
- Harmonica and Spoons Player
- Dance-Hall Girls
- Trick Ropers
- Square Dancing

### CASINO

- Draw Poker
- Black Jack
- Roulette
- Craps

### CONTESTS

- "Boot Hill" Epitaph
- Geologic Quizzes
- Horseshoes
- Cow Chip Toss
- Bubble Gum Tobacco Chew
- Longest, Bushiest Beard

### AUCTION

Winings from Casino and Contests  
Used in Special Auction

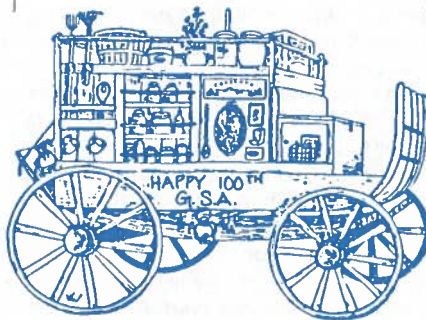
- Round-Trip Air Fares for 2
- '88 and '89 Annual Meeting Registrations
- Denver Restaurants/Dinner for 2
- Array of Exhibitor Products
- Sets of GSA Field Guides and Transects
- Much, Much More

### CHOW

- Buffalo Burgers
- BBQ Beef Sandwiches
- Chili w/Onions, Cheddar Cheese & Sour Cream
- Pan Fried Trout
- BBQ Baby Back Ribs
- Variety of Fresh Veggies & Dip
- Imported & Domestic Cheeses
- Quesadillas
- Tortilla Chips w/Guacamole & Salsa
- Calientas
- Deep Fried Chili Pepper
- Poquito Empanadas

### THE CENTENNIAL BIRTHDAY CAKE

*All ticket holders  
eligible for prize  
drawing*



*Roudtrip airfare for  
two—anytime,  
continental U.S.*

# SPECIAL CENTENNIAL PROJECTS

Prior to and during the meeting, special exhibits honoring the Society, geologists, and the science will be on view at various Denver locations.

The most extensive displays will be housed at the Denver Museum of Natural History in City Park. Together with the Colorado School of Mines, GSA is sponsoring a special exhibit reflecting the importance of **100 Years of Geology and Technology** in the Coors Mineral Hall through November 6.

Also at the Denver Museum through November 6 will be **New Visions of Earth: The Technology of Reading Our Planet**, a three-floor exhibit aimed at educating the public about the use of remote sensing to study Earth's global climate, atmosphere, and physical systems. This major installation, sponsored in part by GSA, includes Corridors in Time, a panoramic geological photomural exhibit depicting the Grand Canyon and Bryce and Zion Canyons. Throughout the fall, with GSA's assistance, speakers and programs about geology are scheduled for the museum's membership and for the general public.

With the start of registration for the annual meeting at Denver's Currigan Hall, the **GSA Century Exhibit, 1888-1988** will open on the Mezzanine Level. This historical display gives special tribute to the Society's original founders at its inception in 1888. The story of the Society's development as one of the nation's most prominent professional organizations is accented with rare photographs and unusual memorabilia gathered nationwide, and displays from GSA Divisions, Sections, and affiliated societies.

At the downtown branch of Columbia Savings, 1670 Broadway in Denver, a public display, **The Science of Geology: Dynamic through Time**, will run from September 15 through November 11 during regular banking hours. Custom-made displays throughout the bank will focus on the impact and significance of plate tectonics and other geologic discoveries for the general public.

The Denver Public Library at 13th and Broadway will feature a more technical plate-tectonics display on the second floor. This exhibit, originally produced by the University of Colorado Museum in Boulder, **Uncharted Islands and Lost Continents in Earth History**, will run from September 15 through November 11 during library hours.

The **Saga of the American West in Prints** is a series of lithographs from the collections of Denver's Graham Curtis, who has gathered hundreds of prints made from field sketches by the geologist-explorers of the early West. This display will appear in the lobby of Denver's First Interstate Bank during Centennial week.

## SPECIAL EVENTS

### Centennial Welcoming Reception

**Sunday, October 30, 6:00 to 9:00 p.m.**

**Currigan Hall**

The Welcoming Reception will lead off with entertainment, finger food, and beverages as the Centennial Exhibit opens in Currigan Hall. The Rocky Mountain Association of Geologists has arranged for mountain music of all sorts for your enjoyment. Everyone is invited.

For your convenience, registration will be open throughout the evening. When you arrive in Denver, 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. 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.

### Great Beard and Field Trip Contest

**Sunday, October 30, 8:30 p.m.**

**Denver Convention Complex, Currigan Hall  
GSA Center Lounge**

All bearded and field-dressed geologists who want to be part of this contest are to gather together so that the first round of creative judging can take place. If you've been growing a beard or collecting fine field attire, this is the once in a 100 years time to earn appropriate recognition at a GSA meeting. Winners will be named in six categories and prizes awarded to the 18 creative finalists.

## GSA Presidential Address/Awards/ Honorary Fellows

**Monday, October 31, 5:15 to 6:15 p.m.**  
**Hyatt Regency Hotel**

President Albert Bally's Centennial Address will be followed immediately by the GSA awards ceremonies. After his address, Dr. Bally will present the 1988 Day Medal to Claude J. Allegre and the 1988 Penrose Medal to Robert S. Dietz. Recognition will also be given to newly elected Honorary Fellows Ihsan Ketin, Rashid A. Khan Tahirkheli, Rupert W.R. Rutland, and Isabella Premoli-Silva. The AGI Ian Campbell Award will be presented to John D. Haun.

## All-GSA Awards Reception

**Monday, October 31, 6:15 to 7:00 p.m.**  
**Hyatt Regency Hotel**

Complimentary beverages will be available during this hour in honor of GSA awardees. Everyone is invited to meet the medalists and to enjoy the music and toasting to the Centennial. Every registrant and guest is encouraged to participate.

## Alumni Night

**Monday, October 31, 7:00 to 9:30 p.m.**  
**Hyatt Regency and Marriott City Center**

More than 60 universities and colleges will be represented in the Group Alumni Receptions held in the Hyatt Regency and the Marriott City Center. In addition, other private alumni receptions will be held at these and other hotels. If you would like your university to participate, contact the GSA Events Coordinator.

## GSA Open House

**Monday through Thursday, October 31 to  
November 3, 10:00 a.m. to 3:00 p.m.**

The GSA Headquarters building in Boulder is unusual in design and reminds viewers of the grace and symmetry exhibited in earth materials. Rock and mineral specimens are part of the work space and the landscaping. Tours of this unique environment will occur daily. Everyone is welcome.





Mt. Callahan, north of highway at Parachute.

## *GSA Centennial Orchestra*

**Tuesday, November 1, 8:30 to 10:30 p.m.  
Hyatt Regency Hotel**

The GSA Centennial Orchestra, for which more than 70 geoscientist musicians have been auditioned by orchestra organizer Holly Stein (USGS, Denver) will be led by professional conductor Jurgen deLemos. The orchestra will play selections that are familiar and pleasing—and perhaps even geological. A once-in-a-hundred-years concert. Purchase tickets by preregistration or on-site.

Fee: \$5

## *Awards Luncheons and Other Ticketed Meal Functions*

Associated Societies and GSA Divisions hold annual catered events that honor medalists and address important issues. The events are open to anyone wishing to attend. See the registration form for dates and ticket orders. Location and times will be listed in the Centennial Celebration Program received on-site.

## *SPORTS EVENTS*

### *Colorado Mineral Belt Runs (5K/10K)*

**Wednesday, November 2, 7:30 to 9:00 a.m.  
City Park, Denver**

Take a mile-high 5K/10K run, jog, or walk through the crisp air in Denver's City Park at the foot of the Rockies. The beautiful wide, paved course passes through trees and past lakes and the City Zoo—all within view of snow-capped mountains. The early November weather should be clear, dry, cool, and ideal. Bring sweats and gloves, just in case.

Runners will be bused from the Denver Convention Complex to the race site and returned at the completion of the runs. The race will be professionally directed and timed. Water will be provided on the course; refreshments and prizes will be plentiful at the finish. GSA will provide race shirts. Select shirt size on the registration form. Shirts and maps may be picked up in the Registration Area.

Fee (includes shirt): \$12

## *Ice Hockey*

A noncontact, non-slap shot ice hockey game is organized for Tuesday, November 1, 9:45 to 11:45 p.m. at the University of Denver Ice Arena. A nominal fee will be collected for ice rental. Equipment cannot be rented on-site; you must bring your own. By October, contact Bruce Nesbitt, Department of Geology, University of Alberta, Edmonton, Alberta, Canada T6G 2E3, (403) 432-5071.

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## PROFESSIONAL HORIZONS GSA SHORT COURSES

Interested in increasing your professional abilities? GSA courses are open to members and nonmembers. Registration for the meeting is not required.

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

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

**PREREGISTRATION  
DEADLINE—OCTOBER 7  
FOR MORE INFORMATION  
ON GSA COURSES:  
EDNA COLLIS,  
COURSE REGISTRAR**

### *Cancellation*

Requests for refunds must be received by GSA no later than October 14. Registration substitutions may be made at any time.

#### **Use of Microcomputers in Structural Geology**

**Friday, October 28, 2:00 p.m. to 5:00 p.m.,  
Saturday, October 29, 9:00 a.m. to  
5:00 p.m., and Sunday, October 30,  
9:00 a.m. to 1:00 p.m. University of  
Colorado, Boulder. Cosponsor: Structural  
Geology and Tectonics Division**

Recent advances in the use of microcomputers in structural geology has significantly changed the direction of research in many aspects of the subject; teaching methods are correspondingly affected. The focus of the course is to bring teachers and researchers up to date on algorithms, applications, and the design and use of computer hardware-software packages that will be of major importance to the subject area during the next decade. Specific topics to be covered include

- introduction to hardware/software systems; major microcomputer set-ups; digitizing hardware and software; plotter hardware and drivers; dot-matrix printers;
- language systems: main emphasis on BASIC, with review of concepts of graphics programming;
- algorithms and applications: stereographic and other projections; matrices; stress and strain analysis; fold analysis; section construction and balancing; structure contours; others.

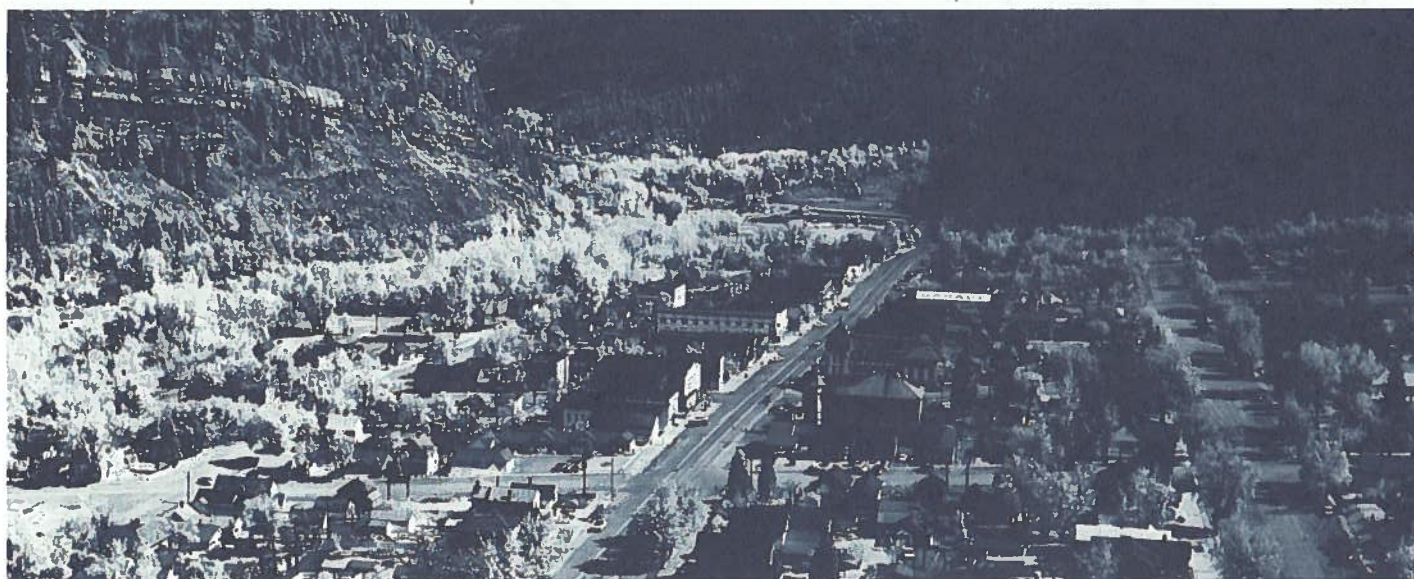
Classroom facilities and computers provided by the University of Colorado School of Business.

Faculty: Roy Kligfield, University of Colorado; David Sanderson, Queen's University at Belfast; Richard H. Groshong, Jr., University of Alabama.

Limit: 40. Fee: \$190; includes course manual, dinner on Friday and Saturday evenings, and lunch on Saturday.

**Ore Deposition Associated with Magmas  
Friday, October 28, Saturday, October 29,  
and Sunday, October 30, 8:30 a.m. to  
12:30 p.m. and 2:00 p.m. to 6:00 p.m.  
Executive Tower Inn. Cosponsor: Society  
of Economic Geologists**

This course is intended as a review and update on many aspects of sulfide ore deposition associated directly with magmas. The level will be suitable for those in industry or government who wish a refresher course, first-year and more senior graduate students, and academics with an interest in magmatic processes or mineral deposition. Half the course will be concerned with ore deposits associated with mafic and ultramafic rocks and will include a half-day devoted to theoretical aspects, followed by a day devoted to discussion of PGE-enriched ores, komatiite-related ores, and Ni-Cu ores in



Ouray, CO.



continental environments. The other half will include discussions of chemical processes related to the formation of, or associated with, silicic rocks, porphyry and skarn systems (including Cu, Mo and Sn-W) and volcanic epithermal systems, and distal ore deposits. Both the descriptive and genetic aspects of the ore types will be emphasized in all cases.

Faculty: A. J. Naldrett, University of Toronto; P. Candela, University of Maryland; A. H. Clark, Queen's University; C. M. Leshner, University of Alabama; E. Mathez, American Museum of Natural History; J. A. Whitney, University of Georgia.

Limit: 60. Fee: \$225; includes course manual, a precourse reception on Thursday evening, and lunch on Friday, Saturday, and Sunday.

### **Geographic Information Systems: A Tool for Geological Data Analysis and Interpretation**

**Saturday, October 29, 8:00 a.m. to 5:00 p.m. U.S. Geological Survey, Denver Federal Center**

The objective of this course is to teach the principles of geographic information systems, demonstrate their application, and help the participants to evaluate the applicability of GIS for their own purposes. Designed for practicing geoscientists, such as private consultants or members of state surveys, the course will cover examples of the use of GIS in various types of geological and hydrological investigations. An introduction to GIS concepts, characteristics of data for GIS investigations, data availability from public sources, GIS hardware and software systems at various price levels, evaluation of GIS for the needs of the course participants, demonstrations, and hands-on workshop exercises in GIS techniques will be included in the course. Participants should have some knowledge of personal computers.

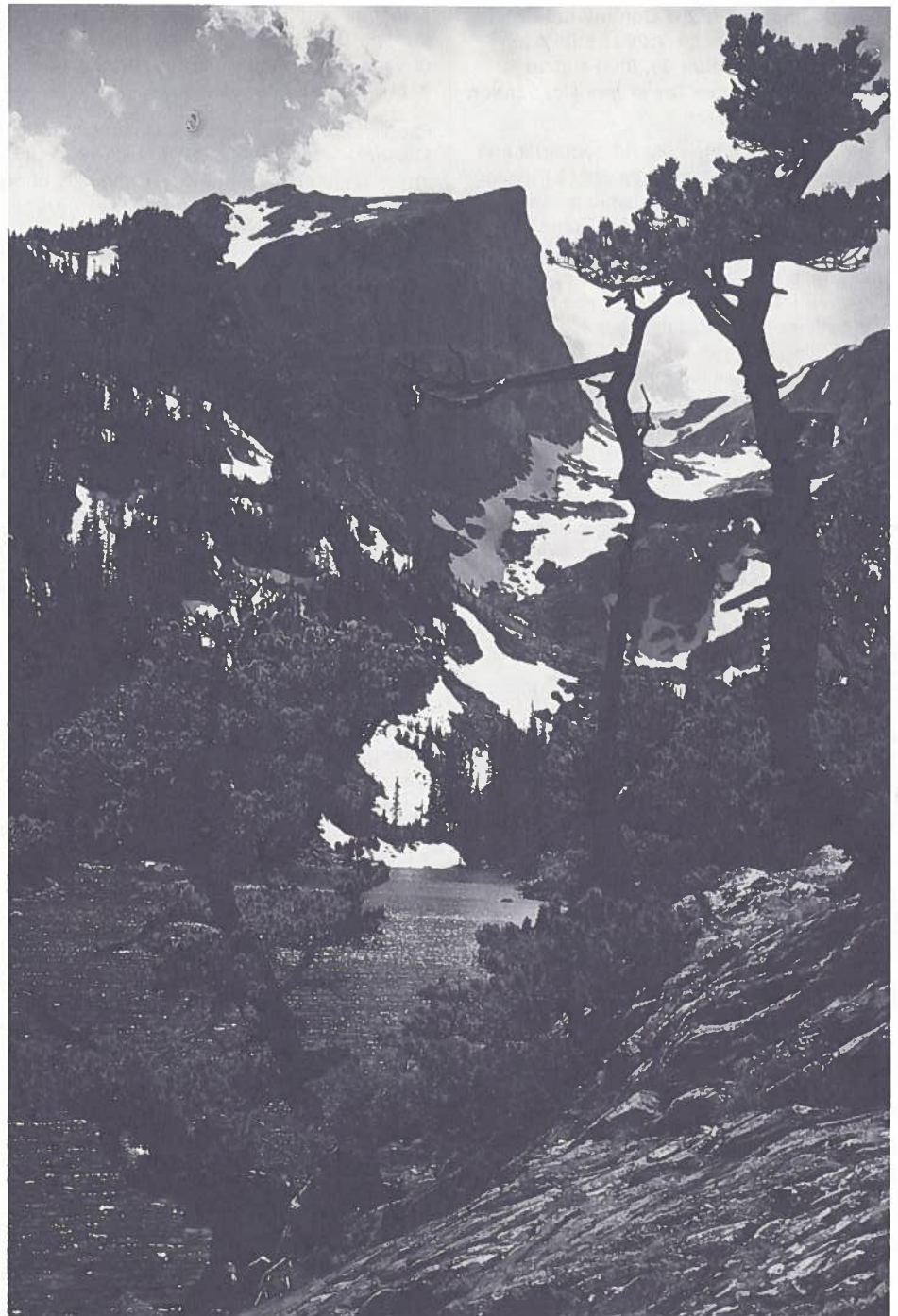
Faculty: David A. Hastings, National Oceanic and Atmospheric Administration; Michael Crane, USGS; Walden P. Pratt, USGS; Bruce Johnson, USGS. Classroom facility provided by USGS.

Limit: 30. Fee: \$194; includes course manual.

### **Glacial Facies Models**

**Saturday, October 29, and Sunday, October 30, 8:00 a.m. to 5:00 p.m. Marriott City Center. Cosponsors: Quaternary Geology and Geomorphology Division and Sedimentary Geology Division**

Aimed at a cross section of geologists ranging from modern-process people to those working on the rock record, this course will present a summary of physical processes and the lithofacies produced in a variety of glacial environments (terrestrial,



*Hallets Peak from Dream Lake, Rocky Mountain National Park.*

coastal, and marine). Glacial facies models representing polar and temperate depositional settings (terrestrial and marine) will be proposed and tested against well-documented (published) stratigraphic sections from the rock record. Course includes the Society of Economic Paleontologists and Mineralogists (SEPM) 1985 Short Course Notes No. 16, *Glacial Sedimentary Environments*, by Ashley, Shaw, and Smith, and the 1988 Short Course Notes, *Glacial Marine Sedimentation*, by Anderson and Molnia.

Faculty: Gail M. Ashley, Rutgers University; John Shaw, Queen's University; John B. Anderson, Rice University; Bruce F. Molnia, USGS; Ross D. Powell, Northern Illinois University.

Limit: 50. Fee: \$146; includes course manuals and a reception Saturday evening. **ATTENTION, STUDENTS:** The Sedimentary Geology Division has initiated a program to subsidize students who are valid division members. Students **MUST PAY THE FULL COURSE FEE** when registering, but will receive \$25 on-site directly from the division representative.



**Seismic Imaging of the Continental Crust**  
*Saturday, October 29, 1:00 to 5:00 p.m., and Sunday, October 30, 8:00 a.m. to 5:00 p.m. Executive Tower Inn. Cosponsor: Geophysics Division*

Targeted toward the general geologist and geophysicist who may have only a passing familiarity with modern seismic techniques, the goal of this course is to promote the integration of new, high-resolution seismic imaging in geological studies of continental basement. Among the topics to be reviewed:

- What's new in crustal seismology: reflection and refraction?
- How do the seismic measurements relate to physical properties of deep rocks?
- How does deep structure relate to what the geologist sees at the earth's surface?
- How does one integrate modern deep seismic reflection and refraction data?
- How does the interpretation of deep seismic reflection results differ from that of standard oil exploration surveys?
- What is really understood about the lower crust? What are the current controversies?
- What have seismic programs like COCORP, PASSCAL, USGS, BIRPS, ECORS, DEKORP, etc., accomplished, and where are they going in the future?
- How does one obtain deep seismic data?
- How important is processing to the geological interpreter?

Lectures on key topics will be combined with exercises using real and synthetic seismic data to emphasize the strengths and uncertainties associated with deep reflection and refraction data. The objective is to provide the short-course participant with a realistic understanding of what seismology can now say about the geology of the crust.

Faculty: Larry D. Brown, Cornell University; Walter D. Mooney, USGS; Nikolas I. Christensen, Purdue University.

Limit: 50. Fee: \$125; includes course manual and lunch on Sunday.

**Geological Considerations in Hazardous-Waste Site Characterization**  
*Saturday, October 29, and Sunday, October 30, 8:00 a.m. to 5:00 p.m. Marriott City Center*

Designed for the professional, this course will be directed toward the solution of geologic, hydrogeologic, and geotechnical problems encountered in the characterization of sites for hazardous-waste management. The course will include discussion of such topics as evaluation of geologic and groundwater conditions for site characterization, design and installation of monitoring wells, techniques for monitoring the vadose zone, geologic and hydrogeologic factors influencing the

selection and implementation of remedial actions, design of engineered liners, covers, and cut-off walls, and remedial action contract negotiation.

Faculty: John D. Rockaway, University of Missouri—Rolla; David E. Daniel, University of Texas; Allen W. Hatheway, University of Missouri—Rolla; Christopher R. Ryan, Geo-Con, Inc.; Charles Riggs, Sverdrup Corporation.

Limit: 75. Fee: \$152; includes course manual.

**Quantitative Sedimentary Basin Modeling**  
*Saturday, October 29, and Sunday, October 30, 8:00 a.m. to 5:00 p.m. Hyatt Regency. Cosponsor: Sedimentary Geology Division*

Aimed at those with a general sedimentary geology background, but no previous knowledge of basin modeling, this course stresses the quantitative aspects of basin analysis, focusing particularly on how geodynamic processes influence the evolution of sedimentary basins and control the development of stratigraphic sequences. Covered in the course will be

- causes of basin subsidence in various tectonic settings;
- generating tectonic subsidence histories (geohistory analysis and backstripping);
- lithospheric flexure and basin formation;
- thermal subsidence mechanisms;
- the interplay between tectonic subsidence, sea level, and sediment transport in the development of stratigraphic sequences.

The course will emphasize the application of these quantitative methods to specific basin examples with the goal of teaching participants the tools necessary to analyze basin evolution on their own.

Faculty: Charles L. Angevine, University of Wyoming; Paul L. Heller, University of Wyoming; Chris Paola, University of Minnesota.

Limit: 100. Fee: \$138; includes course manual and lunch both days. ATTENTION, STUDENTS: The Sedimentary Geology Division has initiated a program to subsidize students who are valid division members. Students MUST PAY THE FULL COURSE FEE when registering, but will receive \$25 on-site directly from the division representative.

**Seminar in Geoscience Writing**  
*Sunday, October 30, 8:00 a.m. to 5:00 p.m. Marriott City Center*

"A well-written paper is considered, in a sense, almost a work of art that deserves appropriate satisfaction on the part of the author and appreciation on the part of the reader."—Jack Oliver, GSA Presidential Address 1987.

In this seminar participants learn a unique method for organizing all kinds of on-the-job writing, from short memos to long reports. This systematic, efficient approach ensures both easier writing and easier reading. Topics covered include how to

- get started easily and reliably every time,
- avoid burying key points,
- handle special problems in writing,
- ensure reader-oriented organization,
- develop a nonsuspenseful outline,
- select illustrations efficiently,
- write topic sentences with impact,
- get long reports approved rapidly,
- prepare lengthy drafts quickly,
- edit your own work less painfully.

This seminar is for professionals and executives who spend a significant time preparing information for readers—whether that information is in letter, memos, reports, manuals, or published articles.

Faculty: Hugh Hay-Roe, Murray Associates International.

Limit: 75. Fee: \$88; includes course manual.

**The Evolution of Reef Communities**  
*Friday, November 4, and Saturday, November 5, 8:00 a.m. to 5:00 p.m. University of Colorado, Boulder. Cosponsor: Paleontological Society*

Directed toward graduate students and professional biologists and paleobiologists concerned with the autecology and synecology of reef organisms and the composition of reef ecosystems through time, this course will emphasize the compositional and structural history of communities dominated by reef-building algae, sponges, corals, and rudistid bivalves during the Phanerozoic, their evolutionary and mass extinction history, and their relations to global oceanographic, climatic (e.g., glaciation), and tectonic events. Presentations will include lectures, lab study of reef builders and associated facies, and a final round-table discussion of overall reef history and its importance in exploration for natural resources. Laboratory and lecture facilities provided by the Department of Geological Sciences at the University of Colorado.

Faculty: J. A. Fagerstrom, University of Nebraska; Erle G. Kauffman, University of Colorado; George D. Stanley, Jr., University of Montana.

Limit: 30. Fee: \$138; includes course manual.





Top: Raspberry Butte, Castleneck conglomerate at top. Below: Raspberry Butte mile capped by Castlerock Conglomerate on Wall Mountain Tuff. Note slide scars 1965 Denver Flood.

## FORUMS

**Fibrous Minerals, Mining and Disease**  
**Tuesday, November 1, 5:00 to 7:30 p.m.**  
 Sponsored by the GSA Geology and Public Policy Committee

Removal or encapsulation? This query resounds across the country as homeowners, schools, and building managers contemplate the hazards of asbestos insulation. Asbestos remains big business, but its economic contribution is not the traditional "supply and demand" that creates capital and trade for mining and manufacturing. The new business relating to asbestos is undoing 100 years of use, responding to its identification as an environmental health risk. The costs of expunging asbestos from our daily lives will vastly exceed the compensation awarded employees for death or disability due to work exposure. However, the dangers of low-level exposure are not yet understood and therein lies our dilemma.

This public policy forum will examine the mandated ban and regulation of asbestos in light of the health and attendant economic impact on our society. A physician, an epidemiologist, an EPA official, and a geologist will provide background for discussion of this international, interdisciplinary problem area. The topic has immediate and future significance for the general geologic

community. Although there has been much lay press coverage of the issues, this interchange offers up-to-the-minute information to geologists in their roles as professionals as well as concerned individuals.

No cost or registration.

## MEET THE GSA CONGRESSIONAL SCIENCE FELLOW

**Tuesday, November 1, 12:15 to 1:15 p.m.**  
 Sponsored by the GSA Geology and Public Policy Committee. Denver Convention Complex

The Geology and Public Policy Committee of GSA invites you to meet with James E. Evans, who has spent one year working in the office of Congressman Michael E. Lowry (D—Wash.). Some of the issues that Evans has dealt with are nuclear waste disposal, hazardous wastes, wilderness and endangered species protection, Arctic National Wildlife Refuge, and clean air standards. For your convenience, a sandwich stand will be located outside the session area; this informal lunch-hour session will include free beer and soft drinks.

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

**Monday, October 31, 1:00 to 3:00 p.m.;**  
**Marriott City Center**

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 special area and answer questions from the audience. The 1988 speakers are Chairman Dick Paull, University of Wisconsin; Sam Adams, Colorado School of Mines; J. D. Edwards, Pecten International Company; Charlie Mankin, Oklahoma Geological Survey; John D. McGurk, U.S. Geological Survey; Dave Stephenson, Harding Lawson Associates; and Steve Stow, Oak Ridge National Laboratory. For further information: GSA Membership Manager, GSA headquarters.

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## COMPUTER UPDATE

**Public-Domain Software Demonstration**  
**Tuesday, November 1, 8:00 a.m. to 12:00 noon; Denver Convention Complex**

The Computer Oriented Geological Society (COGS) will sponsor a demonstration of public-domain software of interest to geologists. Software will be IBM and Macintosh compatible.

### Openshare Computer Time

**Wednesday, November 2, 8:00 a.m. to 12:00 noon; Denver Convention Complex**

Professionals interested in sharing software are invited to bring demonstration disks. The software must be IBM compatible. The system will have 640K RAM, two floppy drives, and a monochrome monitor. Hercules graphics package will be used, but no printer or plotter will be available. This is not open to commercial vendors. If interested, contact Carol Petersen, Executive Director, COGS, 9056 East Floyd Place, Denver, CO 80231; (303) 751-8553.



Morrison/Entrada vs. Maroon.

## OTHER SHORT COURSES/WORKSHOPS/SEMINARS

### Cretaceous Resources, Events, and Rhythms Workshop

**Friday, November 4, 9:00 a.m. to 5:00 p.m., and Saturday, November 5, 9:00 a.m. to 12:00 noon. Sponsored by the Society of Economic Paleontologists and Mineralogists**

The U.S. Interim Committee for the Global Sedimentary Geology Program (GSGP), Cretaceous Resources, Events, and Rhythms project (CRER) will hold an informal 1½-day workshop. The purpose of the workshop is to broaden the participation of the U.S. geological community in CRER through (1) brief overviews of the proceedings and results of the international working group meetings and plenary session of the meeting in Digne, France; (2) establishment of U.S. counterparts to the international working groups and discussion of ongoing relevant research in the United States; and (3) discussion of a policy for U.S. participation in GSGP, including possible endorsement of CRER-related grant proposals.

No cost or registration. For information: Judy Parrish, Dept. Geosciences, University of Arizona, Tucson, AZ 85721, (602) 621-4595, or Ed Clifton, U.S. Geological Survey, 2475 Deer Creek Road, Palo Alto, CA 94304, (415) 354-3112.

### GeoRef Advanced Workshop

**Tuesday, November 1, 2:00 to 4:00 p.m. Sponsored by the Geoscience Information Society and the American Geological Institute**

The workshop is designed to address the skills and knowledge needed to search the GeoRef database effectively beyond the beginner level. A panel of expert searchers will share experiences using the GeoRef database on multiple search systems and will discuss problems and special techniques for each system. Questions from attendees will be discussed by the panel and by others attending who may have appropriate expertise.

No cost or registration. For information: Margy Walsh, Texaco E&P Technology Division, P.O. Box 770070, Houston, TX 77215-0070, (713) 954-6000, ext. 6630.

### GeoRef Workshop: Learn about Searching the Geological Literature by Computer

**Monday, October 31, 2:00 to 4:00 p.m. Sponsored by the Geoscience Information Society**

Learn how to search AGI's GeoRef online database of over a million geological references 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, (3) online search commands, and (4) designing effective search strategies. Sample searches will be displayed, and the GeoRef Thesaurus and other online search aids will be described. General discussion and questions will follow.

No cost or registration. For information: Margy Walsh, Texaco E&P Technology Division, P.O. Box 770070, Houston, TX 77215-0070, (713) 954-6000, ext. 6630.

### GIS Database Forum

**Thursday, November 3, 9:00 to 11:00 a.m. Sponsored by the Geoscience Information Society**

Representatives of several numeric and other end-user-focused databases will discuss their services and describe access to users. These databases include raw numerical data as well as small, tightly focused bibliographic files, and all are available, with a minimum of fuss, to the end-user. Most disciplines in the geosciences will be interested in at least one of these databases.

No cost or registration. For information: Jim O'Donnell, Library 170-25, Caltech, Pasadena, CA 91125, (818) 356-2199.





*Crest of range, Rocky Mountain National Park, Moraine Peak, south lateral Moran of Big Thompson Glacier.*

**Hydrous Phyllosilicates Exclusive of Micas Short Course**

**Saturday, October 29 and Sunday, October 30. A welcoming reception will be held Friday evening, October 28. Holiday Inn Denver. Sponsored by the Mineralogical Society of America**

The short course covers the structures, polytypism, crystal chemistry, identification, compositions, properties, occurrences, and petrology of all major hydrous phyllosilicates except micas, both macroscopic and clay size. Included are kaolins, serpentines and other 1:1 layer types, talc-pyrophyllite, chlorite, vermiculite, smectite, sepiolite-palygorskite, interstratified systems, and modulated species. Also covered will be phase equilibria, isotopic studies, and vector representation of compositions. Convener: S. W. Bailey.

Cost: MSA member—\$220; MSA student member—\$50; nonmember—\$260; student nonmember—\$70. For information and registration: MSA Business Office, 1625 I Street, NW, Washington, DC 20006, (202) 775-4344.

**Introduction to the Scientific Application of ODP Downhole Logging**

**Saturday, October 29, 8:00 a.m. to 6:00 p.m. Sponsored by the Joint Oceanographic Institutions and the U.S. Science Advisory Committee**

For the first time here in the United States, JOI/USSAC is offering a short course that has been designed to introduce the scientific applications of downhole logging used in the Ocean Drilling Program (ODP) to scientists of varying disciplines. ODP logging specialists from the Borehole Research Group at Lamont-Doherty Geological Observatory will demonstrate how logging data are being used to solve scientific problems of paleoenvironment, stratigraphy, geochemistry, basement structure, hydrogeology, geomechanics, and tectonics.

A complimentary happy hour will follow the course. Limited per diem reimbursement is available on a first-come, first-served basis.

No cost. Preregistration is required. For information and preregistration: Robin Smith, JOI, Inc., 1755 Massachusetts Avenue, NW, Washington, DC 20036, (202) 232-3900.

**Molecular Evolution and the Fossil Record Short Course**

**Sunday, October 30, 8:00 a.m. to 5:00 p.m. Sponsored by the Paleontological Society**

This is an interdisciplinary short course dealing with the nature and use of molecular information obtained from living and fossil organisms. Experts in various fields will review the techniques of molecular evolutionary biology and biogeochemistry as applied to studies of the history of life. The short course is aimed at paleontologists and others with a limited knowledge of these developing fields. Conveners: Bruce Runnegar and J. W. Schopf.

No cost or registration. For information: Jennifer Kitchel, Museum of Paleontology, University of Michigan, Ann Arbor, MI 48109, (313) 764-7543.

**SCIENCE THEATER**

Science Theater 1988 will feature both new and classic films and videos in the geosciences and related fields. This is a great opportunity to preview audio-visual material for possible use in the classroom. In keeping with the Centennial theme, this year's program will feature a special emphasis on the programs that shaped the way we use film-base media for study and teaching of geologic phenomena.

# EMPLOYMENT SERVICE

Do you need qualified earth scientists to fill staff needs? Are you looking for employment in the earth-sciences fields? If so, you are invited to participate in the GSA Employment Interview Service that will be conducted in the Denver Currigan Exhibition Hall.

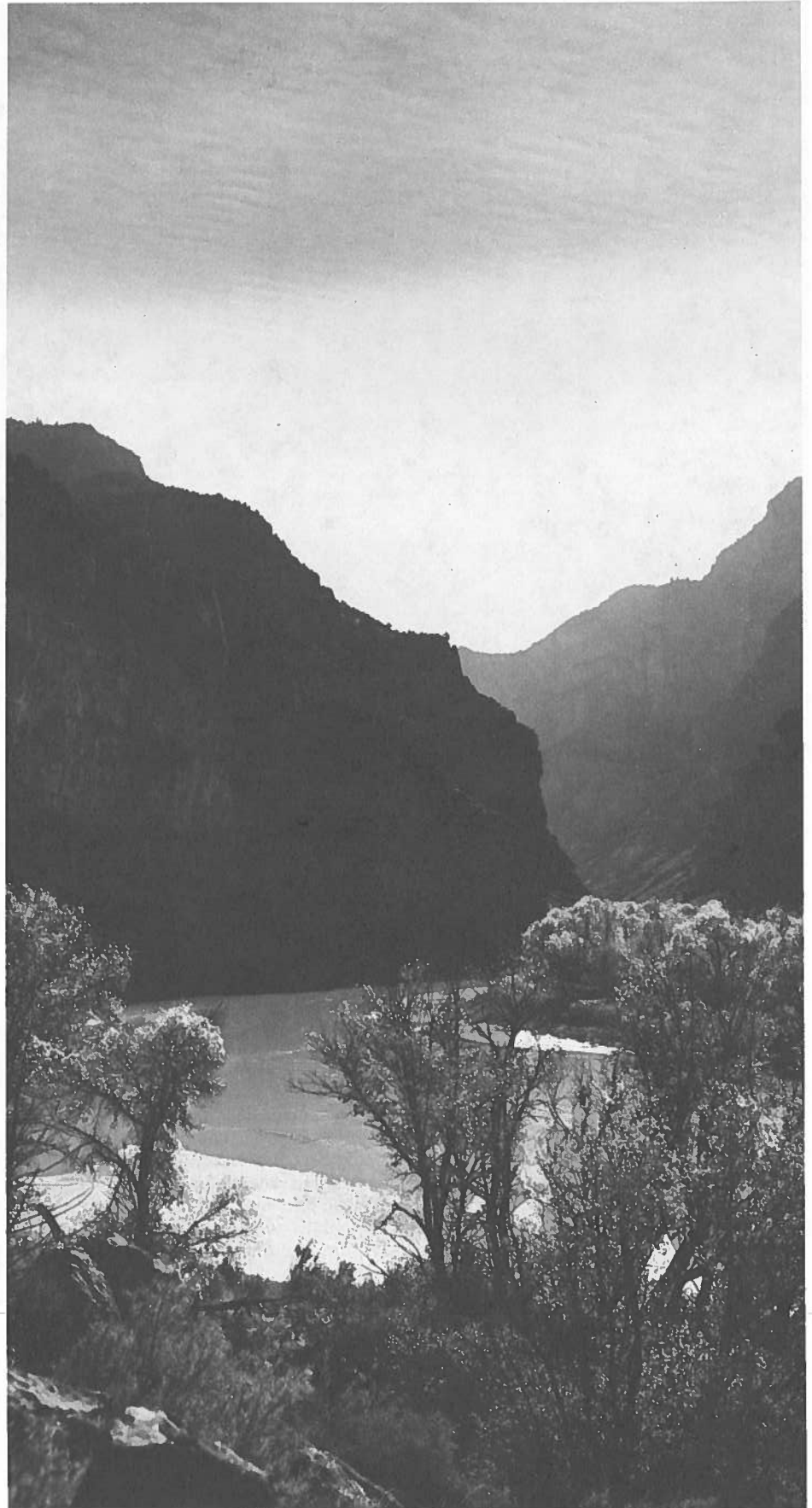
All interested organizations seeking qualified earth scientists to fill staff needs are urged to submit notices of their vacancies and their requests for computer listings of applicants. The minimum fee for a printout of two specialty listings is \$140. A specialty code narrows the field of your search.

Interview booths may be rented at the meeting for a nominal fee in half-day increments from Monday through Wednesday, October 31–November 2. GSA staff will handle all interview scheduling with Employment Service applicants.

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

**Note to Applicants:** If we receive your materials by **August 12, 1988**, your record will be included in the information that employers receive prior to the meeting. Submit your forms early to receive maximum exposure! Don't forget to indicate on your application form that you would like to interview in October–November.

**For More Information:** Employment Service forms are in the March and July 1988 issues of *GSA News & Information* or may be obtained by contacting the Membership Department, GSA headquarters.



Mouth (N) of Lodore Canyon, Dinosaur National Monument, Green River.



# GUEST PROGRAM

The Denver Centennial Guest Committee welcomes you to Colorado. The Hospitality Room, located in the Moulin Rouge Room of the Hyatt Regency Denver will be open to all guest registrants. Please note, guest registration does not include admission to the technical program. Remember to wear your badge and be our guest when you come in to redeem your certificate for your lovely silver registration gift. Light refreshments will be served during the day. Our hostesses will try to make the Hospitality Room a comfortable and congenial place to visit, relax, or meet your friends.

Hours:  
Sunday 12:00 noon to 4:00 p.m.  
Monday–Thursday 8:00 a.m. to 4:30 p.m.

To make your visit exciting and enjoyable, the following programs are planned.

## Guest Seminars

There is no preregistration or cost.

### **The Saga of Baby Doe Tabor** **Monday, October 31, 2:00 to 3:00 p.m.**

A professional and moving two-act drama. Baby Doe, wife of silver king Horace Tabor, was one of Colorado's most colorful legends.

### **You've Come a Long Way, Baby—Women From the 1880's to 1920's (Musical)** **Wednesday, November 2, 10:00 to 11:00 a.m.**

Jeff Waters, with his historic slides, humor, and honky-tonk piano, will delight us with this musical rendition.

### **Wine on the Rocks, with a Splash of History** **Tuesday, November 1, 2:00 to 3:00 p.m.**

A fascinating seminar by Jim Wilson. He is the author of a book about the geology and the wine of France.

## Tours

All tours will depart from and return to the arcade area at the main entrance to the Hyatt Regency Denver. These tours have been organized to show the best of the Denver area. Space is limited on the tours, filled on a first-come, first-served basis. Preregister to insure your place on the tours. Note the registration and cancellation deadlines. Remember to pack a coat in case of cold weather.

### **Historic Denver Walking Tour** **Monday, October 31, or Wednesday, November 2, 9:00 to 11:30 a.m.**

See the beautiful Trinity Church and the Brown Palace Hotel. Experience a time long gone when you enter the refurbished Paramount Theater. Registration required. Wear walking shoes; a warm coat may be needed.

Cost: \$5.

### **Georgetown—Nostalgic Mining Mecca** **Monday, October 31, 9:30 a.m. to 3:30 p.m.**

Enjoy a geological and historical guided tour through the Rockies to Georgetown, once a thriving mining center. It's now a community of colorful gingerbread homes, quaint shops, restaurants, and historic buildings and churches. Tour the stately Hamill House and the elegant Hotel de Paris, both restored to their former grandeur. There will be time for shopping and lunch on your own. Wear walking shoes and warm clothing. Enrollment is limited to 90. *Preregistration is required.*

Cost: \$19 (includes bus, snacks, guides, and admissions).

### **The Saga of the American West—In Prints** **Tuesday, November 1, 9:30 to 11:00 a.m.**

Collector Graham Curtis will lead this tour of a unique collection of lithographs, many from early explorations of the West. It is being shown at the First Interstate Bank on 17th Street, across from the Marriott City Center. Virtually all the artists of the West from 1820 to 1885 are represented—Catlin, Bodmer, Bierstadt, Moran, Audubon, Seth Eastman, and others.

### **Molly Brown's Trunk Showing and Tour** **Tuesday, November 1, 10:00 a.m. to 3:00 p.m.**

Enjoy the Molly Brown Trunk showing of vintage gowns and history combined with a delicious brunch at the opulent Brown Palace Hotel. This is followed by a city tour with stops at our State Capitol, a drive through the quaint Ninth Street Park of middle-class Victorian residences nestled among the buildings of the Auraria College campus, and a guided tour of the Unsinkable Molly Brown's house.

Cost: \$30 (includes brunch, style show, guides, tour, and admissions).

### **The Colorado Springs Cache—Crème de la Crème Tour** **Wednesday, November 2, 8:30 a.m. to 5:00 p.m.**

Bring cameras, coats, and walking shoes for our trip to the Air Force Academy. We will go into the awe-inspiring Cadet Chapel and to the Visitor's Center for souvenir shopping. Enjoy a guided geologic lecture as we drive through the famous geologic park, Garden of the Gods. Lunch in the magnificent Broadmoor Hotel Penrose Room and then travel on to old Colorado City, once the territorial capitol of Colorado, for a historic walk through distinctive shops, especially the famous Simpich Doll factory.

Cost: \$38 (includes tour, guides, lunch, and admissions).

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## TRANSPORTATION

### AIR

GSA has again designated The Cain Travel Group of Boulder, Colorado, as the official airline reservation agent for the GSA Centennial Celebration. Meeting participants are encouraged to call Cain's toll-free number to take advantage of discounted fares on selected airlines. United and Delta Airlines have been named official carriers.

Reduced rates are 5% off any available discount fare that generally has restrictions. If you do not meet the requirements for the discount fare, you will be offered 40% off the unrestricted coach fare.

To make a reservation:

- Call 1-800-346-4747 (toll-free outside Colorado), 303-443-2246 (inside Colorado), or collect from Canada. Hours are Monday through Friday, 8:00 a.m. to 5:30 p.m., Mountain Time.
- Call early for best availability and identify yourself as a GSA traveler.
- Be sure that you understand the restrictions on the type of ticket you request.
- Tickets can be paid for by check (payable to Cain Travel), major credit card, or invoice to company. The final payment must reach Cain Travel no later than seven 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 Currigan Hall.

### GROUND

Denver's Stapleton Airport is 5 miles from Currigan Hall, the Denver Convention Complex, and the downtown area (an approximate 15-minute ride). Transportation options are as follows.

#### The Airporter

Airport to hotel. Open from 8:00 a.m. to 10:00 p.m., 7 days a week. To purchase a ticket go to the ground transportation counter opposite door 6 in the baggage claim area. Departures are every 15 minutes. Cost: \$5.

Hotel to airport. During the week, The Airporter stops at all major downtown hotels every half hour. For service on weekends, call 24 hours in advance for reservations, 393-0621. Cost: \$5.

#### Taxi Cabs

Airport service. Three cab companies service the airport and downtown area; they are regulated, metered vehicles. Charges are \$1.25 for the first mile and \$1.00 for each additional mile.

#### Regional Transportation District (RTD)

The city transportation system services downtown and major sight-seeing locations. RTD runs from 5:00 a.m. to 1:00 a.m., 7 days a week. Buses stop every 15 to 30 minutes. Route maps will be posted in all GSA hotel lobbies. Cost: 75¢ per ride (10¢ for senior citizens). For general information, call RTD at 778-6000.

#### GSA Shuttle

GSA will operate a free shuttle service throughout the meeting. GSA hotel guests will be transported to and from Currigan Hall during meeting hours. The shuttle will also operate during special events at Currigan Hall and the hotels.

This service will be provided each day (Sunday, October 30, through Thursday, November 3) beginning at 6:30 a.m. and continuing at 15-minute intervals through the meeting hours. The service will continue into the evening for the special events.

Look for shuttle schedules posted in GSA hotel lobbies and in registration packets. Each bus will be identified by a "GSA Shuttle Bus" sign in the front window.

#### Car Rental

Alamo is the official car rental agency for the meeting. Identify yourself as a GSA delegate and get guaranteed, discounted, daily/weekly rates as follows: economy \$24/\$75; compact \$26/\$99; intermediate \$28/\$119; standard (two-door) \$29/\$149; luxury \$31/\$179. Add \$2 per day for 4-door models. Unlimited mileage. Vehicles returned to any other Alamo location will be subject to drop charges. Call Alamo for advance reservations, (800) 732-3232. Give the GSA Group I.D. No. 34148 and the GSA Rate Plan Code No. G5.



Mitten Park fault, northeast of Harpers corner.





Echo Peak, Pats Hole.

## HOUSING

GSA has blocked rooms at eight hotels that are offering special convention rates to GSA meeting attendees. GSA endorses these hotels for quality, cleanliness, and service.

### To Make Your Hotel Reservation

BY FRIDAY, OCTOBER 7, fill out the attached Official Housing Request Form and mail it immediately to the address shown on the form. No reservations will be accepted if not submitted on this form.

AFTER FRIDAY, OCTOBER 7, you are responsible for making your own reservation directly with the hotel. Note that (1) many hotels will be filled at that time, and (2) hotels are not required to offer the special GSA rate as shown.

### 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 both 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 bureau and that the reservation has been entered into their system.

### Room Deposits/ Guarantees

All GSA hotels require a first night's room deposit. Deposits can be made by (1) including a credit card number on the housing form, or (2) sending payment directly to the hotel once you have received your confirmation. The amount of deposit should be the cost of one night's stay at your assigned hotel. Note that the Housing Bureau will accept ONLY credit card numbers. If making payment directly to the hotel, be sure to give them 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 6:00 a.m. of the following day.

If you have not guaranteed your reservation, the hotel is not required to hold your room beyond 6:00 p.m. of the scheduled arrival day.

### Changes and Cancellations

**BEFORE OCTOBER 7**, all changes and cancellations to your room reservation must be sent, in writing, to the Housing Bureau.

**AFTER OCTOBER 7**, all changes and cancellations to your room reservation must be telephoned in to your hotel.

Supply your hotel reservation number at the time of any change or cancellation.

Your notice of cancellation must be received AT LEAST 48 HOURS in advance of your scheduled arrival in order to receive full refund of your first night's room deposit.

NOTE: All rooms are subject to a (current) 11.8% room tax.

**1 DENVER MARRIOTT CITY CENTER—  
CO-HEADQUARTERS**

1701 California Street, Denver, CO 80202  
(303) 297-1300 (500-room block)  
4 blocks from Currigan Hall  
Single: \$74 Double: \$84

Children under 18 accompanied by parent—Free

Full-service hotel; complete fitness center (indoor swimming pool, whirlpool, saunas, exercise equipment); 2 restaurants; Gallery Bar; cocktail lounge with piano; concierge; laundry and valet service; valet parking, currently \$10/day

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

**2 HYATT REGENCY DENVER—  
CO-HEADQUARTERS**

1750 Welton Street, Denver, CO 80202  
(303) 295-1200 (400-room block)  
4 blocks from Currigan Hall  
Single: \$74 Double: \$84

Children under 18 accompanied by parent—Free

Full-service hotel; 1 block from 16th Street shopping mall; full-service casual and elegant dining; piano bar and terrace lounge; outdoor running track and tennis courts; complete health club facility adjacent; laundry, valet service; garage self-parking, currently \$4.50/day; valet parking, currently \$9/day

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

**3 BROWN PALACE HOTEL**

321 Seventeenth Street, Denver, CO 80202  
(303) 297-3111 (230-room block)  
7 blocks from Currigan Hall  
Single: \$85 Double: \$100

Children under 18 accompanied by parent—Free

95-year history, distinguished by unerring commitment to excellence; 2 restaurants; 2 lounges; 24-hour room service; valet parking, currently \$7.50/day; gift shop; florist; Mobil 4-star and AAA 4-diamond ratings

Check-in: 2 p.m. Check-out: 1 p.m.  
CC: AX, CB, DC, MC, V

**4 COMFORT INN**

401 Seventeenth Street, Denver, CO 80202  
(303) 296-0400 (175-room block)  
8 blocks from Currigan Hall  
Single: \$45 Double: \$45

Children under 16 accompanied by parent—Free

Free cocktails for 2½ hours every evening; complimentary continental breakfast daily; 24-hour room service; valet and laundry service; valet parking, currently \$5/day; free HBO, CNN, ESPN; connected by walkway to Brown Palace

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

**5 EXECUTIVE TOWER INN**

1405 Curtis Street, Denver, CO 80202  
(303) 571-0300 (250-room block)  
1 block from Currigan Hall  
Single: \$60 Double: \$70

Children under 17 accompanied by parent—Free

Restaurant; coffee shop; cocktail lounge; free use of full athletic club (racquetball, squash, tennis, indoor olympic pool, basketball court, steam, sauna, whirlpool, jogging tracks); coin-operated laundromat; indoor self-parking, currently \$3/day

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

**6 HOLIDAY INN DENVER DOWNTOWN**

1450 Glenarm Place, Denver, CO 80202  
(303) 573-1450 (250-room block)  
3½ blocks from Currigan Hall  
Single: \$55 Double: \$65

Children under 18 accompanied by parent—Free

Restaurant; cocktail lounge; room service; valet laundry; free indoor self-parking, valet parking upon request; gift shop; pay movie channels; access to athletic facility at reduced rate

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

**7 RADISSON HOTEL DENVER**

1550 Court Place, Denver, CO 80202  
(303) 893-3333 (650-room block)  
6½ blocks from Currigan Hall  
Single: \$60 Double: \$70

Children under 18 accompanied by parent—Free

Three restaurants and lounges featuring continental cuisine and nightly entertainment; full health club (outdoor heated pool, aerobics classes, exercise and weight equipment, saunas, tanning bed, licensed massage therapist); concierge floor; laundry and valet service; inside parking, currently \$1.25–\$5.25/day; in-house barber shop; package liquor; gift shops; airline ticket agent; print shop; currency exchange

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

**8 WESTIN HOTEL TABOR CENTER**

1672 Lawrence Street, Denver, CO 80202  
(303) 572-9100 (150-room block)  
4 blocks from Currigan Hall  
Single: \$84 Double: \$98

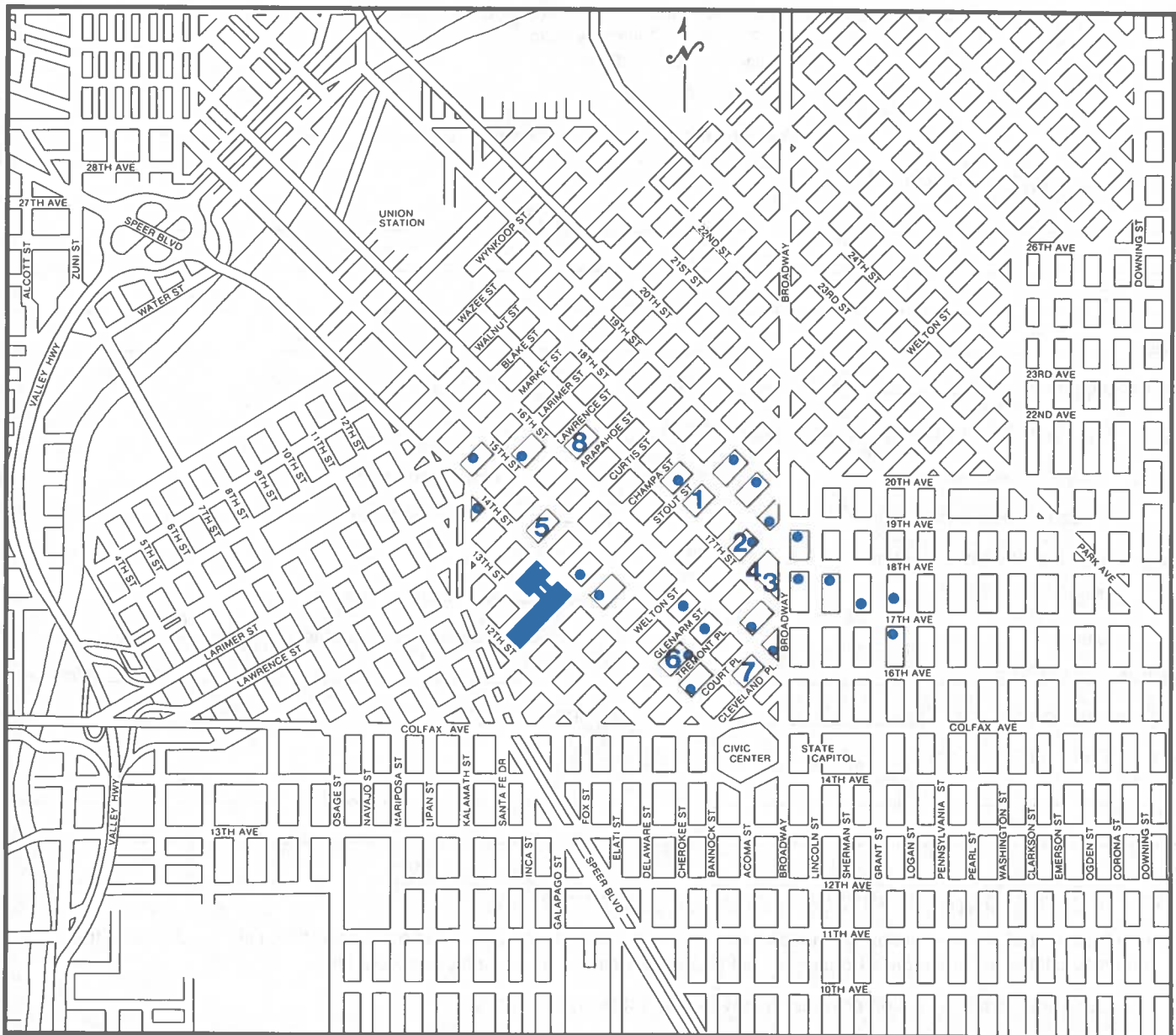
Children under 18 accompanied by parent—Free

Deluxe hotel connected to Tabor Center (featuring 70 shops and restaurants); oversized guest rooms and honor bar/ refrigerator; color TV, complimentary HBO, Spectravision; large working desk area; casual 3-meal restaurant, Augusta 5-star dining room; lobby lounge with live piano entertainment; 24-hour room service; free health club facilities (indoor/outdoor pool, hot tub, saunas, exercise and weight room); underground parking, currently \$6/day

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



# DOWNTOWN DENVER



1. DENVER MARRIOTT CITY CENTER
2. HYATT REGENCY DENVER
3. BROWN PALACE HOTEL
4. COMFORT INN
5. EXECUTIVE TOWER INN
6. HOLIDAY INN DENVER DOWNTOWN
7. RADISSON HOTEL DENVER
8. WESTIN HOTEL TABOR CENTER

**CURRIGAN EXHIBITION HALL  
DENVER CONVENTION COMPLEX**

Dots indicate public parking lots. Rates range from 50¢ minimum charge per ½ hour to \$6 maximum charge for all day. Some lots are open 24 hours per day, allowing for overnight parking. Most lots, however, are unattended after 8:00 p.m.

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# GSA OFFICIAL HOUSING REQUEST FORM

Please complete BY OCTOBER 7 and send to: Denver Convention Bureau/GSA Housing  
225 West Colfax Avenue  
Denver, CO 80202  
(303) 892-1151

(Please print or type all information below)

## HOTEL/MOTEL PREFERENCE:

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

Rate requested \$ \_\_\_\_\_

## TYPE OF ACCOMMODATION NEEDED:

- |  |   |
|--|---|
| <input type="checkbox"/> Single (1 bed, 1 person)    | <input type="checkbox"/> 1 Bedroom Suite      |
| <input type="checkbox"/> Double (1 bed, 2 persons)   | <input type="checkbox"/> 2 Bedroom Suite      |
| <input type="checkbox"/> Dbl/DbI (2 beds, 2 persons) |   |
| <input type="checkbox"/> Triple                      | <input type="checkbox"/> Add rollaway to room |
| <input type="checkbox"/> Quad                        |   |

NOTE: All rooms are subject to 11.8% tax.

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

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

## NAMES OF OCCUPANTS:

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

### GUARANTEED ROOM RESERVATION AUTHORIZATION:

I understand that my reservation will not be held after 6:00 p.m. unless I guarantee my reservation. I also understand that the hotel may bill me for one night's housing if I fail to properly cancel a guaranteed reservation.

- 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.
- I will take my chances. No guarantee deposit will be provided.

DO NOT SEND ANY MONIES WITH THIS FORM

Please guarantee my room reservation with the following:

American Express     Carte Blanche     Diners Club     Discover     MasterCard     VISA

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

SIGNATURE \_\_\_\_\_

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

## MAIL CONFIRMATION TO:

Name \_\_\_\_\_ Telephone (    ) \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_

State \_\_\_\_\_ ZIP \_\_\_\_\_ Country \_\_\_\_\_



# CONVENIENCE INFORMATION

## INFORMATION/ MESSAGES

GSA information and message desks will be located at both Currigan Hall and the Marriott from Friday, October 28, through Thursday, November 3.

Currigan Hall (303) 595-4100  
Marriott Hotel (303) 297-1300

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 7, the GSA Meetings Coordinator will accept names, addresses, and phone numbers of interested participants. ON OCTOBER 11, the above information will be distributed to only those who have responded. Participants are responsible for contacting one another. Optional: You may include the number of children, ages, hotel where you will stay, and the phone number.

## NEWS ROOM

Sunday-Thursday, October 31-November 3  
Denver Convention Complex

The News Room provides information for the news media. Press releases provided by authors or their institutions will be available to the press at the meeting. Please let us know of newsworthy topics. Before the meeting, contact Joann Dennett or Sandra Rush, RDD Consultants, Inc., 1206 Crestmoor Drive, Boulder, CO 80303, (303) 443-8489 or 494-6131.



Mt. Daly on right. Dike Capital Park on left. (Near Snowmass.)

## VAIL/ BEAVER CREEK/ LEADVILLE/AVON

Rest and relax following the Celebration. Take a weekend to enjoy Colorado in the Vail/Beaver Creek area, and to experience the beauty of Colorado's western slope. Nearby Vail has activities year-round—including golf, tennis, biking, and hiking. There is always a weekend festival, plus the pleasures of pre-ski season shopping.

The GSA special package rate of \$68 per person includes

- two nights double occupancy room accommodations at a newly decorated Comfort Inn in Avon, a town located between Vail and Beaver Creek
- deluxe Continental breakfast each morning
- cross-country jeep tour on Saturday to and from historic Leadville, with spectacular views of Colorado's highest

peak, Mount Elbert, and its companion peak, Mount Massive. The tour includes a delicious lunch at The Golden Rose just down the street from Baby Doe's hotel, plus a visit to Leadville's Mining Museum.

- indoor jacuzzi and pool
- transportation between Avon and Vail—daily and evenings both on a regular schedule and on request.

The two nights reserved are Friday and Saturday. Thursday night also may be reserved for an additional \$30 double occupancy.

Transportation by van to and from Denver will be arranged at no more than \$35 additional per person round trip. This is \$20 below the regular rate and will be a substantial savings if you do not have a car.

RESERVATIONS ARE DUE BY OCTOBER 10. A DEPOSIT WILL BE REQUIRED. CALL DIRECTLY TO THE COMFORT INN, 1-800-423-4374, or (303) 949-5511.

## COLORADO TOURIST INFORMATION

Abundant information and friendly service are available through the following sources:

Colorado Tourism Board  
1625 Broadway, Suite 1700  
Denver, CO 80202  
1-800-433-2656

Denver Metro Convention &  
Visitors Bureau  
225 West Colfax Avenue  
Denver, CO 80202  
(303) 892-1505

1888. Geological Society of America. 1988





## REGISTRATION

**PREREGISTER TODAY!**  
**PREREGISTRATION DEADLINE: MUST BE RECEIVED NO LATER THAN OCTOBER 7.**

1. There is a substantial 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. Registration is required for *all* attendees. Badges must be worn for *ALL* activities 10:00 a.m. Sunday through 5:00 p.m. Thursday. PLEASE, do not lose your badge. A fee will be charged for replacement of lost badges.
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 and form **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.
5. Register one professional or student per form. Copy the form for your records. One-day registrants **MUST** indicate the day they plan to attend on the registration form.
6. Guest registration is required for guests attending guest activities, special events, the exhibit hall, and luncheons. The registration fee does not include admission to the technical sessions. Guest registrants **MUST** be accompanied by either a professional or student registrant.
7. **CURRENT** student ID is required to obtain student rates at both the on-site and preregistration counters. Students not carrying a current student ID when they arrive to pick up registration materials will be required to pay the professional fee.

## Registration Fees

	Advance*	On-Site	One-Day
Professional—Member	\$100	\$115	\$58
Professional—Nonmember	\$140	\$155	\$78
Student—Member	\$ 40	\$ 47	\$24
Student—Nonmember	\$ 60	\$ 67	\$34
Guest	\$ 35	\$ 45	N/A

\*Registration fees received before October 7.

## On-Site Registration Schedule

Denver Convention Complex and Currihan Hall-A

Sunday, October 30	10:00 a.m. to 9:00 p.m.
Monday, October 31	7:30 a.m. to 5:00 p.m.
Tuesday, November 1	7:30 a.m. to 5:00 p.m.
Wednesday, November 2	7:30 a.m. to 2:00 p.m.
Thursday, November 3	7:30 a.m. to 2:00 p.m.

## Cancellations and Refunds

GSA will refund advance registration fees for cancellations received in writing by **OCTOBER 14. NO REFUNDS WILL BE MADE ON CANCELLATION NOTICES RECEIVED AFTER THIS DATE.** Refunds will be mailed from GSA after the meeting; a \$10 processing fee will be charged. 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.

## New Membership Discounts

A \$40 member discount on registration applies to any professional member of GSA or Associated Society. The Associated Societies that qualify are listed on the registration form. Professional registrants who paid the nonmember registration fee and apply for GSA membership by March 31, 1989, will be entitled to a \$40 reduction in the 1989 membership fee. Students will receive a \$20 discount from the 1989 Student Associate membership fee. Only **ONE** discount will apply per person. In order to receive the reduction, a copy of the meeting registration form **MUST** be attached to the membership application. Membership applications are available from GSA headquarters. During the meeting, you can pick up applications at the GSA Bookstore (Exhibit Hall, Booth #435) or at the Employment Service, Membership Desk, or Registration Area, Denver Convention Complex and Currihan Hall A.



# PREREGISTRATION FORM

1988 GSA Centennial Celebration ■ October 31–November 3

Preregistration must be RECEIVED by October 7. Payment and form MUST accompany each preregistration request. Unpaid purchase orders NOT accepted as valid registration. Cancellation deadline: October 14. No refunds on cancellations received after this date. Shaded areas are badge information.

Please print \*\* Copy for your records \*\* One form per registrant

Name (Last) \_\_\_\_\_ (First) \_\_\_\_\_  
 Institution/Employer \_\_\_\_\_ Nickname for badge \_\_\_\_\_

Mailing Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP code \_\_\_\_\_  
 Country \_\_\_\_\_ Business phone \_\_\_\_\_ Home phone \_\_\_\_\_

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

Circle Member Affiliations: (1) GSA (Member # \_\_\_\_\_) (2) CF (3) GS  
 (4) GIS (5) MSA (6) NAGT (7) PS (8) SEG (9) AWG (0) SGE (00) SVP  
 (registration required for participation in all events)

	Price	Qty	Amount
Professional Member (member affiliation checked above)	(1) \$100	_____	_____
Member One-Day (circle day: S M T W T)	(2) \$ 58	_____	_____
Professional Nonmember	(3) \$140	_____	_____
Nonmember One-Day (circle day: S M T W T)	(4) \$ 78	_____	_____
Student Member (member affiliation checked above)	(5) \$ 40	_____	_____
Member One-Day (circle day: S M T W T)	(6) \$ 24	_____	_____
Student Nonmember	(7) \$ 60	_____	_____
Nonmember One-Day (circle day: S M T W T)	(8) \$ 34	_____	_____
Guest (fill in name above for badge)	(9) \$ 35	_____	_____
Abstracts with Programs (reserved for on-site pickup)	(10) \$ 19	_____	_____

	Price	Qty	Amount
Historic Denver Walking Tour	(11) \$ 5	_____	_____
Georgetown—Nostalgic Mining Mecca	(12) \$ 19	_____	_____
Molly Brown Trunk Showing and Tour	(13) \$ 30	_____	_____
Colorado Springs Cache	(14) \$ 38	_____	_____
Historic Denver Walking Tour (repeat)	(15) \$ 5	_____	_____

	Price	Qty	Amount
GSA Centennial Orchestra	(16) \$ 5	_____	_____
5K Run (check T-shirt size: S M L XL)	(17) \$ 12	_____	_____
10K Run (check T-shirt size: S M L XL)	(18) \$ 12	_____	_____
Centennial Birthday Bash	(19) \$ 19	_____	_____
Total Column A			_____

FOR OFFICE USE ONLY

Deposit Date \_\_\_\_\_ Comment \_\_\_\_\_  
 Balance Due \$ \_\_\_\_\_ A/R \_\_\_\_\_  
 Refund \$ \_\_\_\_\_ A/P \_\_\_\_\_  
 Refund Ck # \_\_\_\_\_  
 Refund Date \_\_\_\_\_

Mall to: '88 GSA Centennial, P.O. Box 9140, Boulder, CO 80301

## TICKETED MEAL FUNCTIONS

	Price	Qty	Amount
Engineering Geology Luncheon	(20) \$ 16	_____	_____
History of Geology Luncheon	(21) \$ 16	_____	_____
Geophysics Luncheon	(22) \$ 16	_____	_____
Geoscience Information Society Luncheon	(23) \$ 16	_____	_____
Hydrogeology Luncheon	(24) \$ 16	_____	_____
Mineralogical Society Luncheon	(25) \$ 16	_____	_____
National Assoc. Geology Teachers Luncheon	(26) \$ 16	_____	_____
Paleontological Society Luncheon	(27) \$ 16	_____	_____
Sedimentary Geology Breakfast	(28) \$ 11	_____	_____
Assoc. Women Geoscientists Breakfast	(29) \$ 11	_____	_____
Coal Geology Luncheon	(30) \$ 16	_____	_____
Geochemical Society Luncheon	(31) \$ 16	_____	_____
Quaternary Geology & Geomorphology Luncheon	(32) \$ 16	_____	_____
Society of Economic Geologists Luncheon	(33) \$ 16	_____	_____

	Price	Qty	Amount
1 Precambrian, SE Wyoming	(34) \$250	1	\$250
2 Pikes Peak Plutons and Pegmatites	(35) \$275	1	\$275
3 Early Tertiary Coals, Powder River Basin	(36) \$305	1	\$305
4 Hayden's Tertiary Lakes-White River Formation	(37) \$495	1	\$495
5 Geology, Hydrogeology, Nebraska Sandhills	(38) \$247	1	\$247
6a Hydrogeology, Paleohydrology (w/ airfare)	(39) \$305	1	\$305
6b Hydrogeology, Paleohydrology (w/o airfare)	(40) \$210	1	\$210
7 Basin and Range to Edge of Plains	(41) \$380	1	\$380
8 Pennsylvanian-Permian Deposition, Eagle Basin	(42) \$135	1	\$135
9 Archaeological Geology, High Plains	(43) \$175	1	\$175
10 Compression and Crustal Wedging, Front Range	(44) \$ 55	1	\$ 55
11 Geomorphology of Canyonslands, Utah	(45) \$190	1	\$190
12a Lake Bonneville, Neotectonics (w/ lodging)	(46) \$195	1	\$195
12b Lake Bonneville, Neotectonics (w/o lodging)	(47) \$105	1	\$105
13 Hydrogeology, Mountains and Foothills, Denver	(48) \$ 67	1	\$ 67
14 Vertebrate Paleontology, W. Colorado and Utah	(49) \$230	1	\$230
15 Landslides and Construction Problems	(50) \$170	1	\$170
16 Telluride Deposits, Boulder County	(51) \$ 66	1	\$ 66
17 In the Presence of Eternity	(52) \$ 25	1	\$ 25
18a Deformation Cordilleran Orogenic (w/ airfare)	(53) \$330	1	\$330
18b Deformation Cordilleran Orogenic (w/o airfare)	(54) \$230	1	\$230
19 Proterozoic Glacial-Marine Sedimentation	(55) \$190	1	\$190
20 Upper Cretaceous Sandstones, Wyoming	(56) \$370	1	\$370
21 Dinosaur Tracks, Purgatoire Valley	(57) \$220	1	\$220
22 Cretaceous-Tertiary Boundary, Raton Basin	(58) \$200	1	\$200
23 Geology and Mineral Resources, Colorado	(59) \$140	1	\$140
24 Pleistocene Floods, Big Thompson River	(60) \$ 35	1	\$ 35
25 Tectonics & Sedimentation, Phanerozoic Rocks	(61) \$ 16	1	\$ 16
26 Proterozoic Core, Central Front Range	(62) \$ 16	1	\$ 16
27 Dinosaurs Near Denver	(63) \$ 16	1	\$ 16
28 Denver's Geologic Setting	(64) \$ 16	1	\$ 16

## SHORT COURSES

	Price	Qty	Amount
1. Use of Microcomputers, Structural Geology	(65) \$190	1	\$190
2. Ore Deposition Associated with Magmas	(66) \$225	1	\$225
3. Geographical Information Systems	(67) \$194	1	\$194
4. Glacial Facies Models	(68) \$146	1	\$146
5. Seismic Imaging of the Continental Crust	(69) \$125	1	\$125
6. Hazardous-Waste Site Characterization	(70) \$152	1	\$152
7. Quantitative Sedimentary Basin Modeling	(71) \$138	1	\$138
8. Seminar in Geoscience Writing	(72) \$ 88	1	\$ 88
9. Evolution of Reef Communities	(73) \$138	1	\$138
□ Check here if already registered for a short course.			

## FIELD TRIPS

	Price	Qty	Amount
1. Precambrian, SE Wyoming	(34) \$250	1	\$250
2. Pikes Peak Plutons and Pegmatites	(35) \$275	1	\$275
3. Early Tertiary Coals, Powder River Basin	(36) \$305	1	\$305
4. Hayden's Tertiary Lakes-White River Formation	(37) \$495	1	\$495
5. Geology, Hydrogeology, Nebraska Sandhills	(38) \$247	1	\$247
6a Hydrogeology, Paleohydrology (w/ airfare)	(39) \$305	1	\$305
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18a Deformation Cordilleran Orogenic (w/ airfare)	(53) \$330	1	\$330
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26 Proterozoic Core, Central Front Range	(62) \$ 16	1	\$ 16
27 Dinosaurs Near Denver	(63) \$ 16	1	\$ 16
28 Denver's Geologic Setting	(64) \$ 16	1	\$ 16

## MEETING REGISTRATION

Meeting registration not required

## REMITTANCE

Remit in U.S. funds, payable to '88 GSA Centennial Celebration or charge:

□ American Express □ Diners Club/Carte Blanche □ MasterCard □ VISA

Card expires: \_\_\_\_\_ mo. / \_\_\_\_\_ yr. card number \_\_\_\_\_

Signature \_\_\_\_\_

(PREREGISTRATION MUST BE RECEIVED BY OCTOBER 7!)

## *FUTURE ANNUAL MEETING DATES*

<i>1989</i>	<i>St. Louis</i>	<i>November 6-9</i>
<i>1990</i>	<i>Dallas</i>	<i>October 29-November 1</i>
<i>1991</i>	<i>San Diego</i>	<i>October 21-24</i>
<i>1992</i>	<i>Cincinnati</i>	<i>October 26-29</i>
<i>1993</i>	<i>Boston</i>	<i>October 25-28</i>

*Start the next 100 off right . . .  
... meet us in ST. LOUIS*

## *1989 Annual Meeting*

*November 6-9  
Cervantes Convention Center*

**FRONTIERS IN GEOSCIENCE:  
MEETING THE CHALLENGES  
OF THE NEXT 100 YEARS**

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# ABSTRACTS WITH PROGRAMS

If not previously purchased, *Abstracts with Programs* for the 1988 Annual Meeting is available four ways:

1. **Advance Mailing:** Complete the order form below and mail it to be RECEIVED at GSA by September 5. Annual meeting *Abstracts with Programs* are mailed via second class mail five to seven weeks before the meeting, allowing sufficient time for normal delivery in the United States. However, postal delays are

common and impossible to control. Therefore, subscribers, and especially those overseas, should not depend on receiving copies before the meeting. Price for GSA members is \$15; for nonmembers it is \$18.75.

2. **Reserved On-Site in Denver:** If you would like a copy reserved for pickup at the Annual Meeting or for extra copies, purchase from *Abstracts with Programs* line on the Preregistration Form. Pick up your copy in the Registration Area. Price: \$19. (If you have already ordered a copy

on your 1988 GSA dues form, this will give you a *duplicate* copy. Please check your records *Prior to ordering.*)

3. **Open On-Site:** Purchase on-site, Registration Area, from a limited quantity available. Price: \$19.

4. **GSA Membership Dues Form:** You may have already ordered a copy when you paid your dues. If so, placing an order under option 1 or 2 will give you a duplicate copy.

USE THIS FORM FOR OPTION (1) ADVANCE MAILING ONLY.

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## ABSTRACTS WITH PROGRAMS, 1988 ANNUAL MEETING

MAIL SEPARATELY TO: GSA Publication Sales, P.O. Box 9140, Boulder, CO 80301

Ship \_\_\_\_\_ advance copies of 1988 *Abstracts with Programs* at \$18.75 per copy.  
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\*Colorado residents add applicable sales tax.

1888 *Geological Society of America* 1988



# *The Bash*

Once in a hundred years . . .  
the party all geologists will remember

## *THE CENTENNIAL BIRTHDAY BASH*

Western Pioneer Walkabout,  
Casino, Auction,  
and High Country Hoedown

WEDNESDAY, NOVEMBER 2, 7 TO 11 P.M.  
MARRIOTT CITY CENTER  
(see page 219)



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