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GSA TODAY

A Publication of the Geological Society of America

1996 Annual Meeting

DENVER, COLORADO • OCTOBER 28–31

COLORADO CONVENTION CENTER – MARRIOTT CITY CENTER

EARTH SYSTEM SUMMIT Denver

John Karachewski

- ABSTRACTS: Due July 9
  For a paper copy of the abstract form: (303) 447-2020, ext.161
  E-mail: ncarlson@geosociety.org
  For the electronic form: http://www.geosociety.org
- PREREGISTRATION: Due September 20—Registration and housing forms enclosed
- INFORMATION: (303) 447-2020 or 1-800-472-1988; fax 303-447-0648
  E-mail: meetings@geosociety.org
  World Wide Web: http://www.geosociety.org

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The theme for the 1996 Denver meeting is Earth System Summit. The Earth is a complete system whose processes are complexly interrelated at a variety of scales. We are all inhabitants of this amazing system, and our actions can significantly impact, or be impacted by, its dynamic behavior. The gathering of scientists and engineers for the GSA Annual Meeting in Denver, at the base of the Rocky Mountains, will be an intellectual summit, focusing on the Earth System.

Read through the extensive list of symposia, theme sessions, and field trips. Topics range from the global scale to focus on the southern Rocky Mountains; something to interest everyone. Our keynote symposium, convened by E-an Zen and Karen Prestegaard, considers *Linkages Among Dynamic Processes of Oceans, Continents, and Atmosphere* on a global scale. The Annual Meeting Committee has also recruited symposia on the geologic development of the southern Rocky Mountains, ecosystems and the role of science in their management, and Earth system processes at the last glacial maximum. We invite you all to come, listen, and participate.

Every geologist knows Denver, founded on mining and still known as the Queen City of the Plains. Colorado is booming, and Denver, its capital, is more than keeping pace. The meeting will be at a new convention center in a revitalized, completely rejuvenated downtown. Lower downtown Denver (Lodo) is an exciting dining and entertainment area, with restaurants, brew pubs, and clubs. It's only a few miles west to the foot of the Rockies. There will be opportunities to get out and to enjoy the scenery. Come to Denver this autumn, to stimulate your mind, to see your colleagues, and to enjoy Colorado.

— 1996 General Co-Chairs, Gregory S. Holden and Kenneth E. Kolm

1996 Annual Meeting Committee

(From left to right) Front Row: Lisa Finiol, Ken Kolm, Chuck Pillmore, Katherine McCarville. Middle Row: Kris Zumalt, Greg Holden, Doug Peters. Back Row: John Warme, John Humphrey, Ren Thompson.

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This publication is included on GSA's annual CD-ROM *GSA Journals on Compact Disc.* Call GSA Publication Sales for details.

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New for '96 — SUBMIT ABSTRACTS VIA THE WWWEB

http://www.geosociety.org

- Use only ASCII characters in title and contents — no graphics, tables, Greek, or superscripts.
- Compose abstract in your favorite word processor. This will be your back-up copy. When complete, "save" as "text."
- Copy and paste into the appropriate fields on the GSA Web form.
- Use the instructions, pull down lists, and helpful hints on the Web form.
- "Send" your abstract.
- Stay at the Web site and wait ~30–60 seconds.

Please do not send a "back-up" paper form, and of course, send your electronic form only once.

What happens next?

1. "Error Checker" is a screening function that will automatically evaluate your abstract for omissions. If there is an omission on your abstract form, you will be asked for correction *immediately* while you're still on the Web. Correct and resubmit.
2. If there are no errors, you will receive an immediate acknowledgment of receipt at GSA *while you are on the Web,* with an abstract number assigned. This will be a unique number for your reference.
3. If you provide your E-mail address in the E-mail field:

   Within 72 hours, you also will receive *by E-mail a detailed acknowledgment* showing the full text of the abstract as it was received at GSA.

   By August 22, after the Joint Technical Program Committee selects abstracts and schedules sessions, you will receive *by E-mail an acceptance notice* with the date, time, and place of presentation.

   If the E-mail address field is vacant, the acknowledgment and acceptance notices will be sent by U.S. mail.
4. If you want to change your submittal *in any way* after you have received an acknowledgment, please contact the Abstracts Coordinator: ncarlson@geosociety.org or call (303) 447-2020 or 1-800-472-1988, ext. 161. Refer to your abstract number. Please do not submit a duplicate abstract or mail a paper copy.

Yes! Paper forms are being accepted as always.

Please feel free to submit the paper form if you do not want to submit electronically. The new system will not yet replace the familiar paper version of GSA's abstract form. Rather, the two systems will operate simultaneously. The way your abstract is submitted will not in any way affect the abstract selection process.

If you submit by paper copy, you will receive by U.S. mail both the acknowledgment card of receipt at GSA and the acceptance notice with the date, time, and place of presentation.

Paper forms are available from:

- Abstracts Coordinator at GSA headquarters — E-mail: ncarlson@geosociety.org or call (303) 447-2020 or 1-800-472-1988, ext. 161
- Conveners of symposia and advocates of theme sessions
- Geoscience departments at most colleges and universities
- Main federal and state survey offices.

Please do not send both electronic and paper forms.

Technical Program

CALL FOR PAPERS AND ANNOUNCEMENT OF SYMPOSIA AND THEME SESSIONS

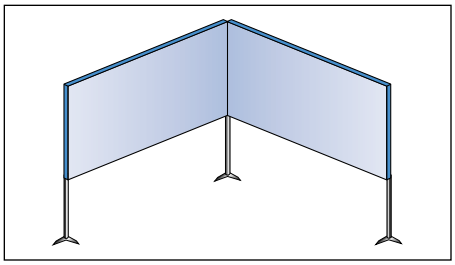
Abstract Deadline: July 9

ABSTRACT SUBMITTAL GUIDELINES

Presentation Modes

Oral Mode— This is a verbal presentation before a seated audience. The normal length of an oral presentation is 15 minutes, including time for discussion. Projection equipment consists of two 35 mm projectors, one overhead projector, and two screens. Requests for video projection and computer display will be addressed on a case-by-case basis.

Poster Mode— *New format:* Each poster session speaker is provided with **TWO** horizontal, free-standing display boards approximately 8' wide and 4' high. Precise measurements will appear in the Speaker Kit. The speaker must be present for at least two of the four presentation hours. Papers for discipline sessions may be submitted in either oral or poster mode. Papers for theme sessions, however, are to be submitted only in the mode noted in the theme description. If a theme abstract is submitted in the incorrect mode, the abstract will be transferred automatically to a discipline session.



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GSA TECHNICAL SESSIONS ON THE WEB

The titles and authors database will be available on the Web by August 25. You can download sessions, events, exhibits, field trips, and courses, together with a basic search and sorting software that will create your personal daily calendar, at http://www.geosociety.org.

Symposia (Invited Papers)

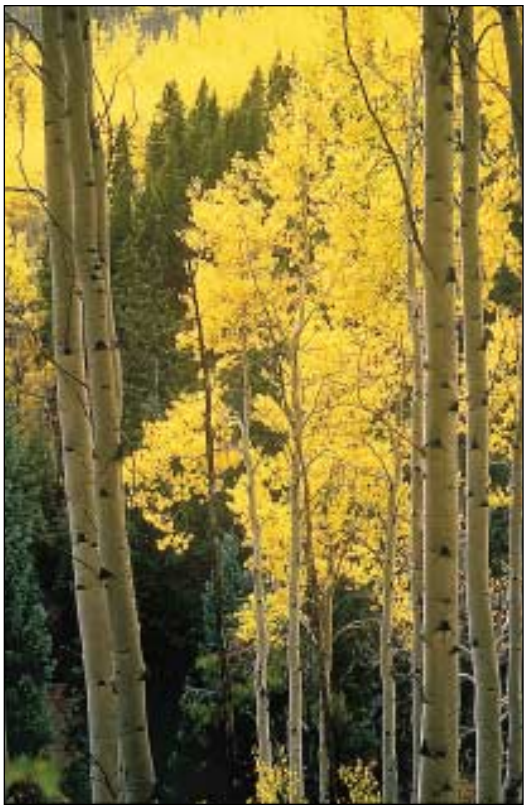
NEW for 1996: All invited abstracts (electronic and paper) are to be sent to GSA. The abstracts will be forwarded by GSA to the conveners for review.

***The day and time shown after each symposium are tentative. The final schedule will be available on the Web after August 25 and will appear in the September issue of* GSA Today.**

S1. **GSA Keynote Symposium: Linkages Among Dynamic Processes of Oceans, Continents, and Atmosphere.**
Monday, October 28, morning.
1996 GSA Annual Meeting Committee. E-an Zen and Karen Prestegaard, University of Maryland.

Thure Cerling, University of Utah
New Plants, Animals, and Soils: An Example of Global Change in the Neogene.

Douglas Burbank, University of Southern California
Impact of Tectonism on the Late Cenozoic Record: Character, Scale, and Resolution.



Golden Aspen, Vail, Colorado. Photo by John Karachewski.

Greg Ravizza, Woods Hole Oceanographic Insititution.
Contrasting the Marine Sr and Os Isotope Records: Different Perspectives on Chemical Weathering During the Cenozoic.

Richard Alley, Pennsylvania State University
Abrupt Climate Change in Ice Cores and Other Deposits: Glacial Records and Global Consequences.

Thomas Cronin, U.S. Geological Survey, Reston
Cyclicity in Deep-Sea Ecosystems and Biodiversity: Links to Orbitally Induced Climate Change.

Kate Freeman, Pennsylvania State University
Molecular and Isotopic Proxies for Paleo pCO_2.

Lynn Walter, University of Michigan
Geochemical Dynamics of Modern Shelf Carbonate Systems: Impact of Rapid Carbon and Sulfur Recycling on the Ancient Limestone Sediment Record.

Margaret Delaney, University of California, Santa Cruz
Phosphorus Geochemistry and Accumulation Rates in Marine Sediments: Insights into the Marine Phosphorus Cycle.

John Grotzinger, Massachusetts Institute of Technology
Understanding Ancient Sediments: New Insights and Approaches.

S2. **Tectonic Development of the Southern Rocky Mountains.**
Wednesday, October 30, morning.
1996 GSA Annual Meeting Committee. Eric Nelson, Colorado School of Mines.

S3. **Dinosaurs, Asteroids, Spotted Owls, and Humanity: An Evolving View of Ecosystems and the Role of Science in Their Management.**
Monday, October 28, afternoon.
1996 GSA Annual Meeting Committee and *Institute for Environmental Education.* Cathleen L. May, U.S. Department of Agriculture, Forest Service, Denver; Kenneth Kolm, Colorado School of Mines.

S4. **Earth System Processes at the Last Glacial Maximum.**
Wednesday, October 30, morning.
1996 GSA Annual Meeting Committee. Robert S. Webb, National Oceanic and Atmospheric Administration, Boulder; Benjamin Felzer, National Center for Atmospheric Research, Boulder.

S5. **Dimensional Scaling and the Stratigraphic Record of Episodic and Periodic Forcing.**
Tuesday, October 29, afternoon.
Sedimentary Geology Division. Carl N. Drummond, Indiana University/Purdue University, Fort Wayne; Bruce H. Wilkinson, University of Michigan.

S6. **Interdisciplinary Strategies for Teaching About Earth as a System.**
Monday, October 28, afternoon.
Geoscience Education Division. Ellen Metzger, San Jose State University.

S7. **Coalbed Methane—From Micropore to Pipeline.**
Monday, October 28, afternoon.
Coal Geology Division. James R. Staub, Southern Illinois University at Carbondale; Thomas Demchuk, Amoco Exploration and Production Technology, Houston, Texas.

S8. **The Geoarchaeology of Caves and Cave Sediments.**
Tuesday, October 29, afternoon.
Archaeological Geology Division. E. James Dixon, Denver Museum of Natural History.

S9. **IEE Annual Environmental Forum: Prospects for the Future: Gold and Water in the Earth System.**
Sunday, October 27, afternoon.
Institute for Environmental Education. Daniel Sarewitz, Geological Society of America.

- *Valuing Natural Resources—Lessons in Science and Policy from Yellowstone National Park.*
- *The International Context for Mining and the Environment.*
- *Regulation and Remediation—The Benefits of Good Communication Between Scientists and Regulators.*
- *Base-line Data, Predictive Models, and the Limits of Science.*
- *Innovative Approaches to Remediation—Technical and Policy Perspectives.*
- *Tales from the Real World: Running an Environmentally Sound Mining Operation.*
- *Community-based Decision Making for Mining and Remediation.*

S10. **Earth Systems Education: K–16.**
Monday, October 28, morning.
National Earth Science Teachers Association. Victor J. Mayer and Rosanne W. Fortner, Ohio State University.

S11. **Recent Advances in Plate Tectonics—What Students Should Know.**
Tuesday, October 29, afternoon. *National Association of Geoscience Teachers.* Barbara Tewksbury, Hamilton College.

S12. **Geochemical Constraints on Seawater Composition and the Coupled Ocean-Atmosphere System: The Precambrian Revisited.**
Tuesday, October 29, afternoon. *Geochemical Society.* Timothy W. Lyons, University of Missouri; Tracy D. Frank, University of Michigan.

S13. **Organic Geochemistry—Linking the Biosphere and Geosphere.**
Sunday, October 27, all day. *Organic Geochemistry Division of the Geochemical Society.* Keith A. Kvenvolden, U.S. Geological Survey, Menlo Park; Michael D. Lewan, U.S. Geological Survey, Denver; Joseph A. Curiale, Unocal Corporation, Sugarland, Texas.

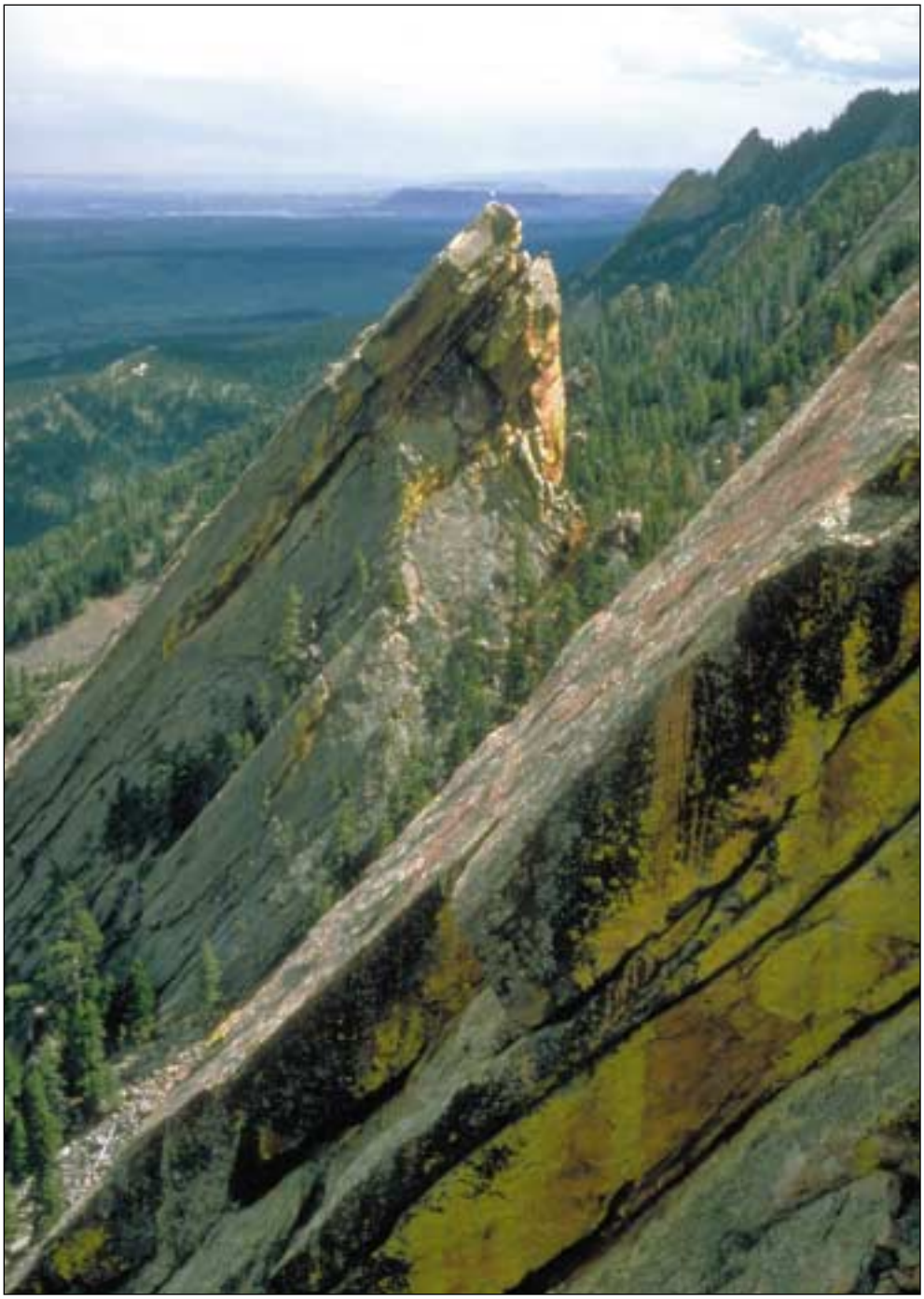
S14. **Engineering Geology Applications of Geologic Maps.**
Wednesday, October 30, morning. *Engineering Geology Division.* Helen Delano, Pennsylvania Geological Survey.

S15. **Farvolden Hydrogeology Symposium.**
Tuesday, October 29, morning. *Hydrogeology Division.* John A. Cherry, University of Waterloo.

S16. **Perspectives on Soil-based Information for Investigating Earth Surface Processes.**
Tuesday, October 29, morning. *Quaternary Geology and Geomorphology Division.* Eric V. McDonald, Los Alamos National Laboratory; Bruce Harrison, New Mexico Institute of Mining and Technology; Les McFadden, University of New Mexico.

S17. **Planets as Complex Systems.**
Tuesday, October 29, morning. *Planetary Geology Division.* James R. Zimbelman, Center for Earth and Planetary Studies, National Air and Space Museum, Washington, D.C.

S18. **Expanding Boundaries: Geoscience Information for Earth System Science.**
Tuesday, October 29, morning. *Geoscience Information Society.* Barbara DeFelice, Dartmouth College; Barbara Haner, University of California, Los Angeles.



Alluvial-fan deposits of Pennsylvanian-Permian Fountain Formation. Flatirons near Boulder, Colorado. Photo by John Karachewski.

S19. **Seismic Investigations Along the Western Margin and Cordillera of North America: Tectonic Implications.**
Tuesday, October 29, morning. *Geophysics Division.* G. Randy Keller, University of Texas at El Paso; Alan Levander, Rice University.

S20. **Active Tectonics of Intracontinental Mountain Belts with Implications for Ancient Systems.**
Monday, October 28, afternoon. *Structural Geology and Tectonics Division.* Michael Hamburger, Indiana University; Richard Allmendinger, Cornell University; Terry Pavlis, University of New Orleans.

Meandering river, northwest Colorado. Photo by Martin Miller.

S21. **Sigma Gamma Epsilon Student Research.**
Tuesday, October 29, afternoon. *Sigma Gamma Epsilon.* Charles J. Mankin, Oklahoma Geological Survey; James C. Walters, University of Northern Iowa. POSTER.

S22. **Alteration Geochemistry: Genetic and Exploration Perspectives.**
Sunday, October 27, all day. *Society of Economic Geologists.* Tim J. Barrett, University of British Columbia.

S23. **Geoscience Information for Tomorrow's Markets: What Is Wrong with the Present Products.**
Wednesday, October 30, afternoon. *Institute for Environmental Education, International Division,* and *Commission on the Management and Application of Geoscience Information.* A. Keith Turner, Colorado School of Mines.

S24. **Tectonic Evolution of the Urals and Surrounding Basins.**
Tuesday, October 29, morning. *International Division.* James H. Knapp, Institute for Study of the Continents, Cornell University; Helmut Echtler, GeoForschung-Zentrum—Potsdam, Potsdam, Germany; Andrès Peres-Estaùn, Instituto de Ciencias de la Tierra, "Jaume Almera," Barcelona, Spain.

S25. **Earth Science–Environmental Justice Summit.**
Tuesday, October 29, morning. *GSA Committee on Public Policy, Institute for Environmental Education, Association for Women Geoscientists, GSA Committee on Minorities and Women in the Geosciences,* and *National Association for Black Geologists and Geophysicists.* Wes Ward, U.S. Geological Survey, Flagstaff; Daniel Sarewitz, Geological Society of America.

S26. **Environmental Mineralogy: Science and Politics.**
Wednesday, October 30, morning. *Mineralogical Society of America* and *Clay Minerals Society.* George D. Guthrie and David L. Bish, Los Alamos National Laboratory.

S27. **The Role of Preferential Flow in the Unsaturated Zone.**
Thursday, October 31, morning. *Hydrogeology Division.* Scott W. Tyler, Desert Research Institute, University of Nevada, Reno; Bridget R. Scanlon, University of Texas at Austin.

S28. **Biology of the Foraminiferida: Applications in Paleoceanography, Paleobiology, and the Environmental Sciences.**
Monday, October 28, morning. *Cushman Foundation.* Susan T. Goldstein, University of Georgia; Joan Bernhard, Wadsworth Center Labs & Research, Albany, New York.

S29. **Evolutionary Paleoecology.**
Tuesday, October 29, morning. *Paleontological Society.* Warren Allmon, Paleontological Research Institution, Ithaca, New York; David Bottjer, University of Southern California.

S30. **Impact of the Western Surveys.**
Tuesday, October 29, afternoon. *History of Geology Division.* William R. Brice, University of Pittsburgh at Johnstown.

S31. **Applications of Reactive Transport Modeling to Natural Systems.**
Monday, October 28, morning. *Mineralogical Society of America.* Carl I. Steefel, University of South Florida; Peter C. Lichtner, Southwestern Research Institute, San Antonio, Texas; Eric H. Oelkers, Université Paul Sabatier, Toulouse, France.

Volunteered Papers

Discipline Sessions

Papers are submitted to ONE scientific discipline. The JTPC representatives organize the papers in sessions focused on this discipline—for example, hydrogeology or mineralogy.

Theme Sessions

Papers are submitted to a specific preannounced title and to ONE scientific category. Theme sessions are interdisciplinary; each theme may have as many as three categories from which authors may choose ONE. After each theme description below, the categories are identified by name and number as they appear on the 1996 Abstract Form. PLEASE SUBMIT ONLY IN THE MODE INDICATED in the description (oral or poster). An abstract submitted in the incorrect mode will be transferred automatically to a discipline session.

LIMIT OF ONE VOLUNTEERED ABSTRACT

Please submit only one volunteered abstract as speaker or poster presenter of a discipline and/or theme session. Multiple submissions as speaker-presenter for volunteered abstracts will result in rejection of ALL abstracts. Note that this limitation does not apply to, nor does it include, invited contributions to symposia.

Theme Submissions Must Include: *(Example)*

- Theme number — T18
- Key words of the theme title — Methods for Quantifying Unsaturated Permeability
- One category — Environmental Geology (#6 on abstract form)
- The group you want to review your abstract
- Mode for the session — Poster

Role of theme advocate

Each theme session has been proposed by an advocate. *Advocates may not invite speakers; however, they may encourage colleagues to submit abstracts, with the understanding that there is no guarantee of acceptance.* JTPC representatives, in consultation with the theme advocates, will organize theme sessions by August 10.

Theme Topics

Please check the correct mode of the theme session—poster or oral. Abstracts submitted inaccurately will be transferred automatically to a discipline session.

T1. **The U.S. Atlantic Passive Margin: Tectonics, Eustasy, and Sedimentation—A Memorial to James Patrick Owens.**
Sedimentary Geology Division. Kenneth G. Miller, Rutgers University; Frank J. Pazzaglia, University of New Mexico. Marine Geology (14), Quaternary Geology/Geomorphology (26), Sediments, Clastic (29). ORAL and POSTER

T2. **History of the Equatorial Atlantic.**
Mary Anne Holmes, University of Nebraska; Francisca Oboh, University of Missouri, Rolla. Marine Geology (14), Paleoceanography/Paleoclimatology (17), Tectonics (32). POSTER.

T3. **High-Resolution Glacial Records from Marine and Lacustrine Basins.**
Quaternary Geology and Geomorphology Division. Ellen A. Cowan, Appalachian State University; James P. M. Syvitski, Institute for Alpine and Arctic Research, University of Colorado, Boulder. Paleoceanography/Paleoclimatology (17), Quaternary Geology/Geomorphology (26), Sediments, Clastic (29). ORAL.

T4. **Application of Soil-based Information for Understanding Earth Surface Processes.**
Quaternary Geology and Geomorphology Division and *Institute for Environmental Education.* Eric McDonald, Los Alamos National Lab; Bruce Harrison, New Mexico Institute of Mining and Technology; Les McFadden, University of New Mexico. Environmental Geology (6), Paleoceanography/Paleoclimatology (17), Quaternary Geology/Geomorphology (26). ORAL.

T5. **Cretaceous of the Western Interior Seaway, North America.**
Paul R. Krutak, Fort Hays State University; Michael Arthur, Pennsylvania State University, University Park. Coal Geology (2), Petroleum Geology (19), Stratigraphy (30). ORAL.

T6. **The Rockies Across the Southern Border.**
José F. Longoría, Florida International University; Dante Moran-Zenteno, Universidad Nacional Autónoma de México; Rogelio Monreal, Universidad de Sonora. Paleontology/Paleobotany (18), Stratigraphy (30), Tectonics (32). ORAL.

T7. **Paleozoic and Mesozoic Tectonic History of Central Asia.**
Marc S. Hendrix, University of Montana; David B. Rowley, University of Chicago. Stratigraphy (30), Structural Geology (31), Tectonics (32). ORAL.

T8. **Tectonic Evolution of the Urals and Surrounding Basins.**
International Division. James H. Knapp, Cornell University; Helmut Echtler, GeoForschungZentrum—Potsdam, Potsdam, Germany; Andrès Peres-Estaùn, Instituto de Ciencias de la Tierra, "Jaume Almera," Barcelona, Spain. Geophysics/Tectonophysics (10), Petroleum Geology (19), Tectonics (32). POSTER.

T9. **Neotectonics of the Northern Caribbean Plate-Boundary Zone.**
William R. McCann, Consultant, Broomfield, Colorado. Geophysics/Tectonophysics (10), Marine Geology (14), Tectonics (32). ORAL.

T10. **Appalachian and Cordilleran Melanges: Comparisons and Contrasts.**
Northeastern, Southeastern, and Cordilleran Sections of GSA. Stephen Pollock, University of Southern Maine. Sediments, Clastic (29), Structural Geology (31), Tectonics (32). ORAL.

T11. **Laramide Sedimentation and Tectonics in the Rocky Mountains.**
Eric A. Erslev, Colorado State University; Romeo M. Flores, U.S. Geological Survey, Denver. Sediments, Clastic (29), Structural Geology (31), Tectonics (32). ORAL.

T12. **History of Recurrent Basement Faulting in Cratonic North America and Its Orogenic Margins.**
Christopher Schmidt, Western Michigan University; Donald S. Stone, Consultant, Littleton, Colorado; William A. Thomas, University of Kentucky. Geophysics/Tectonophysics (10), Structural Geology (31), Tectonics (32). ORAL and POSTER.

T13. **Geologic and Hydrologic Studies of Fluid Flow in Faults.**
Gary G. Gray, Exxon Production Research Company, Houston, Texas. Hydrogeology (13), Petroleum Geology (19), Structural Geology (31). ORAL.

T14. **Evolution of the Neogene Strain Field in the Southeastern Great Basin: Roles of Faults, Folds, and Magmatism.**
Robert B. Scott and Ernie Anderson, U.S. Geological Survey, Denver. Structural Geology (31), Tectonics (32), Volcanology (33). ORAL and POSTER.

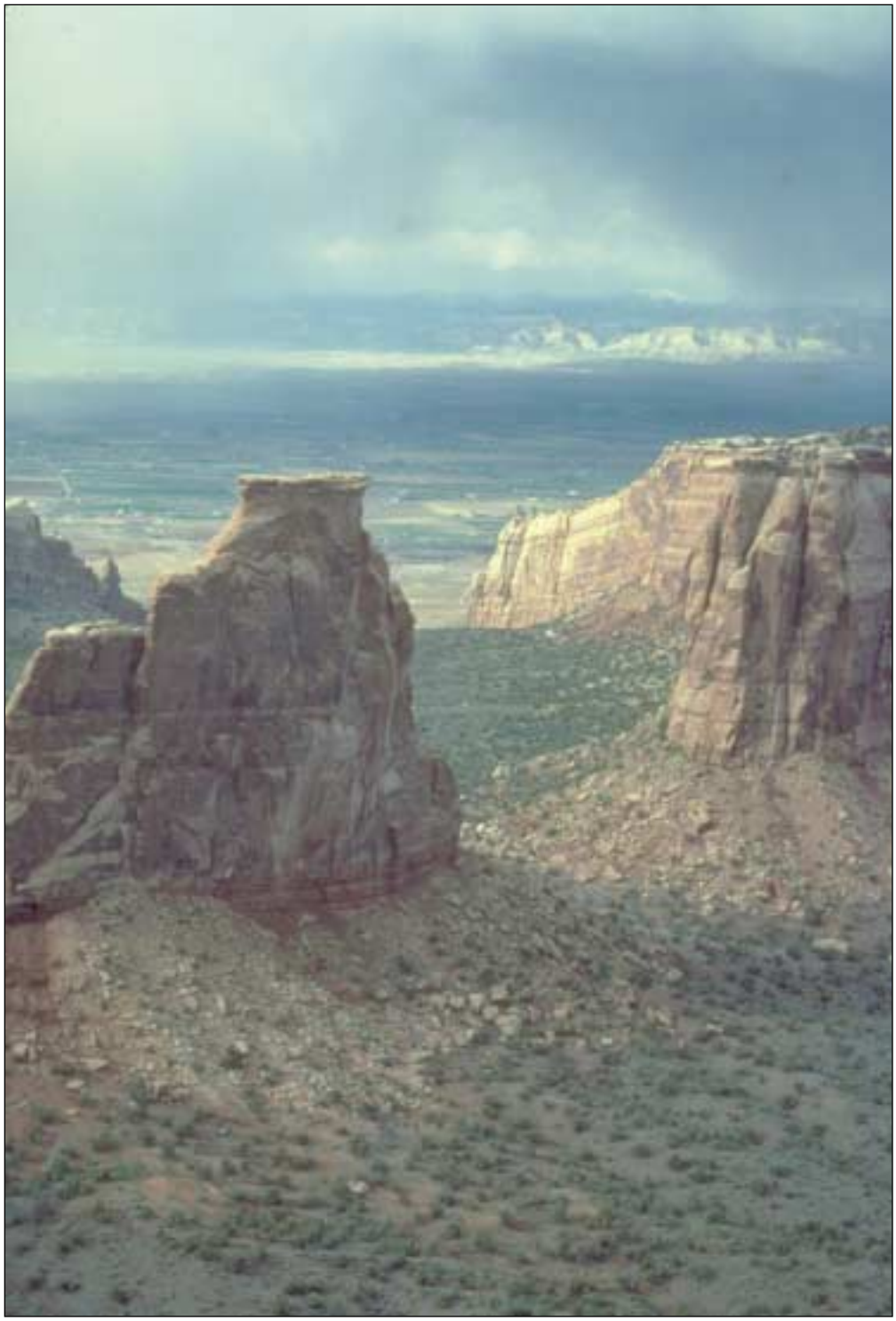
T15. **Neogene and Quaternary Geology of the Yucca Mountain Region, Nevada, and Its Relevance to Long-Term Nuclear Waste Isolation.**
Institute for Environmental Education. Dennis O'Leary and John W. Whitney, U.S. Geological Survey, Denver. Geophysics/Tectonophysics (10), Quaternary Geology/Geomorphology (26), Structural Geology (31). ORAL.

T16. **Seismic Investigations Along the Western Margin and Cordillera of North America: Data and Earth Models.**
Geophysics Division. Gary Fuis, U.S. Geological Survey, Menlo Park; Ron Clowes, University of British Columbia. Geophysics/Tectonophysics (10), Tectonics (32). POSTER.

T17. **Cenozoic Uplift of the Western United States.**
Geophysics Division. Paul Morgan, Northern Arizona University; Clement Chase, University of Arizona. Geophysics/Tectonophysics (10), Quaternary Geology/Geomorphology (26), Tectonics (32). ORAL.

T18. **Precambrian Lithosphere I: Proterozoic Tectonics—Modification of Archean Cratons and Additions of Juvenile Crust.**
Kevin Chamberlain and B. Ron Frost, University of Wyoming. Geochemistry, Other (8), Precambrian Geology (24), Tectonics (31). ORAL.

T19. **Precambrian Lithosphere II: Mid-Proterozoic Magmatism and Tectonics of Western North America.**
Carol Frost, University of Wyoming; Matt Nyman, University of New Mexico. Petrology, Igneous (21), Precambrian Geology (24), Tectonics (32). ORAL.



Navajo Sandstone (Jurassic) at Colorado National Mounument. Photo by Martin Miller.

T20. **Precambrian Lithosphere III: Middle Crustal Processes.** Karl E. Karlstrom, University of New Mexico; Michael Williams, University of Massachusetts. Precambrian Geology (24), Structural Geology (31), Tectonics (32). ORAL.

T21. **Volcanism, Tectonism, and Sedimentation in the Rio Grande Rift and Its Margins in New Mexico and Colorado.** David Sawyer and Ren Thompson, U.S. Geological Survey, Denver; Scott Baldridge, Los Alamos National Laboratory. Sediments, Clastic (29), Tectonics (32), Volcanology (33). ORAL and POSTER.

T22. **Magma Generation and Evolution at Convergent Margins.** Robert J. Stern, University of Texas at Dallas; Mark Feigenson, Rutgers University. Geochemistry, Other (8), Petrology, Igneous (21), Volcanology (33). ORAL.

T23. **High and Ultrahigh Strain Rate Processes in the Earth and Planetary Sciences.** John Spray, University of New Brunswick. Planetary Geology (23), Structural Geology (31), Volcanology (33). ORAL.

T24. **Mapping Other Worlds.** *Planetary Geology Division.* James R. Zimbelman, Center for Earth and Planetary Studies, National Air and Space Museum, Washington, D.C. Planetary Geology (23), Quaternary Geology/Geomorphology (26), Stratigraphy (30). POSTER.

T25. **Jupiter: Solar System Exploration Continues.** *Planetary Geology Division.* Larry Crumpler and James W. Head, Brown University. Planetary Geology (23), Quaternary Geology/Geomorphology (26), Remote Sensing (27). ORAL.

T26. **Application of Reactive Transport Modeling to Natural Systems.** *Mineralogical Society of America.* Carl I. Steefel, University of South Florida; Peter C. Lichtner, Southwest Research Institute, San Antonio, Texas; Eric H. Oelkers, Université Paul Sabatier, Toulouse, France. Geochemistry, Aqueous/Organic (7), Hydrogeology (13), Mineralogy/Crystallography (16). ORAL.

T27. **Mineralogy of Planetary Surfaces Using In-Situ Analysis and Remote Sensing.** *Mineralogical Society of America* and *Planetary Division.* Bradley L. Jolliff, Washington University. Mineralogy/Crystallography (16), Planetary Geology (23), Remote Sensing (27). ORAL.

T28. **Environmental Mineralogy.** *Mineralogical Society of America* and *Clay Minerals Society.* George D. Guthrie and David L. Bish, Los Alamos National Laboratory. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Mineralogy/Crystallography (16). ORAL.

T29. **Hydrogeology of Confining Units I: Sampling, Analysis, and Interpretation.**
Hydrogeology Division and *Society for Sedimentary Geology.* Paul A. Thayer, University of North Carolina, Wilmington; Mary K. Harris, Westinghouse Savannah River Co., Aiken, South Carolina. Computers (3), Hydrogeology (13), Sediments, Clastic (29). ORAL.

T30. **Hydrogeology of Confining Units II: Physical and Biogeochemical Processes.** *Hydrogeology Division* and *Society for Sedimentary Geology.* William W. Simpkins, Iowa State University; C. Kent Keller, Washington State University. Geochemistry, Aqueous/Organic (7), Hydrogeology (13), Quaternary Geology/Geomorphology (26). ORAL.

T31. **Field-Scale Investigations of Biodegradation.**
Hydrogeology Division. Hedeff Essaid, U.S. Geological Survey, Menlo Park; Isabelle Cozzarelli, U.S. Geological Survey, Reston. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13). ORAL and POSTER.

T32. **Scale Effects of Fluid Flow and Fractures.**
Randall Marrett, University of Texas, Austin. Hydrogeology (13), Petroleum Geology (19), Structural Geology (31). ORAL.

T33. **Geofluids: The Role of Fluids in Crustal Processes.**
Mark Person, New Mexico Institute of Mining and Technology; Emi Ito, University of Minnesota. Geochemistry, Aqueous/Organic (7), Hydrogeology (13), Sediments, Clastic (29). ORAL and POSTER.

T34. **Applications of Isotopes for Understanding Hydrologic Systems.**
Hydrogeology Division. James M. Thomas, U.S. Geological Survey, Carson City, Nevada; John Hess, Desert Research Institute, Las Vegas. Environmental Geology (6), Geochemistry, Aqueous/Organic (7), Hydrogeology (13). ORAL.

T35. **High Plains Hydrogeology.**
Hydrogeology Division. Alan E. Fryar, University of Kentucky; Allan R. Dutton, University of Texas at Austin. Hydrogeology (13), Quaternary Geology/Geomorphology (26), Sediments, Clastic (29). ORAL.

T36. **Physical and Chemical Heterogeneity: Impact on Reactive Transport.**
Hydrogeology Division. Janet S. Herman, University of Virginia; John L. Wilson, New Mexico Institute of Mining and Technology. Geochemistry, Aqueous/Organic (7), Hydrogeology (13). ORAL.

T37. **Innovations and Applications of Inverse Ground-water Models.**
Hydrogeology Division. Eileen Poeter, Colorado School of Mines; Mary Hill, U.S. Geological Survey, Denver. Computers (3), Hydrogeology (13). ORAL.

T38. **Evaporite Karst: Origins, Processes, Landforms, Examples, and Impacts.**
Hydrogeology Division and *Engineering Geology Division.* Kenneth S. Johnson, Oklahoma Geological Survey; James T. Neal, Sandia National Laboratory. Engineering Geology (5), Environmental Geology (6), Hydrogeology (13). ORAL.

T39. **The Death Valley Hydrogeologic System.**
Frank A. D'Agnese and Claudia C. Faunt, U.S. Geological Survey, Denver; A. Keith Turner, Colorado School of Mines. Environmental Geology (6), Hydrogeology (13), Quaternary Geology/Geomorphology (26). ORAL.

T40. **Physical and Chemical Heterogeneity: Impact on Samples and Measurements at Wells.**
Hydrogeology Division. Thomas E. Reilly, U.S. Geological Survey, Reston; Dennis R. LeBlanc, U.S. Geological Survey, Marlborough, Massachusetts. Geochemistry, Aqueous/Organic (7), Geophysics/Tectonophysics (10), Hydrogeology (13). ORAL.

T41. **Diagenetic Processes at Waste-Disposal Sites.**
Hydrogeology Division. Peter J. Hutchinson, University of Pittsburgh. Geochemistry, Aqueous/Organic (7), Hydrogeology (13), Sediments, Clastic (29). ORAL.

T42. **Global Impacts of Mining and Urbanization on Fluvial and Coastal Systems.**
Institute for Environmental Education. Robert A. Morton, University of Texas, Austin; Waite R. Osterkamp, U.S. Geological Survey, Tucson, Arizona. Environmental Geology (6), Public Policy (25), Sediments, Clastic (29). ORAL.

T43. **Environmental Geology: The Voice of Reason.**
Institute for Environmental Education and *National Association of Geoscience Teachers.* Paul R. Pinet, Colgate University; Daniel Sarewitz, Geological Society of America. Environmental Geology (6), Geology Education (9), Public Policy (25). ORAL.

Please check the correct mode of the theme session—poster or oral. Abstracts submitted inaccurately will be transferred automatically to a discipline session.

T44. **Clean-up at Rocky Flats, a Former Nuclear Weapons Plant: Application of Science to Site Remediation Plans.**
Institute for Environmental Education. Barry Roberts, Rocky Flats Environmental Technology Site; Daniel Sarewitz, Geological Society of America. Engineering Geology (5), Environmental Geology (6), Public Policy (25). ORAL.

T45. **Integrated Site Characterization for Waste Disposal.**
Institute for Environmental Education. Daniel J. Soeder, U.S. Geological Survey, Las Vegas; Richard Quittmeyer, Woodward Clyde Federal Services, Las Vegas, Nevada.. Environmental Geology (6), Hydrogeology (13), Public Policy (25). ORAL.

T46. **Interpretation of Continental Sedimentation Patterns Using Surface and Subsurface Data.**
Debra Hanneman, Whitehall Geogroup, Inc., Whitehall, Montana; Charles J. Wideman, Montana Tech of the University of Montana. Environmental Geology (6), Geophysics/Tectonophysics (10), Stratigraphy (30). ORAL.

T47. **The Impact of Geologic Heterogeneities on Characterization, Transport, and Remediation of Non-Aqueous Phase Liquids (NAPLs) at Hazardous Waste Sites.**
Institute for Environmental Education. John A. Karachewski, OHM Remediation Services Corp., Pleasanton, California; Mark K. Levorsen, ERM—Rocky Mountain, Inc., Greenwood Village, Colorado. Environmental Geology (6), Hydrogeology (13). ORAL and POSTER.

T48. **Rates of Geologic Processes in the Holocene.**
Institute for Environmental Education. Thure E. Cerling, University of Utah. Environmental Geology (6), Geochemistry, Other (8), Quaternary Geology/Geomorphology (26). ORAL.

T49. **Mechanics of the Riverbed I: Hydrology.**
Paul A. Washington, Northeast Louisiana University. Engineering Geology (5), Hydrogeology (13). ORAL.

T50. **Mechanics of the Riverbed II: Sedimentology.**
Leonard M. Young, Northeast Louisiana University. Hydrogeology (13), Sediments, Clastic (29). ORAL.

T51. **Mechanics of the Riverbed III: Geomorphic Consequences.**
Rene A. DeHon, Northeast Louisiana University. Engineering Geology (5), Hydrogeology (13), Quaternary Geology/ Geomorphology (26). ORAL.

T52. **Geographic Information Systems and Integrated Digital Databases: Tools for Geoscience Analysis.**
Dogan Seber, Cornell University; Eric J. Fielding, Jet Propulsion Lab, California Institute of Technology; Robert J. Krumm, Illinois Geological Survey. Computers (3), Quaternary Geology/ Geomorphology (25), Tectonics (32). ORAL and POSTER.

T53. *Was combined with T52.*

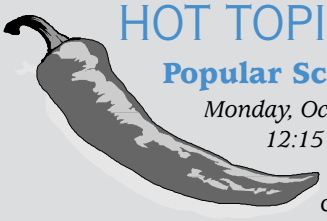
T54. **Improving Geoscience Courses Through the Use of the Internet and the World Wide Web.**
National Association of Geoscience Teachers. Philip Sandberg, Dakota State University. Computers (3), Geology Education (9). ORAL.

T55. **Roles of Multiple Intelligences and Creativity in Teaching, Learning, and Doing Geoscience.**
Barbara L. Mieras, Geological Society of America. Geology Education (9). ORAL.

T56. **When Plates and People Collide—Teaching About Human-Tectonics Interactions.**
National Association of Geoscience Teachers. Barbara Tewksbury, Hamilton College. Geology Education (9), Tectonics (32). ORAL.

T57. **National Parks as Classrooms for Geoscience Education.**
National Association of Geoscience Teachers. Duncan Foley, Pacific Lutheran University; Paul and Heidi Doss, Colby College. Environmental Geology (6), Geology Education (9). ORAL.

T58. **The Role of Geology Field Camp in the Geology Curriculum: An Appraisal.**
David McConnell and Verne Friberg, University of Akron; Kevin Stewart, University of North Carolina. Geology Education (9), Stratigraphy (29), Structural Geology (31). ORAL.



HOT TOPICS AT NOON

Popular Scientific Debates for Everyone

Monday, October 28 through Thursday, October 31, 12:15 to 1:15 p.m., Colorado Convention Center.

Join your colleagues in spirited lunch-time debates. Keeping with the theme, hot (and mild) red and green chili (beer, softdrinks) will be available for purchase outside the debate room. Bring your lunch.

Life's New Twist: The Precambrian-Cambrian Explosion of Life.
Moderator: Jere Lipps, Museum of Paleontology, University of California, Berkeley.

Panel: Stefan Bengtson, Swedish Museum of Natural History, Stockholm; Sandy Carlson, University of California, Davis; Charles Marshall, University of California, Los Angeles; Douglas Erwin, National Museum of Natural History, Smithsonian Institution.

The Precambrian-Cambrian explosion of life has not been satisfactorily explained or interpreted. Many hypotheses have been suggested, though none are generally accepted. The discussion will focus on this important and controversial event in biotic history.

Chicxulub: How Did It Do It?—
The K-T Boundary, Mass Extinction, and the Post-Chicxulub Era.
Moderator: Philippe Claeys, Museum für Naturkunde, Berlin, Germany.

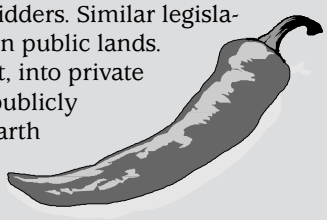
It is now difficult to argue against a large-sized impact at the K-T boundary, but we still need to more fully document and clarify the mechanisms leading to the extinction of organisms across the boundary. How can this be accomplished with testable results?

Bald Uprights from the Pleistocene: Paleoclimate Influence on Human Evolution.
Moderator: Craig Feibel, Rutgers University.

Climatic shifts in Pliocene-Pleistocene time dramatically changed the face of the planet at the same time that critical evolutionary steps were being taken in Africa. How were global climatic trends felt in Africa, and what were the ecological and habitat changes that fostered this unusual lineage? To what extent can we tie the critical stages of early human evolution to major events in climatic, tectonic, and biotic change?

Federal Collecting Laws.
Moderator: Richard Stucky, Denver Museum of Natural History.

Bills before Congress, such as H.R. 2943 (Fossil Preservation Act of 1996), could allow commercial fossil hunters to collect on public lands, the collecting rights accruing to the highest bidders. Similar legislation could affect mineral and rock localities on public lands. How can YOU help thwart the relinquishment, into private hands for commercial gain, of irreplaceable publicly owned fossils, minerals, and other valuable Earth materials?



T59. **Geology Field Camp Exercises in the Rocky Mountains.** David McConnell, University of Akron. Geology Education (9), Stratigraphy (30), Structural Geology (31). POSTER.

T60. **Linking Natural and Social Systems in Geoscience Education: Pedagogy, Content, and Context.** *National Association of Geoscience Teachers* and *Institute for Environmental Education.* Lauret E. Savoy, Mount Holyoke College; Margaret N. Rees, University of Nevada, Las Vegas; Jill S. Schneiderman, Vassar College. Environmental Geology (6), Geology Education (9). ORAL and POSTER.

T61. **Organics-Ore Interactions in the Field and Laboratory.** *Society of Economic Geologists* and *International Geological Correlation Program, Project 357—Organics and Mineral Deposits.* Thomas H. Giordano, New Mexico State University. Economic Geology (4), Geochemistry, Aqueous/Organic (7), Petroleum Geology (19). ORAL.

T62. **The Magmatic-Hydrothermal-Epithermal Transition and Associated Alteration and Mineralization.** *Society of Economic Geologists.* Mark Bloom, PTI Environmental Services, Boulder, Colorado. Economic Geology (4), Geochemistry, Aqueous/Organic (7). ORAL.

Please check the correct mode of the theme session—poster or oral. Abstracts submitted inaccurately will be transferred automatically to a discipline session.

T63. **Quantifying the Environmental Impacts of Mining.** *Society of Economic Geologists.* Andrew Nicholson, PTI Environmental Services, Boulder, Colorado. Economic Geology (4), Geochemistry, Aqueous/Organic (7), Hydrogeology (13).ORAL.

T64. **Conservation Geology: Preserving and Protecting the Natural Resources of Ecosystem Earth.** *Institute for Environmental Education.* Russell G. Shepherd, U.S. Department of Agriculture, Natural Resources Conservation Service, Ft. Collins, Colorado. Environmental Geology (6), Hydrogeology (13), Quaternary Geology/Geomorphology (26). ORAL.

Educational Programs

GSA-Sponsored Continuing Education Courses

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

A course *only* fee of $35 is required if you are not attending the meeting. This fee may be applied to a full meeting registration if you decide to attend. Preregistration is recommended; on-site is $30 additional. You may register for GSA courses on the Annual Meeting Preregistration Form. Courses will be held at the Colorado Convention Center unless otherwise noted.

Continuing Education Unit (CEU) Service

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

PREREGISTRATION DEADLINE:
SEPTEMBER 20
Cancellation Deadline:
September 27
For more information, contact
Edna Collis —
(303) 447-2020, ext. 134,
GSA Continuing Education Coordinator.

1. **Geomorphic Expression of Active Tectonics.**
Saturday, October 26, and Sunday, October 27, 8:00 a.m. to 5:00 p.m. University of New Mexico, Albuquerque. Cosponsored by *Structural Geology and Tectonics Division* and *Quaternary Geology and Geomorphology Division.*

This combination course and field trip will present the principles and tools of tectonic geomorphology, including: Quaternary stratigraphy, surficial processes, and landforms and their application in identifying, characterizing, and quantifying the nature and rate of tectonic deformation. The course will focus on various aspects of tectonic geomorphology in known regions of rapid Quaternary deformation such as convergent plate margins. It will also evaluate how geomorphology can be used in regions of more subtle or unknown rates of deformation such as continental interiors or passive margins. The course will present the principles and specific techniques for utilizing tectonic geomorphology in both research and university teaching. Day one of this course will be held at the University of New Mexico, Albuquerque. Day two of the course will be spent in the field with stops in the northern Rio Grande Rift near Taos, en route to Denver.

Who Should Attend—(1) Researchers and teachers in the area of structural geology and tectonics who would like to better appreciate the topographic expressions of active tectonic processes; (2) process geomorphologists interested in working on tectonic processes; and, (3) geology students interested in learning the fundamentals of tectonic geomorphology.

Recommended Background—Attendees are expected to have a broad background in geology, but advanced technical knowledge of geomorphology, structural geology, and tectonics is not required. In fact, this course is specifically aimed at people lacking advanced experience in one or more of those areas.

What You Will Learn—This course will present an introduction to the field of tectonic geomorphology. Many researchers are now recognizing that the landscape represents one of the best records of active tectonic processes. This course will focus on two particular aspects of tectonic geomorphology: (1) recognizing how tectonic processes shape the Earth's surface and what landforms are created by those processes, and (2) using geomorphology as a qualitative and quantitative tool to infer the patterns, rates, and history of tectonic processes in the geologically recent past.

Faculty: **Frank J. Pazzaglia,** Dept. of Earth and Planetary Sciences, University of New Mexico, Albuquerque; Ph.D., Pennsylvania State University. **Nicholas Pinter,** Dept. of Geology and Geophysics, Yale University; Ph.D., University of California, Santa Barbara.

Limit: 40. Fee: $325, students $305; includes course manual, lunch both days, and van transportation from Albuquerque to Denver. CEUs: 1.6.

2. **How To Do Anything with Mohr Circles (Except Fry an Egg): A Short Course About Tensors for Structural Geologists.**
Saturday, October 26, 8:00 a.m. to 5:00 p.m., and Sunday, October 27, 1:00 to 5:00 p.m. Cosponsored by *Structural Geology and Tectonics Division.*

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

Who Should Attend—This course is particularly aimed at those currently teaching structural geology, however, graduate students are also welcome.

Recommended Background—Attendees should have taken at least one course in structural geology.

What You Will Learn—Attendees will learn about the general nature of tensors, the universality of Mohr circles for tensors, the finite deformation tensor, the velocity gradient tensor, the stress tensor, the tensor transformation rule, and Mohr diagrams for three-dimensional tensors.

Faculty: **Winthrop D. Means,** Dept. of Geological Sciences, State University of New York at Albany; Ph.D., University of California, Berkeley.

Limit: 30. Fee: $195, students $175; includes two course manuals and lunch on Saturday. CEUs: 1.2.

Continuing Education Participants, 1995 Annual Meeting.

3. **New Numerical Techniques for Sedimentary Data: Fractals and Nonlinear Dynamics.**
Saturday, October 26, and Sunday, October 27, 8:00 a.m. to 5:00 p.m. Colorado School of Mines, Golden. Cosponsored by *Sedimentary Geology Division* and *Society for Sedimentary Geology (SEPM).*

ATTENTION STUDENTS: The Sedimentary Geology Division will SUBSIDIZE ALL STUDENTS WHO ARE VALID DIVISION MEMBERS. Students MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed $100 after the GSA meeting by the Sedimentary Geology Division. To be reimbursed, students must apply in writing to Rebecca J. Dorsey, Dept. of Geology, Box 4099, Northern Arizona University, Flagstaff, AZ 86011, (520) 523-9339, E-mail: r.dorsey@nau.edu.

Designed to teach geologists about the techniques and potential applications of fractals and nonlinear dynamics ("chaos theory"), this course presents new theories and powerful new techniques for analyzing time series, or spatial profiles (e.g., well logs, topographic profiles), and spatial data (maps). Sedimentary geologists deal every day with actual time series (e.g., measurements of current velocity or suspended sediment concentration at a station), or spatial "time" series (e.g., stratigraphic sections) and maps, yet few know about the new numerical techniques available to analyze such data. Much of the literature on these topics is published in journals or books that geologists do not normally read, and often in language that is difficult to understand. A set of notes will be provided explaining these concepts and techniques in language that geologists can understand.

Who Should Attend—Those sedimentary geologists engaged in research (whether in industry, government, or universities) and those in operations.

Recommended Background—Attendees should have a math background consisting of a first university course in calculus.

What You Will Learn—Detailed application to time-series and nonlinear forecasting techniques. Included in the notes will be a diskette of public-domain programs that will demonstrate some of the phenomena of interest and that can be used directly to analyze simple data sets.

Faculty: **Gerard V. Middleton,** Dept. of Geology, McMaster University, Ontario; Ph.D., University of London.

Precambrian gneiss. Photo by John Karachewski.

Roy E. Plotnick, Dept. of Geological Sciences, University of Illinois at Chicago; Ph.D., University of Chicago. **David M. Rubin,** U.S. Geological Survey, Menlo Park; Ph.D., Rensselaer Polytechnic Institute.

Limit: 40. Fee: $320, students $300; includes course manual and lunch both days. CEUs: 1.6.

4. **Applications of Environmental Isotopes to Solving Hydrologic and Geochemical Problems.**
Sunday, October 27, 8:00 a.m. to 5:00 p.m. Cosponsored by *Hydrogeology Division.*

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

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

Who Should Attend—This course is intended for students and practicing geologists, hydrologists, and engineers.

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

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

Faculty: **Carol Kendall,** Research Hydrologist, Water Resources Division, U.S. Geological Survey, Menlo Park; Ph.D., University of Maryland. **Robert J. Drimmie,** Dept. of Earth Sciences, University of Waterloo, Ontario; Ph.D., University of Waterloo.

Limit: 50. Fee: $205, students $155; includes course manual, lunch, and casual postcourse reception. CEUs: 0.8.

5. **Applications of GPS in the Earth Sciences.**
Sunday, October 27, 8:00 a.m. to 5:00 p.m. University NAVSTAR Consortium (UNAVCO), Boulder. Cosponsored by *Structural Geology and Tectonics Division.*

The Global Positioning System (GPS) is the most important technological innovation in the field of precise surveying in this century. It enables scientists, surveyors, and others to precisely determine the relative position of points with accuracies of a few millimeters to hundreds of meters, depending on the hardware and software used and the length of observation times. This course focuses on the application of GPS to rapid point positioning and the integration of the data into Geographical Information Systems (GIS). This course will provide an introductory overview of the essential technical and organizational aspects of GPS positioning. We will cover the basics of GPS from the 100 meter to the millimeter accuracy level, from methodology to benchmark. A "hands-on" approach with a range of GPS receivers from hand-held to field survey receivers will be emphasized.

Who Should Attend—Earth scientists who require precise (mm to meters) positions of mapped features at scales of a few meters to hundreds of kilometers.

Recommended Background—Anyone interested in using GPS positioning as a tool for surveying, mapping, or deformation monitoring. Some prior college-level classes or experience in geology, geophysics, geography, or surveying is recommended.

What You Will Learn—An overview of GPS positioning, some hands-on experience with hand-held and survey-quality GPS receiver types, and an introduction to the use of GPS with Geographical Information System analysis.

Faculty: **Charles M. Meertens,** University Navstar Consortium (UNAVCO) and Dept. of Geology and Geophysics, University of Utah; Ph.D., University of Colorado. **Roland Burgmann,** Dept. of Geology, University of California, Davis; Ph.D., Stanford University.

Limit: 40. Fee: $185, students $165; includes course manual and lunch. CEUs: 0.8.

6. **Effective Teaching of Hydrogeology: How to Make Do With Scant *Real-World* Data.**
Sunday, October 27, 8:00 a.m. to 5:00 p.m. Cosponsored by *Hydrogeology Division.*

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

Much of what is taught in elementary hydrogeology courses and textbooks has minimal value when students enter the *real world,* particularly in consulting and regulatory employment. In practice, the types and quality of hydraulic, geologic, and chemical data are constrained by regulatory, legal, and economic considerations such that "textbook" methods may not be feasible. Hydrologic and chemical data are often scant, of poor quality, and incomplete. To do hydrogeology in practice, therefore, is less an academic exercise in technique, however mathematically sophisticated, than an exercise in clear, critical thinking based upon first principles. This course is designed to guide college instructors to what are the practical essentials of hydrogeologic and pertinent geochemical analysis and how to apply them to solve real-world consulting (and arguably, academic) problems. The course will consist of materials presented in college level (upper undergraduate–beginning graduate) hydrogeology courses coupled with case-study problems designed to illustrate methods of interpretation. Attendees will gain a clear understanding of the typical degree of precision and accuracy possible in typical hydrogeologic studies in practice, and the most appropriate means to extract the most reliable information from often marginal hydraulic and chemical data sets. The underlying premise of the course comes from Aristotle's admonition: It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject permits, and not to seek an exactness where only an approximation of the truth is possible.

Who Should Attend—College and university professors who are not formally trained in hydrogeology (e.g., have not prepared a dissertation on the subject), but who are teaching the subject and/or who have minimal real-world consulting experience should find the nontraditional perspective of this course valuable. Practicing professionals who have gained their hydrogeologic knowledge from hands-on experience but who never have had a formal introduction to the subject will find from the course that they probably harbor wrong assumptions about how ground water behaves in the subsurface. Academically educated and experienced university hydrogeologists who elect to take this course may find concepts in it both stimulating and controversial.

Recommended Background—Participants should have either taught or taken a course in hydrogeology or done hydrogeologic projects in the workplace. It will be assumed that everyone knows or has been exposed to Geology 101 material, Darcy's Law, and basic chemical nomenclature (symbols—not thermodynamics!).

What You Will Learn—Attendees will learn to use Darcy's Law in ways they never imagined or have since forgotten. They will learn about the most common difficulties encountered in evaluating the hydrogeology of local sites, and how to make do with what you get when data are of bad quality and scant. Most important, attendees will learn how ground-water hydraulics and geochemistry are linked and how to use one to confirm or deny conclusions based on the other. Case studies and problems will center on contamination and wetland issues, two of the most topical areas within which hydrogeologic work is done today.

Faculty: **Donald I. Siegel,** Dept. of Earth Sciences, Syracuse University; Ph.D., University of Minnesota.

Limit: 100. Fee: $175, students $125; includes course manual and lunch. CEUs: 0.8.

7. **Recognition, Investigation, and Mitigation of Landslides.**
Sunday, October 27, 8:00 a.m. to 5:00 p.m. Cosponsored by *Engineering Geology Division.*

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

This introductory level course will provide attendees with a state-of-the-art view of recognition, investigation, and mitigation of landslides, including political sensitivity of landslide problems. More specifically, the workshop will provide a discussion of factors controlling landslides and how maps of various scales from grading plans (1" = 40') to standard U.S. Geological Survey topographic maps can be used to identify landslides. Also, the use of aerial photographs and the importance of having available many different dates and times of photography will be discussed. Other topics to be covered will include modern methods for exploring landslides (including subsurface mapping), landslide hazard maps, and methods used to stabilize active or ancient landslides. Most discussions will include documentation from actual case histories drawn from the faculty's personal experiences—this will include examples from within the United States, as well as examples from Japan, Italy, and New Zealand. Selected slides utilized in the lectures will be incorporated into a slide set to be included with the course notes.

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

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

What You Will Learn—Attendees will learn the importance of detailed geologic mapping in determining subsurface slip-surface geometry, factors controlling landslide development, mechanics of landslides, techniques of landslide stabilization, recognition, and investigation (surface and subsurface), the political difficulty of correcting incorrect geologic mapping, and how to distinguish landslide slip surfaces from tectonic and other types of shear surfaces.

Faculty: **Jerome V. DeGraff,** Forest Geologist, USDA Forest Service, Clovis, California; M.S., Utah State University. **William R. Cotton,** President, William Cotton and Associates, Inc., Los Gatos, California; M.S., San Jose State University. **Michael W. Hart,** Consulting Engineering Geologist, San Diego, California; M.S., San Diego State University.

Limit: 50. Fee: $170, students $150; includes course manual, slide set, and lunch. CEUs: 0.8.

8. **Vadose Zone Hydrology: Introduction and Applications in Water and Solute Transport.**
Sunday, October 27, 8:00 a.m. to 5:00 p.m. Cosponsored by *Hydrogeology Division.*

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

The study of water and solute transport through the unsaturated zone has come to the forefront in recent years as issues of contamination, ground-water recharge, and the locating of hazardous waste disposal sites have become significant environmental concerns. This course will familiarize students with the essential features of water and solute transport in unsaturated soils and geologic materials, and demonstrate recent advances in assessing transport. The course will also provide students with the opportunity to apply user-friendly numerical models of water and solute transport to real-world problems. The course will begin with an introduction to soil hydraulic properties and their measurement. Development of the basic flow equations in unsaturated material (Darcy's Law, Richards' Equation, and the advection-dispersion equation) will follow, with direct application to laboratory and field measurement methods. New approaches toward estimating soil water flux and recharge will be presented. The second half of the course will focus on introducing students to numerical methods of solution of flow and transport in the unsaturated zone. Students will have hands-on experience using two-dimensional flow and transport solvers as applied to actual field data.

Who Should Attend—Scientists and engineers working in the field of contaminant hydrology and water resource development.

Recommended Background—Attendees should have a background in hydrogeology or soil physics and should have an understanding of mathematics through calculus.

What You Will Learn—Attendees will learn the fundamentals of water flow and solute transport in the unsaturated zone and the techniques used to characterize the direction and magnitude of flow. Laboratory and field measurement methods will be presented along with in-class demonstrations. Attendees will be introduced to new methods for estimating ground-water recharge. Attendees will also be given hands-on experience with computer models of both water and solute transport in the unsaturated zone.

Faculty: **Scott W. Tyler,** Desert Research Institute and the University of Nevada, Reno; Ph.D., University of Nevada, Reno. **Bridget R. Scanlon,** Research Scientist, Bureau of Economic Geology, University of Texas, Austin; Ph.D., University of Kentucky.

Limit: 30. Fee: $310, students $255; includes course manual and lunch. CEUs: 0.8.

Other Courses, Forums, and Workshops

More workshops appear under the K–16 Education Programs on p. 17.

Reactive Transport in Porous Media: General Principles and Application to Geochemical Processes.
Friday, October 25 through Sunday, October 27; Colorado School of Mines and Table Mountain Inn, Golden. Sponsored by *Mineralogical Society of America.*

Heat and mass transport coupled to the interaction of fluids and organisms with coexisting solids are responsible for most geochemical and biogeochemical phenomena. Examples of these phenomena include transport and containment of radioactive and toxic wastes, sediment diagenesis, petroleum migration and accumulation, metasomatic processes in metamorphic environments, and hydrothermal ore deposit formation. Efforts over the past few

years have successfully merged the approaches of hydrology and geochemistry, providing new quantitative tools to analyze the extent and consequences of coupled transport and reaction in multicomponent, multiphase, and multidimensional systems. This short course provides a comprehensive review of quantitative reactive transport modeling in geological and environmentally sensitive systems.

Emphasis will be on: (1) presentation of the governing physical and chemical equations, and (2) the practical application of this theoretical framework. The course will also include a one-day computer software jamboree at the Colorado School of Mines to allow for practical, hands-on instruction in the use of publicly available geochemical and biogeochemical modeling codes. Applications will illustrate coupling kinetically controlled water-rock interaction, solute speciation, and biological activity with advective-dispersive-diffusional transport in fluid phases to solving real geochemical transport problems ranging from environmental waste transport to metamorphism. The course will coincide with release of *Reviews in Mineralogy Volume 34, Reactive Transport in Porous Media: General Principles and Application to Geochemical Processes.*

Limit: 100. Fee: $320 MSA members, $380 nonmembers, $220 student member, $280 student nonmember. Registrations received before August 29 include the course banquet. For information and registration: MSA Business Office, 1015 Eighteenth Street, N.W., Suite 601, Washington, DC 20036-5023; (202) 775-4344, fax 202-775-0018, or the MSA WWW home page: http://geology.smith.edu/msa/ShortCourse/announ.html

Applications of Microanalytical Techniques to Understanding Mineralizing Processes.
Saturday, October 26 and Sunday, October 27; The Nature Place Resort, Florissant, Colorado. Sponsored by *Society of Economic Geologists.*

A two-day lecture course on the applications of state-of-the-art microanalytical techniques to understanding rock- and mineral-forming processes. Included will be techniques utilizing geochronology and radiogenic isotopes, stable isotopes, elemental analysis and fluid inclusions.

Limit: 86, minimum 35. Cost: professionals $425, students $325. Fees include lodging for two nights; all meals, including dinner and reception on Friday evening; coffee breaks; course volume; use of resort facilities. For information: Michael McKibben, Dept. of Earth Sciences, University of California, Riverside, CA 92521, (909) 787-3444, fax 909-787-4324, E-mail: michael.mckibben@ucr.edu,

Active stream erosion in the mountains of Colorado. Photo by Mark A. Koestel.

WWW:http://igpp2413a.ucr.edu/Course1.html. For registration (by August 25, 1996): W. C. Shanks III, U.S. Geological Survey, MS 973, Federal Center, Denver, CO 80225, (303) 236-2497, fax 303-236-3200, E-mail: pshanks@helios.cr.usgs.gov.

Systematics of Fluid Inclusions.
Saturday, October 26 and Sunday, October 27, 8:00 a.m. to 5:00 p.m.; Adams Mark Motel. Sponsored by *SEPM (Society for Sedimentary Geology)*.

The fluid inclusion literature is fraught with studies conducted by persons who are not aware of the limitations of fluid inclusion techniques. Once the limitations of a technique are understood, then it can become a powerful tool, and so it is with fluid inclusions. The main objective of this course is to train the participants how to structure their thought and how to make sound observations. It will be suitable for all geologists wishing to further their knowledge of fluid inclusions, from the aspiring research student to the professor who must critically evaluate papers and/or proposals involving fluid inclusion work. The course lectures on the first day will intensively treat the fundamental and working principles of fluid inclusion techniques. On the second day the applications of fluid inclusions as a geothermometer, geobarometer, and records of fluid composition in various disciplines ranging from metamorphic to sedimentary petrology, as well as minerals and petroleum exploration, will be covered.

Limit: 60. Fee: $290, includes short course notes and refreshment breaks. Preregistration required. For information and registration, contact: Judy Tarpley, Continuing Education and Meetings Coordinator, SEPM, 1731 E. 71st St., Tulsa, OK 74136-5108, (918) 493-3361, ext. 22, fax 918-493-2093, E-mail: cemeet@galstar.com.

Biology and Paleobiology of Corals.
Sunday, October 27, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *Paleontological Society*.

During the past 10 years, new information and ideas have emerged on living and fossil corals, which are the principal builders of reefs. This short course will explore current and relevant biological and paleobiological themes impacting on the principal calcified coral groups. It will also illuminate some important present and future research agendas as well as provide the latest ideas, discoveries, and theories on the evolution, biogeography, and taxonomy of the broad group we call the corals. This short course will offer details on groups of scleractinians, rugosans, and tabulate corals and will use research discoveries from living scleractinian corals to enhance our understanding of some of these Paleozoic groups.

An international faculty from five countries will be presenting up-to-date information and cutting-edge themes on such diverse topics as Cenozoic evolutionary patterns, morphometrics, biogeography, and Paleozoic groups. Carboniferous corals, the role of skeletal microstructure in taxonomy and evolution, the origin of scleractinian corals, geochemistry and stable isotope applications, mechanisms of evolution, molecular DNA studies, and computer applications will be presented, to foster better understanding and interpretation of living and ancient corals.

This course is designed for a wide audience, including students, professional paleontologists, geologists, and biologists, as well as educators seeking the latest information on living and fossil corals.

Faculty: Nancy Budd, Bernard Lathuiliere, Hannes Loeser, William A. Oliver, Jr., Sandra Romano, Ewa Roniewicz, James Sorauf, George Stanley, Peter K. Swart, J.E.N. Veron, Gregory Webb.

No fee or registration. Course notes will be available on site for $15. For information: George D. Stanley, Dept. of Geology, University of Montana, Missoula, MT 59812, (406) 243-5693, fax 406-243-4028, E-mail: fossil@selway.umt.edu.

Digital Database Forum.
Sunday, October 27, 2:00 to 5:00 p.m.; Colorado Convention Center. Sponsored by *Geoscience Information Society*.

The Digital Database Forum offers an opportunity to find out what is new in the area of digital data and information sources. Presentations by product representatives and demonstrations of the products are included in the Forum. These offer the participants an opportunity to learn about the content, search systems, and availability of information sources in a variety of electronic formats such as CD-ROM or on-line. Information on data sets that can be obtained from the Internet and used in Geographic Information Systems may also be included. Producers of electronic databases who are interested in participating in the Digital Database Forum should contact the organizer.

No fee or registration. For information: Vivienne Roumani-Denn, 230 McCone Hall, University of California, Berkeley, CA 94720, (510) 643-7041, fax 510-643-6576, E-mail: vroumani@library.berkeley.edu.

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

This year marks the fifth anniversary of educational programs at the GSA Annual Meeting, and we expect a hallmark year! GSA invites K–16 earth science teachers, graduate students, and scientists to an exciting program designed around dynamic earth science topics. A field trip, workshops, and technical sessions especially designed by and for K–16 teachers are offered. Workshops are hands-on and inquiry-based. Teachers are also encouraged to attend other symposia and theme sessions in the technical program as well as field trips throughout the meeting and to browse in the exhibits area.

The preregistration fee for K–12 teachers is $25. The on-site registration fee is $35. Appropriate ID is necessary. Preregistration for field trips and limited-enrollment events is required. For registration materials and additional information, contact the Educational Programs Department, GSA headquarters.

Field Trip

Denver to Leadville: Colorado's Mineral Resources and Mining History.
Saturday, October 26, 7:00 a.m. to 6:00 p.m. Geoff Snow, Barranca Resources, Golden, Colorado, (303) 278-1292. Minimum: 20. Maximum: 40. No fee. NOTE: K–12 teachers only.

This trip will first stop at Red Rocks amphitheater to set the geologic context of the Front Range and Denver Basin. The trip will continue through historic mining districts of the Colorado Mineral Belt—Idaho Springs, Dumont, Georgetown, and Silver Plume. We will describe the history of discovery and production of these districts so important to the growth of Colorado. Weather permitting, we will cross Loveland Pass (11,988 feet elevation). Leadville, elevation 10,000 feet, is home to one of the most prolific silver-producing districts in the country. In Leadville, we will visit the National Mining Hall of Fame and Museum. On the return to Denver we will stop for an overview of the geologically unique Climax molybdenum mine. Weather could be chilly and most likely windy.

Workshops

Dive into K–12 Geoscience Partnering with Project WET.
Saturday, October 26, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *GSA's Partners for Education Program (PEP)* and *Colorado Water Conservation Board's Colorado Project WET.*

For PEP members and other K–12 educators, geoscientists, and youth leaders. Build a rainstick, learn to use a ground-water model, experience a range of hands-on water education activities, and receive the Project WET K–12 curriculum and activity guide. More than 80 engaging Project WET activities cover atmospheric, surface, and ground-water resources, water quality, and water management and conservation. The activities range across K–12 subject areas including natural sciences and health, social sciences, math, language arts, and fine arts. Developed and tested by teachers, researchers, and students, Project WET helps meet national science standards and encourages critical thinking and problem solving. After this workshop, you will have access to K–12 modules, computer simulations, a water resources information network, and more.

Limit: 25. Cost: $5. Preregistration required. For information, Barb Mieras, PEP Manager, GSA headquarters, (303) 447-2020, ext. 182, E-mail: bmieras@geosociety.org.

Chief Mountain and Continental Divide. Photo by John Karachewski.

Exploring the Solar System in the Classroom: A Hands-On Approach.
Saturday, October 26, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *GSA Planetary Geology Division, National Aeronautics and Space Administration (NASA),* and *GSA's SAGE Program.*

This workshop will be an interactive, hands-on experience for K–12 teachers. Topics related to the geologic exploration of our solar system will be presented in a modular format, permitting maximum discussion and experimentation among the participants.

Limit: 100. Cost: $5. Preregistration required. For information: Cassandra Coombs, Dept. of Geology, College of Charleston, 66 George St., Charleston, SC 29424; (803) 953-8279.

NAGT–NSF Innovative and Effective Techniques for Teaching Geoscience.
Saturday, October 26, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *National Association of Geoscience Teachers* and supported by *National Science Foundation.*

Teaching can be a very rewarding experience, but effective teaching requires careful planning, creativity, and hard work. This workshop is designed to give participants practical advice and hands-on experience with the nuts and bolts of college teaching. Participants will learn how to design and deliver effective lectures and examine nontraditional teaching and assessment methods.

Limit: 40. No fee. Preregistration required. For information: Heather Macdonald, Dept. of Geology, College of William and Mary, Williamsburg, VA 23187, (804) 221-2469, E-mail: rhmacd@facstaff.wm.edu; Barbara Tewksbury, Dept. of Geology, Hamilton College, Clinton, NY 13323, (315) 859-4741, E-mail: btewksbu@hamilton.edu.

Introduction to Interpretation of Gravity and Magnetic Data in Exploration.
Saturday, October 26, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *GSA's SAGE Program.*

This lecture presentation will provide an applied view of gravity and magnetic interpretation in hydrocarbon exploration. Emphasis is on geological and tectonic analysis, which is portrayed by means of numerous real examples and short case histories from the USA, former USSR, South America, and elsewhere. Approaches to interpretation at scales ranging from prospects and fields to basins and continents are included, as well as philosophy and examples of modeling and other types of analysis. The program is abstracted from an oil-industry short course, and is designed for students interested in exploration careers, as well as those interested in tectonics of basins. Theory is minimal, and a previous geophysics course is not required.

Limit: 50. No fee. Preregistration required. For registration or information: Richard I. Gibson, Gibson Consulting, P.O. Box 523, Golden, CO 80402, (303) 278-0867, E-mail: rigibson@ix.netcom.com, WWW: http://www2.csn.net/~rigibson/gibcons2.html.

Culturally Integrated and Place-based Geoscience Education.
Saturday, October 26, 7:00 to 10:00 p.m.; Marriott City Center. Sponsored by *National Association of Geoscience Teachers* and *GSA's SAGE Program.*

One effective way of reaching students is to offer courses that incorporate the cultural perspectives of a particular group or that link geoscience to human events in a place of interest to that group. This is a useful strategy for all students, and it can be particularly useful for targeting underrepresented minorities in the geosciences (e.g., Native Americans and First Nations people, African Americans, Latinos, and Asian Islanders). Participants in this meeting will share their course development efforts, with the ultimate aim of defining a group of people interested in developing a book or CD-ROM to disseminate the materials from these courses.

No fee. Preregistration not required. For information: Barbara Tewksbury, Dept. of Geology, Hamilton College, Clinton, NY 13323; (315) 859-4713, fax 315-859-4807, E-mail: btewksbu@hamilton.edu.

Creating Pages for the World Wide Web.
Sunday, October 27, 8:30 a.m. to noon—Macintosh; 1:00 p.m. to 4:30 p.m.—PCs; Center for the Advancement of Technological Education (CATE) Lab, Laboratory for Atmospheric and Solar Physics (LASP), Boulder, Colorado. Sponsored by the *National Association of Geoscience Teachers.*

This hands-on computer workshop is designed for those who wish to design and create pages for publication on the World Wide Web. Participants will learn the basics of Hypertext Markup

Black Canyon of the Gunnison outside Gunnison, Colorado. Photo by Mark A. Koestel.

Language (HTML), the language of Web hypertext documents. The half-day workshop will include an overview of the World Wide Web, Uniform Resource Locators (URLs), introduction to HTML, basic structure of an HTML document, creating hypertext links to other documents, linking to other places within a document, and incorporating graphics, colors, and backgrounds. Each participant will prepare a Web page. Prior experience with a graphical Web browser (such as Netscape or Mosaic), and basic word processing skills are assumed.

Limit: 20 in each half-day session. Cost: $110. Preregistration required. For information: Pamela J. W. Gore, DeKalb College, Dept. of Geology, 555 N. Indian Creek Drive, Clarkston, GA 30021; (404) 299-4099; E-mail: pgore@dekalb.dc.peachnet.edu.

Geological Exploration of the Solar System: Methods and Current Status.
Sunday, October 27, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *GSA Planetary Geology Division, National Aeronautics and Space Administration,* and *GSA's SAGE Program.*

This workshop will be an interactive, hands-on experience for college-level educators and students. Topics and activities will include planetary geologic mapping, presentation of new Galileo results on the moons of Jupiter, and discussion of three missions to be launched to Mars by the end of the year.

Limit: 40. Cost: $10. Preregistration required. For information: Cassandra R. Coombs, Dept. of Geology, College of Charleston, 66 George St., Charleston, SC 29424, (803) 953-8279.

Learning from the Fossil Record.
Sunday, October 27, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center. Sponsored by *Paleontological Society* in collaboration with *Society of Vertebrate Paleontology, Cushman Foundation, Paleontological Research Institute, University of California, Berkeley Museum of Paleontology, Denver Museum of Natural History,* and *University of Wyoming Museum of Geology.*

This workshop for K–12 teachers will be presented by paleontologists and educators from across North America. There will be a general session followed by break-out groups for further discussion and hands-on activities. Each activity or focused topic will be related to the National Standards for Science Education. Complimentary admission to the Prehistoric Journey exhibit at the Denver Museum of Natural History will be provided for the first 200 registrants. One-half recertification credit will be given to teachers in Colorado.

Limit: 300. Cost: $10. Preregistration recommended. For information: Judy Scotchmoor, University of California, Berkeley, Museum of Paleontology, Berkeley, CA 94720, (510) 642-4877; Richard Stucky, Denver Museum of Natural History, 2001 Colorado Blvd., Denver, CO 80225, fax (303) 331-6492; Ken McKinney, Dept. of Geology, Appalachian State University, 118 Rankin Science Building, Boone, NC 28608, (704) 262-2748.

End-of-Program Assessment in Geoscience Departments.
Sunday, October 27, 1:00 to 5:00 p.m.; Colorado Convention Center. Sponsored by *GSA's SAGE Program.*

End-of-Program Assessments are a feedback mechanism to help a faculty answer the question: Does our educational program produce the results we are seeking? The answer is then used to improve the program. Participants will study examples of various assessment methods. Experience with assessments is not required. Participants who bring departmental information will plan assessments, or improve assessments, for their departments.

Limit: 50. Cost: $5. Preregistration required. For information: Dean A. McManus, School of Oceanography, University of Washington, Box 357940, Seattle, WA 98195-7940, (206) 543-0587; E-mail: mcmanus@ocean.washington.edu.; Internet: http://www.ocean.washington.edu/people/faculty/mcmanus/eop/eop.htm.

Preparing Successful Grant Proposals to Fund Geoscience Education Projects.
Sunday, October 27, 1:00 to 5:00 p.m.; Colorado Convention Center. Sponsored by *National Association of Geoscience Teachers* and *National Science Foundation.*

Learn about NSF programs that fund innovative instructional approaches in the sciences, discover the kinds of ideas that have worked well in the past (and those that have not), understand NSF's review procedures, and learn how to construct a successful proposal. The focus will be on undergraduate education programs, including Course and Curriculum Development, Undergraduate Faculty Enhancement, and Instrumentation and Laboratory Improvement. Information will also be available on programs for K–12 curricula and teacher preparation. Participants will examine actual funded proposals, learning to recognize positive features that characterize outstanding proposals and fatal flaws that kill others. A panel discussion featuring successful participants in NSF's educational programs will solidify understanding of qualities that can make or break a proposal. Bring concerns for necessary improvements in your curriculum, and leave with

concrete ideas about how to get the funding you need.

Limit: 75. No fee. Preregistration recommended. For information: David Mogk, Division of Undergraduate Education, National Science Foundation, Room 835, 4201 Wilson Blvd., Arlington, VA 22230, (703) 306-1669, ext. 5883, E-mail: dmogk@nsf.gov.

Project Atmosphere.
Monday, October 28, 8:30 to 10:00 a.m.; Hyatt Regency. Sponsored by *GSA's SAGE Program* and *Colorado Earth Science Network.*

The sky's the limit! Join Project Atmosphere's Resource Agents in hands-on meteorology activities that will enhance your background and provide new ideas to take into the classroom. All activities and materials provided by Project Atmosphere.

Limit: 40. No fee. Preregistration preferred. For information: Sharon Stroud, 1706 Russell Circle, Colorado Springs, CO 80915; (719) 596-0037.

Project Image.
Monday, October 28, 10:30 a.m. to noon; Hyatt Regency. Sponsored by *GSA's SAGE Program.*

Learn how Earth images can be used to enrich earth science studies and integrated environmental science, math, and geography without computers. Participants will take home an activity and images.

Limit: 40. No fee. Preregistration preferred. For information: Sharon Stroud, 1706 Russell Circle, Colorado Springs, CO 80915; (719) 596-0037.

Mapping Your Way into the Future with the U.S. Geological Survey Education Outreach Program.
Monday, October 28, 1:00 to 5:00 p.m.; Hyatt Regency. Sponsored by *U.S. Geological Survey* and *GSA's SAGE Program.*

The USGS education outreach program provides a means of connecting science teachers with the nation's largest scientific agency. This program includes the production of numerous computerized spatial data sets suitable for use in classroom geographic information systems, real-time scientific data on the Internet, sets of teacher lessons on a variety of science topics, and a wide variety of maps, posters, and other publications that are useful to teachers. Through this computerized and hands-on presentation, attendees will understand the extent of the available resources and how to connect with the outreach program. They will be able to see different standards-based educational lessons that use geographic information systems (GIS) software. They will discover how to arrange for in-class presentations by USGS scientists and consultations for implementation of GIS. They will receive items that will serve as examples of the information the USGS provides.

Limit: 50. No fee. Preregistration is recommended. For information: Joseph Kerski, USGS, Box 25046, MS 516, Denver, CO 80225-0046; (303) 202-4315, E-mail: jkerski@denlab0.cr.usgs.gov.

Earth Science Information "Share-A-Thon" for K–16 Educators
Monday, October 28, 4:00 to 5:30 p.m.; Colorado Convention Center.

The share-a-thon is designed to promote the sharing of teacher-developed earth science materials and ideas with other educators. Teachers are invited to present earth science activities that they have successfully used in the classroom. Presenters will be stationed so that participants can circulate freely. Each station will have explanatory materials available. *Registration required only for presenters.* To be a presenter, check the appropriate box on the GSA Registration Form in this issue.

Rock Raffle
Monday, October 28, 4:00 to 5:30 p.m.; Colorado Convention Center.

Outstanding specimens of rocks, minerals, and fossils could be yours! Come to the Rock Raffle and bid on your favorite sample. All proceeds go to the National Earth Science Teachers Association.

Geoscience Curricula for the 21st Century.
Tuesday, October 29, 7:00 to 9:00 p.m.; Hyatt Regency. Sponsored by *National Association of Geoscience Teachers* and *Geoscience Education Division.*

What should all undergraduate students (non-majors and majors) know and be able to do in the geosciences as we enter the 21st century? Join us in a lively, participatory discussion of how different departments and individual faculty are addressing this issue and what effect the new National Science Education Standards (K-12) may have on undergraduate geoscience education.

For information: Edward E. Geary, Coordinator for Educational Programs, GSA headquarters, (303) 447-2020, ext. 195 or 145, E-mail: egeary@geosociety.org.

Symposia and Theme Sessions

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

Interdisciplinary Strategies for Teaching About Earth as a System.
See Invited Papers, Symposium S6, page 4.

Earth Systems Education: K–16.
See Invited Papers, Symposium S10, page 4.

Recent Advances in Plate Tectonics—What Students Should Know.
See Invited Papers, Symposium S11, page 5.

Improving Geoscience Courses Through the Use of the Internet and the World Wide Web.
See Volunteered Papers, Theme Topic T54, page 10.

Roles of Multiple Intelligences and Creativity in Teaching, Learning, and Doing Geoscience.
See Volunteered Papers, Theme Topic T55, page 10.

When Plates and People Collide—Teaching About Human-Tectonics Interactions.
See Volunteered Papers, Theme Topic T56, page 10.

National Parks as Classrooms for Geoscience Education.
See Volunteered Papers, Theme Topic T57, page 10.

Linking Natural and Social Systems in Geoscience Education: Pedagogy, Content, and Context.
See Volunteered Papers, Theme Topic T60, page 11.

Social Events

Geoscience Education Division Breakfast
Monday, October 28, 7:00 to 8:30 a.m.; Marriott City Center.

NAGT Luncheon
Monday, October 28, 11:30 a.m. to 2:00 p.m.; Marriott City Center.

Earth Science Educators and PEP Members Social Hour
Monday, October 28, 4:00 to 5:30 p.m.; Colorado Convention Center.

Field Trips

All trips begin and end in Denver at the Colorado Convention Center, Lobby B, *unless otherwise indicated.* If you register for *only* a field trip, you must pay a $35 nonregistrant fee in addition to the field trip fee. This fee may be applied toward meeting registration if you decide to attend the meeting.

Students, spouses, and interested guests are cordially encouraged to attend. Trips are technical in nature, and some can be physically rigorous. Participants should be prepared for wet, cold weather. Trips are one to five days in duration and led by active field researchers. *Minimum registration for field trips is 12 unless otherwise stated.*

Student field trip participants from *local* colleges may apply for financial support from the *Colorado Scientific Society* to attend field trip numbers 1, 8, 10, 11, 12, 13, 18, 24, 25, 26, 27, 28, and 29. Contact Karl Kellogg, U.S. Geological Survey, Box 25046, MS 913, Federal Center, Denver, CO 80225, (303) 236-1305; fax 303-236-4930; E-mail: kkellogg@greenwood.cr.usgs.gov; or Mark Hudson, (303) 236-7446; E-mail: mhudson@ardneh.cr.usgs.gov.

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

Some returning buses for postmeeting trips can stop at the Denver International Airport to discharge participants who have evening flights or would prefer to spend the night in a motel closer to the airport. Participants are cautioned against scheduling any tight travel connections with field trip return times, because those times are estimates, and delays in the field can occur. For a list of hotels near the airport and their phone numbers, contact Edna Collis, GSA Field Trip Coordinator, GSA Headquarters, E-mail: ecollis@geosociety.org.

Preregistration deadline is September 20. **Cancellation deadline is September 27.** No refunds will be given after this date. If GSA must cancel a field trip because of logistics or if minimum registration requirements are not met, a full refund will be issued to you after the meeting. Be aware of flight-change penalties imposed by the airlines. Plan alternatives in advance should the trip you are registered for be canceled.

For further information, contact the trip leader or the 1996 Field Trip Co-Chairs Charles L. Pillmore and Ren A. Thompson, U.S. Geological Survey, Box 25046, Federal Center, MS 913, Denver, CO 80225-0046, (303) 236-1240 or (303) 236-0929, E-mail: cpillmor@ardneh.cr.usgs.gov; or rathomps@usgs.gov, fax 303-236-0214.

NEW—*This year GSA and the 1996 field trip guidebook sponsor, the Colorado Geological Survey, are producing the guidebook on CD-ROM. Field trip participants will receive a CD-ROM, containing* ***all*** *the trip guides, and a paper copy of the particular field trip(s) for which they have registered, to use in the field. A limited number of* ***bound paper volumes of all the trips*** *may be available at the meeting, and later through the Colorado Geological Survey, at an additional cost.*

PREMEETING

1. **The Absaroka Range: A Fifty-Million-Year Fascination with Gravity, North-Central Wyoming.** Wednesday, October 23 through Saturday, October 26. David Malone, Dept. of Geography-Geology, Illinois State University, Normal, IL 61790-4400, (309) 438-2692; E-mail: dhmalon@istu.edu; Kent Sundell, and Thomas Hauge. This trip originates and ends in Cody, Wyoming. Maximum: 26; minimum: 20, Cost: $350 (3B, 3L, 2D, R, 3ON, vans). *Several 2+ mile hikes with rigorous climbs are planned.*

   This trip will examine the numerous gravity detachment structures and large-scale mass movement deposits that occur in the eastern Absaroka Range, including the Heart Mountain Detachment, the Reef Creek fault, the Deer Creek Member of the Wapiti Formation, the South Fork fault, in situ liquefaction domains, the Enos–Owl Creek Detachment, and the Castle Rocks Chaos. For each of these features, we will emphasize its respective geometry, internal structure, age, origin, emplacement mechanism, and kinematic pattern. We will visit both classic and newly described "off the beaten path" localities and discuss the present level of understanding. Our base will be the Double Diamond X guest ranch in the beautiful South Fork Shoshone River valley.

2. **Geology of the Solitario Dome, Laccolith, and Caldera System, Trans-Pecos Texas.** Wednesday, October 23 through Sunday, October 27. Chris Henry, Nevada Bureau of Mines and Geology, University of Nevada, MS 178, Reno, NV 89557-0088, (702) 784-6691; E-mail: chenry@nbmg.unr.edu; William Muehlberger, University of Texas at Austin. This trip originates and ends in El Paso, Texas. Maximum: 28; minimum: 10. Cost: $300 (4B, 4L, 3D, R, 4ON, additional guidebook, vans). *Three nights and meals will be in a lodge at the Big Bend Ranch State Natural Area.*

   The Solitario, a circular, 14–16-km-diameter, mid-Tertiary laccolithic dome and caldera in southern Trans-Pecos Texas, is among the world's largest laccoliths. The Solitario underwent sill, dike, and laccolith injection; doming; ash-flow eruption; caldera collapse; and intracaldera volcanism and sedimentation. Detailed mapping and $^{40}Ar/^{39}Ar$ dating demonstrate that activity occurred in three pulses: (1) intrusion of abundant rhyolitic to trachytic sills, dikes, and small laccoliths at about 36.0 ma; (2) emplacement of the main laccolith, ash-flow eruption, and caldera collapse at 35.4 Ma; and (3) intrusion of several small laccoliths and dikes at 35.0 Ma.

3. **A New Look at the Laramide Orogeny in the Seminoe and Shirley Mountains, Freezeout Hills, and Hanna Basin, South-Central Wyoming.** Thursday, October 24 through Sunday, October 27. Arthur Snoke and Jason Lillegraven, Dept. of Geology and Geophysics, University of Wyoming, Laramie, WY 82071-3006, (307) 766-5457; E-mail: snoke@uwyo.edu. Maximum: 24. Cost: $245 (3B, 3L, 0D, R, 3ON, 4x4s in the field, vans).

   On this trip we will introduce a new interpretation of the Laramide orogeny as it developed within a classic area of basement-involved deformation in south-central Wyoming. We will emphasize implications of new geologic mapping and biostratigraphic discoveries to interpretations of tectonic style and multiphasic timing of interactions between complex uplifts and a basinal margin. Specifically, the trip will focus upon the greatly deformed, enormously thick northern rim of the Hanna Basin adjacent to the southern flank of the southeast-plunging Sweetwater uplift (including the eastern Seminoe Mountains,

southern Shirley Mountains, southern Freezeout Hills, and Oil Springs–Flat Top anticlines). We will visit recently discovered examples of Laramide, large-scale out-of-the-basin thrusts, complex fault systems having components of right-lateral separation on the scale of kilometers, and basin-margin synformal anticlines. Lodging will be in the historic Virginian Hotel, in the heart of Wyoming's greater Medicine Bow metroplex.

4. **Hayden's Lakes Revisited: The Origin and New Stratigraphic Interpretations of the White River Sequence, South Dakota, Nebraska, and Wyoming.** Thursday, October 24 through Sunday, October 27. Emmett Evanoff, University of Colorado Museum, Campus Box 315, Boulder, CO 80309-0315, (303) 492-8069; E-mail: evanoff@colorado.edu; Rachel Benton, Dennis Terry, and Hannan LaGarry. Maximum: 24; minimum: 15. Cost: $230 (0B, 4L, 0D, R, 3ON, vans).

This trip focuses on the origin and history of the late Eocene and Oligocene White River sequence of southwest South Dakota, northwest Nebraska, and east-central Wyoming. Once thought by 19th century geologists to have been deposited in a vast lake, the White River is now interpreted to have been deposited primarily by fluvial and eolian processes. The trip will include stops in southwest South Dakota to discuss new stratigraphic units, northwest Nebraska to discuss regional correlations, and near Douglas, Wyoming, where the White River sequence overlaps the Laramie Mountains. Highlights of the trip will include examination of fluvial and eolian features, including paleovalley fills, exhumed channel deposits, loess deposits, the origin of the volcaniclastic sediment, and new stratigraphic units and their correlations between the classic outcrops in southwest South Dakota and northwest Nebraska.

5. **Permian-Triassic Deposystems, Paleogeography, Paleoclimate, and Hydrocarbon Resources in Canyonlands and Monument Valley, Southeastern Utah.** Thursday, October 24 through Sunday, October 27. Cosponsored by *Sedimentary Geology Division*. Russ Dubiel, U.S. Geological Survey, Box 25046, MS 939, Federal Center, Denver, CO 80225, (303) 236-1540; E-mail: rdubiel@sedproc.cr.usgs.gov; Jacqueline Huntoon, and John Stanesco. Maximum: 24; minimum: 13. Cost: $280 (0B, 4L, 0D, R, 3ON, vans)

ATTENTION STUDENTS: The Sedimentary Geology Division will SUBSIDIZE ALL STUDENTS WHO ARE VALID DIVISION MEMBERS. STUDENTS MUST PAY THE FULL FIELD TRIP FEE when registering, but will be reimbursed $100 after the GSA meeting by the Sedimentary Geology Division. To be reimbursed, students must apply in writing to Rebecca J. Dorsey, Dept. of Geology, Box 4099, Northern Arizona University, Flagstaff, AZ 86011, (520) 523-9399; E-mail: r.dorsey@nau.edu.

This trip examines Pennsylvanian to Jurassic strata in the Paradox Basin on the Colorado Plateau in the Canyonlands of Utah, and will focus on Permian-Triassic stratigraphy, depositional systems, and paleogeography. The Paradox Basin was formed in Middle Pennsylvanian time and continued as a major site of deposition through the Permian, accumulating as much as 15,000 ft (5000 m) of Pennsylvanian and Permian evaporite, shale, limestone, and continental strata. We will follow depositional facies from proximal continental settings near the ancestral Rocky Mountains to distal marine facies within the Paradox Basin, and discuss the evolution of these systems from the late Paleozoic to the early Mesozoic, a key period for Pangean paleogeographic and paleoclimatic reconstructions. We will concentrate on unconformities and the effects of sea-level changes and salt diapirism, and integrate depositional sequences of red beds with paleoclimate interpretations and hydrocarbon resources.

6. **Proterozoic Magmatism in Southeastern Wyoming: Evidence for the Cogenetic Relationship Between Anorthosites and Rapakivi Granites, Laramie Mountains, South-Central Wyoming.** Thursday, October 24 through Sunday, October 27. Ronald Frost, Dept. of Geology and Geophysics, University of Wyoming, Laramie, WY 82071-3006, (307) 766-4290; E-mail: rfrost@uwyo.edu; Carol D. Frost, Ken Chamberlain, Donald H. Lindsley, and James S. Scoates. Maximum: 40; minimum: 20. Cost: $240 (0B, 3L, 2D, R, 3ON, 4x4's in the field, and bus).

This trip will examine the various plutons that were emplaced during the 1.75 Ga and 1.43 Ga magmatic events in southeastern Wyoming. We will visit the 1.75 Ga Horse Creek Anorthosite, the oldest anorthosite body in North America. We will also visit many plutons within the 1.43 Ga Laramie anorthosite complex. We will visit some late-stage ferrodiorite bodies and discuss their role in the formation of Fe-Ti oxide bodies and the ferromonzonite plutons that ring the complex. As an example of one of these plutons, we will examine the various phases of the Sybille monzosyenite. We will also visit the contact aureole of this pluton, where temperatures in excess of 800 °C produced distinctive mineral assemblages in the adjacent country rocks. Finally we will visit several sites in the Sherman Granite, a coeval anorogenic granitic batholith that intrudes the Laramie anorthosite complex.

7. **Synchronous Oligocene and Miocene Extension and Magmatism in the Vicinity of Caldera Complexes in Southeastern Nevada.** Thursday, October 24 through Saturday, October 26. Robert Scott, U.S. Geological Survey, Box 25046, MS 913, Federal Center, Denver, CO 80225, (303) 236-1230; E-mail: rbscott@usgs.gov; Peter Rowley, Lawrence Snee, Ernest Anderson, Anne Harding, Daniel Unruh, David Nealey, and Dawna Ferris. One night camping. This trip originates and ends in Las Vegas, Nevada. Maximum: 24; minimum: 15. Cost: $180 (1B, 3L, 1D, R, 2ON, 4x4 vans).

Turn-of-the-century mining structure near Marble, Colorado; water power drove some of the equipment. Photo by Mark A. Koestel.

This trip will examine evidence of synchronous extension and magmatism related to Miocene caldera complexes in southeastern Nevada. In the first half day, we will see growth fault relations near the 17–14 Ma Kane Springs Wash caldera complex. Then, through the second day, we will observe normal-, oblique-, and strike-slip extensional faults synchronous with magmatism in the 23–13 Ma Caliente caldera complex, explore the practical results in the Delamar gold district, and camp at the infamous Delamar ghost town, where an archeologist will interpret the historical significance of the site. On the last day, we will examine differences in style and timing of extensional deformation in the arched North Pahroc Range.

8. **Geology and Geologic Hazards of the Glenwood Springs Area, Central Colorado.**
Friday, October 25 through Sunday, October 27. Robert Kirkham, Colorado Geological Survey, 1313 Sherman St., Denver, CO 80203, (719) 588-1280; Bruce Bryant, Randy Streufert, and Ralph Shroba. Maximum: 30; minimum: 15. Cost: $180 (0B, 3L, 0D, R, 2ON, vans).

Glenwood Springs is a rapidly growing mountain community situated at the boundary between the southern Rocky Mountains and the Colorado Plateau. This trip will provide a general overview of the fascinating and complex geology of the area, with emphasis on the Paleozoic Eagle Basin; Laramide White River Uplift and Grand Hogback Monocline; and Neogene tectonic, volcanic, diapiric, and geomorphic history. Geohazards afflicting the area include landslides, debris flows, rockfalls, swelling and collapsing soils, sinkholes, and earthquakes.

9. **Geology of the Western San Juan Mountains and a Tour of the San Juan Skyway, Southwestern Colorado.**
Friday, October 25 and Saturday, October 26. Robert W. Blair, Jr., Dept. of Geology, Fort Lewis College, Durango, CO 81301, (970) 247-7263; E-mail: blair_r@fortlewis.edu; Jack Campbell, Jack Ellingson, and Doug Brew. This trip originates and ends in Durango, Colorado. Maximum: 42; minimum: 30. Cost: $150 (0B, 2L, 0D, R, 1ON, additional guidebook, bus).

This trip is designed for people who know little about the geology of southwestern Colorado. We will consider the general geology, including the beautifully exposed sedimentary section and Precambrian suite between Durango and Ouray, and especially the volcanic history, ore deposits, and geomorphology. The evening discussion after the first day will take place in the Ouray hot springs. On the second day the trip continues to Telluride and back to Durango to examine glaciated mountains, three distinct ecosystems, and Anasazi ruins. Be prepared for short walks, great scenery, and unpredictable fall mountain weather.

10. **Sequence Stratigraphy of the Muddy Sandstone and Equivalent Rocks from North-Central Colorado to Northeastern New Mexico.**
Friday, October 25 through Sunday, October 27. Cosponsored by *Sedimentary Geology Division*. John Holbrook, Dept. of Geosciences, Southeast Missouri State University, Cape Girardeau, MO 63701, (314) 651-2348; E-mail: c127sce@semovm.semo.edu; Frank Ethridge, Colorado State University, Fort Collins. Maximum: 24; minimum: 13. Cost: $180 (0B, 3L, 0D, R, 2ON, vans).

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This trip will illustrate effects of subtle tectonics, eustasy, basin physiography, and other factors on regional stratal architecture of Lower Cretaceous continental-interior sequences. We will examine an extensive intra-valley fill sequence boundary within Muddy Mountains strata, sequence stratigraphy and ichnofauna at a "dinosaur freeway" tracksite, and Tertiary volcanics at Capulin Mountain National Monument.

11. **Kinematics of the Slumgullion Landslide, Lake City, Colorado.**
Saturday, October 26 and Sunday, October 27. Robert Fleming, Bill Savage and Rex Baum, U.S. Geological Survey, Box 25046, MS 972, Federal Center, Denver, CO 80225, (303) 273-8603; E-mail: fleming@gidvxa.cr.usgs.gov. Maximum: 24; minimum: 15. Cost: $125 (0B, 2L, 0D, R, 1ON, vans). *Participants should be prepared for wet, cold weather and rugged hiking conditions.*

This trip to the Slumgullion landslide will focus on the deformational structures expressed in the active landslide and on their relevance to understanding the kinematics of movement. Continuous sliding for more than 100 years has produced an amazing array of deformational features including basins, grabens, thrust faults, and other structures associated with strike-slip faulting such as flank ridges, clay intrusions, and steps. These and other features will be examined as part of a day-long walk from the head to the toe of the landslide. Structural geologists interested in landslide analogs to larger geologic structures and engineering geologists interested in the significance of fractures and structures to landslide mechanics will find this trip informative.

12. **Petroleum System, Sequence Stratigraphy, Wrench Faulting, and Reservoir Compartmentalization, Central Denver Basin, Colorado.**
Saturday, October 26. Bob Weimer, Dept. of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401-1887, (303) 273-3818; Stephen A. Sonnenberg. Maximum: 40; minimum: 30. Cost: $55 (0B, 1L, 0D, R, bus).

Components of the petroleum system for the central Denver Basin can be observed in outcrop and subsurface by examining Cretaceous strata. These include source, reservoir, and seal rocks related to trap formation. Reservoirs can be characterized as to origin, distribution, and diagenesis and related to sequence stratigraphy. The timing of the petroleum charge can be reconstructed from the thermal and burial history of the basin. This trip will visit Cretaceous outcrops of the petroleum-productive formations and describe their distribution in the subsurface.

13. **Laramide Orogeny and Cenozoic Erosional History, Front Range and Denver Basin, Colorado.** Sunday, October 27. Bob Weimer, Dept. of Geology and Geological Engineering, Colorado School of Mines, Golden, CO 80401-1887, (303) 273-3818. Maximum: 40; minimum: 30. Cost: $55 (0B, 1L, 0D, R, bus).

The Denver basin—Front Range couplet is one of the best localities in the southern Rocky Mountains to study the record of the Laramide orogeny (Late Cretaceous–Early Tertiary). On this trip we will visit outcrops to observe and discuss the following: depositional history of the latest Cretaceous in the Denver basin; conglomerates and volcanic events recording early history of uplift; recurrent movement on wrench faults deforming the Front Range and the Denver basin; mountain flank deformation by folding and thrust faulting; Eocene beveling of the Front Range by a widespread erosional surface; and post-Eocene uplift history.

Half Day—
Concurrent with the Meeting

These half-day trips are presented concurrently with the meeting. Trips 14, 15, and 16 are sponsored by the *Colorado Scientific Society.*

14a/b. **Geology Tour of Denver Buildings and Monuments.** Monday, October 28, or Wednesday, October 30, 1:00 to 5:00 p.m. Cosponsored by *Archaeological Geology Division.* Jack Murphy, Denver Museum of Natural History, (303) 370-6355. Maximum: 40 (each trip). No fee.

This downtown Denver walking tour will examine the various building stones and related geological and historical aspects of local landmarks. The emphasis is on the splendid historical buildings made of native rhyolite, granite, marble, and sandstone during the 1880s and 1890s, when wealth from gold and silver mining in Colorado mining camps reached its peak. Some of the buildings on the tour include the Kittredge Building, Masonic Temple, Boston Building, Trinity United Methodist Church, and Brown Palace Hotel. The two-hour tour is open-ended: individuals can return to the Convention Center on their own, or continue farther and perhaps choose to eat at one of the local establishments. The field trip guide, *Geology Tour of Denver's Buildings and Monuments,* by Jack A. Murphy, published by the Colorado Geological Survey ($8.95), will be available at the meeting.

15a/b. **Dinosaur Ridge and Reconnaissance Along Alameda Parkway.** Tuesday, October 29, 7:30 to 11:30 a.m., or Thursday, October 31, 1:00 to 5:00 p.m. Frank Adler, Glen Scott, and Norb Cygan, Retired Geologists, Friends of Dinosaur Ridge. Maximum: 40 (each trip). Cost: $10. *Walking shoes and personal water bottles recommended.*

Geologic reconnaissance along Alameda Parkway (including Dinosaur Ridge) and a stop in Red Rocks Park for a regional geologic discussion. This trip also includes a stop in Turkey Creek Canyon to examine a live oil seep, a fault, and a textbook example of a uranium occurrence.

16a/b. **Proterozoic Crystalline Rocks of Clear Creek Canyon.** Tuesday, October 29, 1:00 to 5:00 p.m., or Thursday, October 31, 7:30 to 11:30 a.m. Jack Reed, U.S. Geological Survey, Box 25046, MS 913, Federal Center, Denver, CO 80225, (303) 236-1276; Bruce Bryant, Lawrence W. Snee, and Colin Shaw. Maximum: 40 (each trip). Cost: $10.

Crystalline rocks of the Proterozoic Colorado province in spectacular exposures in historic Clear Creek Canyon just west of Denver. This brief trip will provide an opportunity to review the principal lithologic units in the amphibolite to granulite facies metamorphic sequence, to examine some of the prominent structural elements and tectonics, and to discuss the metamorphic history, including the significance of new Ar-Ar mineral ages.

17a/b. **Tour of the U.S. Geological Survey Mapping and Geologic Facilities, Denver Federal Center.** Tuesday, October 29, 12:30 to 5:00 p.m. or Wednesday, October 30, 12:30 to 5:00 p.m. Pete Modreski, U.S. Geological Survey, Box 25046, MS 915, Federal Center, Denver, CO 80225, (303) 236-5639; Joseph Kerski. Maximum: 25 (each trip). No fee.

The Denver Federal Center is the headquarters for geologic mapping and water resource activities of the 15-state Central Region of the U.S. Geological Survey. The tour will include the Rocky Mountain Mapping Center, where 400 professionals use GIS and image processing systems to create computerized and paper maps, and store over 100 million maps and publications to serve customers; the Earth Science Information Center (ESIC); the National Ice Core Laboratory, where 30,000 feet of polar ice core are stored, allowing analysis of climate and weather variations for the past 250,000 years; and the Core Research Center, where more than 1.4 million linear feet of drill core constitute one of this nation's largest rock libraries.

Postmeeting

NEW—*This year GSA and the 1996 field trip guidebook sponsor, the Colorado Geological Survey, are producing the guidebook on CD-ROM. Field trip participants will receive a CD-ROM, containing* ***all*** *the trip guides, and a paper copy of the particular field trip(s) for which they have registered, to use in the field. A limited number of* ***bound paper volumes of all the trips*** *may be available at the meeting, and later through the Colorado Geological Survey, at an additional cost.*

18. **Dunes, Rivers, Lakes, and Wetlands: Tales from the Nebraska Sand Hills of Western Nebraska.** Thursday, October 31 through Saturday, November 2. James Swinehart, 113 Nebraska Hall, University of Nebraska, Lincoln, NE 68588-0517, (402) 472-7529; E-mail: jbs@unlinfo.unl.edu; David Loope, Dan Muhs, and Tom Winter. Maximum: 30; minimum: 16. Cost: $190 (0B, 2L, 0D, R, 2ON, vans).

This visit to the largest sand sea in the Western Hemisphere will emphasize the history of interaction among eolian, fluvial, lacustrine, and wetland depositional systems and processes during the past 13,000 years. New data on the sources of dune sand and the record of eolian activity will be featured, along with a demonstration of Vibracoring in a peatland containing interbedded eolian sand beds. We will also explore the unique hydrology of lakes and peatlands in a dune landscape.

19. **Evidence for Early Proterozoic Reworking of Archean Rocks in the Central Laramie Mountains, Southeastern Wyoming.** Thursday, October 31 through Sunday, November 3. Robert Bauer, 101 Geological Sciences, University of Missouri, Columbia, MO 65211, (573) 882-6785; E-mail: geoscrlb@showme.missouri.edu; Kevin Chamberlin, Art Snoke, and Ron Frost. Maximum: 30; minimum: 15. Cost: $240 (0B, 3L, 2D, R, 3ON, vans).

This trip will visit outcrops that provide evidence for multiple periods of ductile deformation and reworking of the Wyoming Archean craton at mid-crustal levels during the Cheyenne Belt collision and the Trans-Hudson orogeny. We will examine deformation features that formed during these events as well as critical dated rock units and their relation to deformation features and fabrics that indicate the timing of deformation.

20. **Hydrogeology of the San Luis Valley and Summitville Mine, South-Central Colorado.** Thursday, October 31 through Saturday, November 2. Isobel McGowan, Shepherd Miller, Inc., 2460 W. 26th Ave., Denver, CO 80211, (303) 477-5338; E-mail: imcgowan@shepmill.com; Doug Cain, Alan Davey, and Kathy Smith. Maximum: 24. Cost: $200 (0B, 2L, 0D, R, 2ON, vans).

The San Luis Valley of Colorado is about 150 miles long and is bounded on the east by the uplifted Sangre de Cristo Range and on the west by the volcanic San Juan Mountains. The Summitville mine on the western margin of the valley is an open-pit gold mine that used cyanide heap-leach techniques, resulting in acidic and metal-laden drainage. This trip will focus on the ground-water resources of the San Luis Valley, and on the environmental challenges downstream from the Summitville Mine.

Exfoliation in Precambrian granitic rocks, Longs Peak, Rocky Mountain National Park, Colorado. Photo by John Karachewski.

21. **Jemez Volcanic Field and Valles Caldera–Middle Rio Grande Rift.** Thursday, October 31 through Sunday, November 3. Dave Sawyer and Ren Thompson, U.S. Geological Survey, Box 25046, MS 913, Federal Center, Denver, CO 80225, (303) 236-1021; E-mail: rathomps@usgs.gov; Fraser Goff, Steve Reneau, Jamie Gardner, Scott Baldridge, and Dave Broxton, Los Alamos National Laboratory. Maximum: 36; minimum: 16. Cost: $300 (0B, 3L, 1D, R, 3ON, additional guidebook, vans).

This trip will provide an opportunity to evaluate evidence for newly dated young rhyolite volcanism (< 60 ka) and active geothermal systems in the southwest moat of the Valles caldera. We will examine seismic data indicating active hot magma beneath the Valles caldera and review recent work on the Bandelier tuff on the Pajarito Plateau. We will visit localities documenting Quaternary and Pliocene landscape evolution along the Rio Grande and the interaction of the river system with Cerros del Rio basalt volcanism.

22. **Cretaceous-Tertiary Boundary in the Southern Peninsula of Haiti.** Friday, November 1 through Sunday, November 3. Florentine Maurrasse and Gautam Sen, Dept. of Geology, Florida International University, Miami, FL 33199, (305) 348-2350; E-mail: maurrass@fiu.edu. This trip will originate and end in Miami and will depend on the political conditions in Haiti at the time of the meeting. Maximum: 21; minimum: 14. Cost: $250 (2B, 3L, 2D, R, 2ON, vans).

The southern peninsula of Haiti represents an uplifted fragment of the Caribbean oceanic crust with facies identical to those recovered from drill cores in the adjacent Caribbean deep sea. The peninsula also includes some of the best exposed and easily accessible outcrops of the boundary layer marking the end of the Cretaceous and the impact event in the Caribbean area.The Haitian Cretaceous-Tertiary boundary layer is one of the thickest and contains some of the largest tektites related to the ejecta. On van trips across the southern peninsula we will examine the local geology and various exposures of the K-T boundary marker bed where the complexity of the depositional processes associated with the event can be seen.

23. **Depositional Environments of Codell–Juana Lopez Sandstones and Regional Structure and Stratigraphy of Cañon City and Huerfano Areas and Northern Raton Basin, South-Central Colorado.**
Friday, November 1 through Sunday, November 3. Paul Krutak and Kenneth Neuhauser, Dept. of Geosciences, Fort Hays State University, 600 Park St., Hays, KS 67601-4099, (913) 628-5389; E-mail: gspk@fhsuvm.fhsu.edu. Maximum: 24; minimum: 11. Cost: $175 (0B, 3L, 0D, R, 2ON, vans).

This field seminar analyzes the surface distribution and depositional environments of the Codell–Juana Lopez sandstones in the underexplored Cañon City and northern Raton and Huerfano basins. These rocks were the object of an intensive oil and gas play (1981–1984) in the Denver basin, and they are superbly exposed at the surface in southern Colorado. On the first day, we will examine the Colorado Springs area (Louisiana State University Field Station, North Cheyenne Canyon, Gold Camp Road, Manitou Springs, Garden of the Gods). The second day covers Cañon City and its environs (Four Mile Creek—site of the second oil well drilled in the United States, Cope-Marsh dinosaur quarries, Skyline Drive, Royal Gorge of the Arkansas River, Webster Park syncline, Grape Creek grade). The third day traverses the area from Florence southward along Siloam Road toward Beulah (Mace's Hole) and the Rye area (Greenhorn Creek). We end at Badito, about 15 miles north of La Veta, Colorado, where Tertiary dike and sill swarms of Silvertip (Dike) Mountain and Big and Little Sheep Mountains have generated methane and carbon dioxide that is emplaced in Codell and Entrada sandstones (Arco Permian, Sheep Mountain carbon dioxide field).

24. **Geology and Paleontology of the Gold Belt Back Country Byway: Florissant Fossil Beds and Garden Park Fossil Area.**
Friday, November 1 and Saturday, November 2. Herb Meyer, National Park Service, Florissant Fossil Beds National Monument, P.O. Box 185, Florissant, CO 80816, (719) 748-3253; E-mail: herb_meyer@nps.gov; Emmett Evanoff, Dan Grenard, and Woody Henry. Maximum: 35; minimum: 16. Cost: $150 (0B, 2L, 0D, R, 1ON, vans).

On the first day of this trip we will visit Florissant Fossil Beds National Monument, famous for Eocene fossil leaves and insects, and Eocene and Oligocene volcanic fields. Overnight lodging will be in the historic mining town of Cripple Creek, at 9500 feet elevation. On the second day we will visit the Garden Park fossil area near Cañon City, known for many original dinosaur discoveries in the past century. The trip will continue to the Ordovician Indian Springs marine trace fossil site. The geology along the route is very diverse and ranges in age from Precambrian to Quaternary.

25. **Oblique Laramide Convergence in the Northeastern Front Range of Colorado: Regional Implications from the Analysis of Minor Faults.**
Friday, November 1. Cosponsored by *Colorado Scientific Society.* Eric Erslev and Joe Gregson, Dept. of Earth Resources, Colorado State University, Fort Collins, CO 80523, (970) 491-6375; E-mail: erslev@cnr.colostate.edu. Maximum: 26. Cost: $65 (0B, 1L, 0D, R, vans).

The structural diversity of basement-involved Laramide arches has led to a multitude of tectonic hypotheses, including models invoking multidirectional compression, wrench tectonics, and oblique thrusting. This trip will visit exposures in the northeastern Front Range with minor faults resulting from Cretaceous slumping, Laramide oblique convergence, and year-old landsliding. Fault analysis methods will be tested on the outcrop and combined with structural geometries to illustrate the interplay of crustal detachment and backthrusting during the Laramide orogeny.

26. **Precambrian Tectonics and Metallogeny of the Hartville Uplift, Wyoming.**
Friday, November 1 through Sunday, November 3. Paul Sims, U.S. Geological Survey, Box 25046, MS 905, Federal Center, Denver, CO 80225, (303) 236-5621; Warren Day, and Terry Klein. Maximum: 21. Cost: $200 (2B, 2L, 2D, R, 2ON, vans).

On this trip we will examine the structure and stratigraphy of key Precambrian outcrops, emphasizing structural evolution and metallogeny of the external zone (margin of Wyoming Archean province) of the early Proterozoic Trans-Hudson orogen.

27. **Soil-Geomorphic Relationships Near Rocky Flats, Boulder and Golden, Colorado Area, with a Stop at the Pre–Fountain Formation Paleosol of Wahlstrom (1948).**
Friday, November 1. Peter Birkeland, Dept. of Geological Sciences, University of Colorado, Boulder, CO 80309, (303) 492-6985; E-mail: birkelap@stripe.colorado.edu; Ralph Shroba, Dan Miller, Penny Patterson, and Al Price. Maximum: 36; minimum: 20. Cost: $50 (0B, 1L, 0D, R, vans).

This trip will focus on soil-geomorphic relations at the transition from the mountains to the plains between Boulder and Golden. First, we will look at Wahlstrom's (1948) pre-Pennsylvanian weathering profile that was interpreted to indicate laterization in a warm, humid climate. Coloration of the overlying Fountain Formation also will be discussed. The rest of the trip will focus on the soil chronosequence formed in gravelly terrace deposits in the vicinity of the mouth of Coal Creek Canyon. At Rocky Flats the alluvium-bedrock contact is the locus of many landslides. Finally, the pedogenic and paleomagnetic properties of a series of buried soils are used to demonstrate the duration of the hiatus between the Verdos and Rocky Flats alluviums.

28. **Tertiary Intrusive Rocks of the Spanish Peaks and the Laramide Structure of the Western Margin of the Raton Basin, South-Central Colorado.**
Friday, November 1 and Saturday, November 2. Brian Penn, Dept. of Geological Sciences, University of Texas, El Paso, TX 79968, (915) 747-7497; E-mail: bpenn@geo.utep.edu; Dave Lindsey, U.S. Geological

Survey, Box 25036, Federal Center, Denver, CO 80225, (303) 236-6482. Maximum: 24. Cost: $140 (0B, 2L, 1D, R, 1ON, vans).

This field trip will visit the classic igneous rocks of the Spanish Peaks area and introduce participants to the Laramide history of the west side of the Raton basin. Beginning at Huerfano Butte north of Walsenburg, we will examine parallel and radial dikes, intersecting dikes, Big Dike and Small Dike, and the spectacular radial dikes of the Cuchara Valley. We will examine Laramide structures and sediments west of La Veta and a synorogenic conglomerate on Cordova Pass, which affords scenic overviews of the Spanish Peaks dike system and the Laramide structure along the front of the Culebra Range.

29. **Upper Cretaceous Coals of the Western Interior Seaway, Northwestern Colorado.**
Friday, November 1 through Sunday, November 3. Michael Brownfield and Mark Kirschbaum, U.S. Geological Survey, Box 25046, MS 972, Federal Center, Denver, CO 80225, (303) 236-7767; E-mail: mbrown@dnerds0.cr.usgs.gov. Maximum: 22; minimum: 13. Cost: $185 (0B, 3L, 0D, R, 2ON, vans).

This trip will examine the Upper Cretaceous coal-bearing rocks of northwestern Colorado. We will emphasize the regional sedimentological and depositional setting of the coal beds and coal-bearing sedimentary rocks along the western margin of the Cretaceous Seaway within the Williams Fork Formation. The depositional setting, sedimentology, chemistry, petrology, and mineralogy of the middle coal group coal beds will be addressed at each stop. An overview of mining methods and coal-bed methane potential will also be discussed. A mine visit will be included if possible.

Field Workshop

30. **Innovative Techniques for Shallow Soil and Ground-Water Investigations.**
Saturday, October 26. William DiGuiseppi, CTE Engineers, 2751 Prosperity Ave., Suite 200, Fairfax, VA 22031, (703) 849-0063; fax 703-849-0065; Jeff Flanzenbaum. Maximum: 45; minimum: 35. Cost: $55 (0B, 1L, 0D, R, additional handouts, bus).

This field workshop will introduce and demonstrate new and innovative techniques for collecting subsurface soil and ground-water samples. These techniques can provide geological and environmental data in a more timely and cost-effective way than conventional methods. Techniques presented are dominantly applicable to shallow depths (< 50 ft) in unconsolidated materials: mainly, direct push (cone penetrometer); percussion and hydraulic methods (Geoprobe); Roto-Sonic drilling, combination rotary and hydraulic rigs (Hurricane); and casing-advancing probing (Precision).

Sponsored by Society of Economic Geologists

For information, contact the field trip leader. Send payment in U.S. dollars to: James Cappa, Colorado Geological Survey, 1313 Sherman St., Room 715, Denver, CO 80203, (303) 866-3293; E-mail: jim.cappa@state.co.us. Costs reflect a differential in SEG member/nonmember rates and include transportation and lunch.

State Line Kimberlite District, Colorado.
Saturday, October 26. Howard Coopersmith, P.O. Box 1916, Ft. Collins, CO 80522, (970) 224-4943, fax 970-221-5280. Maximum: 40; minimum: 20. Cost: $100/$125.

We will visit the kimberlites in the State Line district. These kimberlites intrude Precambrian granitic rocks. There are about 100 known kimberlite pipes in the district. The discovery of diamonds in 1975 sparked an early period of exploration in the 1980s. The district now has experienced a new round of exploration. Participants will visit the Kelsey Lake Mine, where a 14.2 carat gem-quality white diamond was discovered in 1994.

Cresson Mine, Cripple Creek District, Colorado.
Friday, November 1. Jeffrey Pontius, Pikes Peak Mining Company, P.O. Box 191, Victor, CO 80860, (719) 689-2977, fax 719-689-3254. Maximum: 40; minimum: 20. Cost: $100/$125.

We will visit Colorado's premier gold mining camp, the Cripple Creek district, where more than 21 million ounces of gold have been recovered since 1891. A Tertiary alkalic intrusive–diatreme complex hosts the gold and associated minerals.

Special Programs

Earth Scientists on Capitol Hill

Wednesday, October 28, 12:00 noon to 1:00 p.m.; Colorado Convention Center. Sponsored by *GSA Geology and Public Policy Committee.*

The GSA Congressional Science Fellow program places earth scientists on the staffs of congressional offices. Congressional Science Fellows gain first-hand experience with the federal legislative process while actively participating in this process by providing scientific and technical expertise to members of Congress and congressional committees. Several previous fellows have accepted positions in Washington, D.C., and continue to provide Congress and federal agencies a much-needed perspective on earth sciences.

As GSA's tenth Congressional Science Fellow, Peter F. Folger concentrated on energy policy, mining issues, and reorganization of the national laboratories. He served on the staff of Senator Pete V. Domenici (R—NM), chairman of the Senate Budget Committee.

At this open session, Folger will report about his experiences on the Hill and discuss some means by which earth scientists may become more effective in the public policy sphere. In addition, Geology and Public Policy Committee members will comment on how scientists can provide expertise to the U.S. Congress, on the purpose of the GSA Congressional Science Fellow program, and on the fellowship application process. Previous GSA Congressional Science Fellows will attend the session, and audience participation is encouraged.

Funded by GSA and by a grant from the U.S. Geological Survey, the GSA Congressional Science Fellowship demonstrates the importance of science-government interaction, and responds to the need for informed involvement by the earth science community in the policy process.

Employment Service

Sunday, October 27, 2:00 to 5:00 p.m.; Monday, October 28 through Wednesday, October 30, 8:00 a.m. to 5:00 p.m.; Colorado Convention Center.

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

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

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

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

Applicants who sign up with the Employment Service by August 30, 1996, will be included in the information that employers receive prior to the meeting, so submit your forms early to receive maximum exposure, and remember to indicate on your application form that you would like to interview in November.

For additional information or forms, contact T. Michael Moreland, Membership Services Manager, GSA headquarters, (303) 447-2020; E-mail: member@geosociety.org or see GSA's World Wide Web site at http://www.geosociety.org and check under the Membership section.

Employment Opportunities in the Geological Sciences Roundtable Discussions

Sunday, October 27, 2:00 to 4:00 p.m.; Colorado Convention Center.

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

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

Everyone—professionals and students—is encouraged to attend, to talk with as many of the experts as you like, and to pick up a free copy of the 1996 booklet "Future Employment Opportunities in the Geological Sciences."

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

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

Career Planning and Placement Workshop.

Tuesday, October 29, 5:30 to 7:30 p.m.; Colorado Convention Center.
Sponsored by *GSA's SAGE Program* and *GSA Membership Services.*

A workshop on job hunting skills and strategies specifically designed for geoscientists. Topics will include: identifying your skills and career goals, career alternatives for scientists, structuring your job search, and researching the job market. Participants will receive reference materials on job and fellowship opportunities and job hunting skills. There is no charge for workshop participants, but you must register in advance to receive workshop materials. "Landing a good job takes more than luck."

For information and registration: Edward E. Geary, Coordinator for Educational Programs, GSA headquarters, (303) 447-2020, ext. 195 or 145, E-mail: egeary@geosociety.org.

Graduate School Information Forum

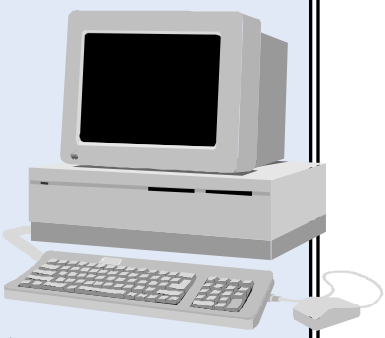
Monday, October 28 through Wednesday, October 30, 9:00 a.m. to 5:00 p.m.; Colorado Convention Center.

Attention, students: This is a great opportunity for you to search for the right graduate school. Come to Denver and meet with representatives of top graduate schools without spending the travel time and money to go to each school for information and interviews.

University representatives will be on hand to answer questions and talk to students. Individual appointments are not necessary, although students are welcome to contact the schools in advance and schedule a meeting time. A complete list of participating schools, with contact names and telephone numbers, is available. The schedule will be published in the September issue of *GSA Today.* The deadline for schools to register for the forum is **August 16.** If you would like to participate or receive the list, please contact Matt Ball, GSA headquarters (mball@geosociety.org).

Software Fair

Monday, October 28 through Thursday, October 31, 9:00 a.m. to 5:00 p.m.; Colorado Convention Center.



Back by popular demand! An expanded and improved Software Fair is being organized for the Denver meeting, to promote the use of computers in all fields of geology. GSA is looking for developers of freeware, public domain software, shareware, and commercial packages to give demonstrations. GSA supplies PC, Macintosh, and Silicon Graphics computers with Internet connections. The Software Fair will be located in the exhibit hall in a high-traffic area between the poster sessions and the exhibits. A nominal fee of $100 will be charged to commercial vendors for one four-hour morning or afternoon presentation. Contact Matt Ball, GSA headquarters, E-mail: mball@geosociety.org, for information and application form. The deadline for receipt of completed applications is August 16, 1996. See GSA's World Wide Web site (http://www.geosociety.org/meetings/96/softfair/) for an on-line application form.

Fourth Annual President's Student Forum

Wednesday, October 30, 4:00 to 5:30 p.m.; Colorado Convention Center. Sponsored by *GSA Council.*

Students are invited to meet with outgoing GSA President Eldridge M. Moores and incoming GSA President George A. Thompson to voice opinions and contribute ideas about their perceptions of GSA and how students can best participate in GSA affairs. Please come prepared to discuss any particular positive or negative GSA activities that relate to student satisfaction with being a Society member. This informal open session will include complimentary beverages.

Geology and Public Policy Forum

Saving Our Science: Entering the Public Policy Debate.

Wednesday, October 30, 1:00 to 2:30 p.m., Colorado Convention Center.

It's hard to miss. Anyone who picks up a newspaper or science news publication or turns on the radio or television news knows that science is becoming an endangered species. Free-flowing Cold War dollars are drying up, science agencies are being eliminated, and everywhere there is talk of "privatization." What does all this mean for us as earth scientists? We know that our science is important, that it is imperative to understand the planet on which we live. But is this message getting to the decision-makers in Washington? And what have we done to contribute to this effort?

In an article from *Technology Review,* Representative George Brown (D—CA) urges scientists to get out of their laboratories and the confines of their narrow science and band together to preserve the pursuit of science and technology as a national goal. Vice President Al Gore has spoken around the country about the appalling lack of understanding of scientific and technological issues by many of our Congressional members. We are facing a decrease in federal support for science over the next seven years of as much as 30%. Isn't it time we do something about it? Attend the GSA Geology & Public Policy Committee forum and take the first step toward making a difference.

Special Events

Colorado Symphony and Dinner

Saturday, October 26, 6:00 to 10:00 p.m.

Join us for a dynamic evening with the Colorado Symphony Orchestra and En Shao as guest conductor. The group will meet at the Denver Performing Arts Complex for a private catered dinner at 6:00 p.m. before the 7:30 p.m. performance at Boettcher Hall. Nancy Adams of Travel to Music will serve as hostess for the evening. She will send additional information after you register. Limit: 50. Cost: $65.

Welcoming Party

Sunday, October 27, 5:00 to 7:30 p.m.; Colorado Convention Center.

All attendees must be registered for the meeting in order to attend. A complimentary drink ticket for this event will be provided with all paid meeting registrations. Registration will remain open until 7:30 p.m. for your convenience.

Register, then join your colleagues and exhibitors Sunday evening to celebrate the grand opening of the 1996 GSA Annual Meeting and exhibits! This is the time to meet with friends to plan the next four days of meeting activities. Relax and take this uninterrupted opportunity to view the exhibits, eat, and enjoy your favorite beverage.

"Microbrew Mania" Pub Crawl

Sunday, October 27, 7:00 to 11:00 p.m.

Did you know that Denver has more brewpubs than *any* other American city? Join us for a tour of the top four of the eleven brewpubs downtown, including the Wynkoop, which is co-owned by a geoscientist! Your ticket allows you access to the continuous shuttle that will run between the Marriott, the Adams Mark, and the pubs throughout the evening. Go to one or all—you choose. Participants are responsible for purchasing their own food and beverages. Minimum 50. Cost: $10.

GSA Presidential Address and Awards Ceremony

Monday, October 28, 5:45 to 7:45 p.m.; Colorado Convention Center.

The GSA Presidential Address and Awards Ceremonies will begin with President Eldridge M. Moores's address, *Geology and Culture.* The GSA Awards Reception will follow immediately.

Penrose Medal
John R. L. Allen

Arthur L. Day Medal
Robert A. Berner

Young Scientist Award (Donath Medal)
Paul R. Bierman

GSA Distinguished Service Award
David Fountain
Royann (Gardner) Cygan
Louis C. Pakiser, Jr.
Anthony Reso

Recognition will also be given to newly elected Honorary Fellows *Alfonso Bosellini, Bruno d'Argenio, Paul Tapponnier.*

Awards Luncheons and Other Ticketed Group Functions

Associated societies and GSA divisions invite their members and other interested guests to join them for their annual meal functions, special addresses, and awards ceremonies. You do not need to be registered for the meeting; everyone is welcome. Please use the Registration Form in this issue to order tickets and check for dates. Location and time will appear on the ticket and in the *1996 Annual Meeting Program.*

Ticket Services for Denver Sports, Concerts, and Performing Arts

Create your own special event! Use these resource numbers to obtain information and tickets to sporting events, concerts, and theater presentations in the Denver area.

Denver Center for the Performing Arts ..... (303) 640-7539
Colorado Ticket Center ..... (303) 695-3040
The TicketMan Tickets to Concerts & Sports ..... (303) 430-1111

PREHISTORIC JOURNEY

Wednesday, October 30, 6:00 to 9:00 p.m., Denver Museum of Natural History

Join us for an exciting tour of the Prehistoric Journey exhibit at the museum, winner of the American Association of Museums' "Curators' Choice Award" for best exhibit in 1995. The exhibit, which opened in October 1995, was over six years in the making and cost $10 million. It spans 3.5 billion years of life and features more than 500 fossils, 12 dinosaur skeletons, and two fleshed-out dinosaur models. Richard Stucky and Kirk Johnson, GSA members and Curators of Paleontology at the Denver Museum, will begin the evening with a brief overview of the exhibit. They and other museum experts will be on hand to answer questions throughout the evening. Ticket price includes round-trip transportation, museum admission, a drink ticket and food voucher for the T-Rex Cafe. Cash bar available. Maximum: 250. Cost: $20.

Alumni Receptions

Monday, October 28, 7:00 to 9:30 p.m., Marriott City Center

Everyone knows *someone* at the popular Alumni Receptions. Plan to join your former classmates for an evening of memories and fun. More than 80 colleges and universities will be represented. If you would like your university to hold a reception or to be part of the Group Alumni Party, have your department chair contact Becky Martin at GSA headquarters, ext. 164.

Denver Mile-High GSA Chorale and Concert

Tuesday, October 29, 8:00 to 9:30 p.m., St. John's Cathedral.

Following upon the tradition of musical excellence exhibited at Denver (1988—Centennial Orchestra) and Boston (1993—Bravo Boston Chorale), GSA will offer a performance of John Rutter's moving Requiem. Thus, musical geologists will again have the opportunity to perform together in the Mile High City, where the arts are thriving. The performance will take place in St. John's Cathedral, a major venue for vocal performances and easily accessible from the central downtown area.

Those wishing to sing with the Denver Mile-High GSA Chorale should contact Carla Montgomery, Geology Dept., Northern Illinois University, DeKalb, IL 60115, (815) 753-9402. You must be an active, accomplished singer who reads music. Spouses and guests with comparable talent are also welcome.

In addition, we seek instrumentalists or vocalists among the GSA family who are interested in performing pieces that would compliment the program either as solo pieces or accompanied by the supporting ensemble. If you are interested in such an opportunity, please contact Greg Bush, Mile-High GSA Chorale Conductor, (303) 592-1714 (mornings), or (303) 670-2349 (home office).

Join us for what promises to be another "evening not to be missed" at the Denver GSA meeting. The Centennial Orchestra was sold out and the Boston Chorale was well attended, so advise your friends and colleagues that a ticket purchase with meeting preregistration will assure a seat (only $10). Don't miss this mile-high exciting event!

T.A.C. *(Thursday Afternoon Club)*

Thursday, October 31, 3:30 to 5:00 p.m.; Colorado Convention Center.

T.A.C. is for the meeting survivors—those who last to the end! Come to Lobby B and the Poster Session area to help us say thank you and farewell to Denver. Beer will be available.

Guest Program

GSA welcomes its guests to the Mile High City. Beginning on Saturday, October 26, guests are invited to visit the hospitality room located at the Colorado Convention Center. Your local hosts will provide a resource center with abundant information on Denver and surrounding areas, and a representative from the Denver Convention and Visitors Bureau will be on hand to answer questions from 9:00 a.m. to 3:00 p.m. Sunday through Wednesday. Formal and informal tour information will be available. Light refreshments will be served throughout the day, so please stop by. Remember to wear your GSA badge; it will be required for admission to the hospitality room and exhibit hall. ***Note: A guest registration will not allow admittance to the technical sessions.***

Guest Hospitality Room Hours

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

Seminars

All GSA meeting attendees—guest, professional, exhibitor, and student registrants—are invited to attend these seminars. There is no fee for the History of Colorado Buildings and the Quilts of Colorado seminars. The Holiday Crafts workshop will have a small materials fee payable at the time of the event. Check the *1996 Annual Meeting Program* on site for room location of these events.

Holiday Crafts Workshop

Monday, October 28, 2:00 to 4:00 p.m.

Local artist Linda Martin will show you how to make special holiday craft projects. A nominal fee will be charged at the workshop for materials. Participants will leave with finished projects to take home or give as gifts. Don't miss this one!

Quilts of Colorado

Tuesday, October 29, 9:00 to 10:30 a.m.

A representative from the Rocky Mountain Quilt Museum will present a history of quilting in Colorado. They will also have samples of antique quilts for all to see.

History of Colorado Buildings—Mesa Verde to DIA
Wednesday, October 30, 9:00 to 10:30 a.m.

Join us for a special presentation by Thomas J. Noel, a history professor from the University of Colorado at Denver. In addition to his teaching duties, Noel is a columnist for the Denver Post, is a nationally registered reviewer for Colorado landmarks, and is author of many books, including *Historic Atlas of Colorado* and *Colorado: the Highest State.* Don't miss this entertaining and informative talk about Colorado buildings. Noel will begin with the first homes of the Native Americans and go through Denver's newest architectural marvel, Denver International Airport. His discussion of building stones will be of particular interest.

Formal Tours

All GSA meeting registrants are welcome to sign up for any of the tours offered. Reservations for all tours will be accepted on a first-come, first-served basis. Space is limited and these trips will be popular, so register early. The tour operator requires a final guarantee several days in advance, so don't wait until you arrive in Denver to sign up.

Tours will leave from the Colorado Convention Center, Lobby B. There will be no pick-ups from the hotels. Plan to arrive about 15-20 minutes before scheduled departure, for check-in.

Mile High City Highlights
Saturday, October 26, 2:30 to 5:30 p.m. and Sunday, October 27, 1:00 to 4:00 p.m.

Tour of highlights of downtown Denver, including the State Capitol, Molly Brown's house, Ninth Street Park, Coors Field, and Larimer Square.

Cost: $21 (includes bus transportation, tour guide, admission to Molly Brown House).

"For the Birds" Field Trip
Sunday, October 27, 6:00 to 11:00 a.m..

In cooperation with the Denver Audubon Society, the Field Ornithologists of Denver, and the Field Ornithologists of Colorado, we're planning a special treat for GSA birds of a feather.

Limit: 24. Cost: $13 (includes transportation and tour guide).

Lowdown on LoDo
Sunday, October 27, 9:00 a.m. to 12:00 noon and Monday, October 28, 9:00 a.m. to 12:00 noon.

Take a walking tour of Denver's lower downtown area, filled with galleries, bookstores, and restaurants. We will also visit Union Station, the Ice House, and Coors Field. Minimum: 10. Cost: $9 (includes tour guide).

Bones and Tracks: Dinosaur Ridge Family Field Trip
Sunday, October 27, 1:00 to 4:00 p.m., and Tuesday, October 29, 1:00 to 4:00 p.m.
Cosponsored by *Association for Women Geoscientists* and *Friends of Dinosaur Ridge.*

The Dinosaur Ridge hogback exposes Jurassic and Cretaceous rocks containing dinosaur bones, and dinosaur and crocodile footprints and trackways. You might just spot a well-known geologist or two, on hand to point out the highlights. We'll also have the opportunity to visit the new Visitor Center at Dinosaur Ridge. Bring the kids! Minimum: 20. Cost: $13 (includes transportation and tour guide). A guidebook can be purchased on the trip.

Browsing in Boulder
Monday, October 28, 9:00 a.m. to 3:00 p.m., and Thursday, October 31, 9:00 a.m. to 3:00 p.m.

Join us for a special outing to Boulder. We'll start with a tour of Celestial Seasonings Tea Company, and then go on to see the sights of Boulder, including the University of Colorado campus and spectacular views of Boulder's mountain landmarks, the Flatirons. We will also stop at GSA Headquarters for a brief tour of this architecturally outstanding building. The trip will conclude with several hours on the Pearl Street Mall, a pedestrian walk with many unique shops and restaurants. Minimum: 20. Cost: $20 (includes round-trip transportation and tour guide). Participants are on their own for lunch.

Cherry Creek Charge
Monday, October 28, 10:00 a.m. to 3:00 p.m.

Visit the famous Cherry Creek area of Denver, including malls, galleries, boutiques, specialty shops, and the incredible Tattered Cover bookstore. Minimum: 25. Cost: $11 (includes round-trip transportation—continuous shuttle, printed guide to Cherry Creek area).

The Best of Colorado Springs
Tuesday, October 29, 9:00 a.m. to 5:30 p.m.

Tour the U.S. Air Force Academy, Garden of the Gods, and Old Colorado City with lunch at the elegant, historic Broadmoor Hotel. Cost: $52 (includes transportation, tour guide, admission fees, and lunch).

Tea and T'Arts
Wednesday, October 30, 12:30 to 5:00 p.m.

Tour the Denver Art Museum and the Museum of Western Art, and have high tea served at the historic Brown Palace Hotel at 3:30 p.m. The quilt exhibit at the art museum is a must see! Cost: $40 (includes transportation, tour guide, admission to museums, tea service at Brown Palace Hotel).

Field Day—Museum of Natural History and Denver Zoo
Wednesday, October 30, 10:00 a.m. to 3:00 p.m.

A continuous shuttle will take you to the Denver Museum of Natural History and the Denver Zoo, both located in City Park. Information on the attractions will be provided on the bus. Minimum: 20. Cost: $13 (includes round-trip transportation only).

Note: Museum and zoo tickets are sold separately because of various ticket options and weather variability. Prices as of June 1996: Museum—$4.50 for adults, $2.50 for children (4–12) and seniors (65+). Separate admission fee is required for the IMAX Theater and Gates Planetarium. Combination tickets are available. Denver Zoo—$6 for adults, $3 for children (4–12) and seniors (62+).

Informal Tours

In addition to the tours listed above, you may wish to visit other area attractions on your own or with other guest attendees. Some ideas: a tour of the Children's Museum, a behind-the-scenes tour of the Denver Center for the Performing Arts, and a visit to Maps Unlimited. Plan to sign up for these informal, self-guided tours in the Hospitality Room during the meeting.

Registration

Preregistration forms must be received at GSA no later than September 20, 1996.

BY MAIL: GSA Annual Meeting, P.O. Box 9140, Boulder, CO 80301-9140

BY FAX: 303-447-0648 or 303-447-1133—credit card use only. Our fax line is open 24 hours. Do not send another copy in the mail.

All registration forms received at GSA by September 20 will be processed and badges mailed two weeks before the meeting.

GSA and ASSOCIATED SOCIETY MEMBERS SAVE $40 (professional) and $20 (student) with preregistration fees.

NONMEMBERS SAVE an additional $40 (professional) and $20 (student) by joining GSA now. See how to get your discount below.

The member fees apply to members of both GSA *and* Associated Societies (listed on the form).

Registration will not be processed unless full payment is received. Unpaid purchase orders are NOT accepted as valid registration. The confirmation sent by GSA will be your only receipt. You should receive it within two weeks after your registration is submitted.

Badges are needed for access to ALL activities, 10:00 a.m. Sunday through 5:00 p.m. Thursday.

Guest registration is required for those attending guest activities and the exhibit hall. *The guest registration fee will not provide technical session access.* Any guest wishing to see a specific talk should come to the Registrant Services Desk for a pass. A guest is defined as a nongeologist spouse or friend of a professional or student *registrant*.

Students: A CURRENT student ID is required to obtain student rates. You will have to pay the professional fee unless you have the ID.

Please register only one professional or student per form and retain a copy for yourself.

All registrations received after September 20 will be considered ON-SITE registrations and charged accordingly. **Absolutely no preregistrations should be mailed or faxed after October 11th.** After this date we will be available to handle your registrations at the Convention Center during the registration hours listed below.

Angular unconformity separates Pennsylvanian and Permian strata from Miocene basalt flows, State Bridge, Colorado. Photo by John Karachewski.

Cancellations, Changes, and Refunds

All requests for additions, changes, and cancellations must be made *in writing* and received by September 27, 1996. Faxes are accepted. GSA will refund or credit preregistration fees for cancellations received in writing by September 27. NO REFUNDS WILL BE MADE ON CANCELLATION NOTICES RECEIVED AFTER THIS DATE. Refunds will be mailed from GSA after the meeting. Refunds for fees paid by credit card will be credited according to the card number on the preregistration form. There will be NO refunds for on-site registration, *Abstracts,* and ticket sales.

On-Site Registration Schedule

Colorado Convention Center, Lobby A

Saturday, October 26
7:00 a.m. to 5:00 p.m.
Sunday, October 27
7:00 a.m. to 7:30 p.m.
Monday, October 28
7:00 a.m. to 4:30 p.m.
Tuesday, October 29
7:00 a.m. to 4:30 p.m.
Wednesday, October 30
7:00 a.m. to 4:30 p.m.
Thursday, October 31
7:00 a.m. to 11:00 a.m.

Members Pay Less! Join Now!

If you are not yet a GSA member, **now** is the time to join. Professionals will save a substantial amount on the registration fee by paying the member rate—almost exactly the amount you would pay to join GSA. That's like joining GSA for free! Likewise, students who pay the basic membership dues of $20 to become a Student Member (graduate student) or Student Associate (undergraduate student) will receive a $20 discount on their Annual Meeting registration. These discounts apply only to **full-meeting paid** registration—not to one-day or complimentary registrations.

The $40 registration discount for members applies to professional members of GSA or an Associated Society. Qualifying Associated Societies are listed on the registration form. Save time by joining **before** the meeting by contacting the Membership Services Department at (303) 447-2020, or E-mail: member@geosociety.org or on the GSA World Wide Web site at http://www.geosociety.org and check under the Membership section. During the meeting, visit the Membership Services Booth in the Convention Center for information.

Registration Fees

	Advance—by 9/20/96		After 9/20/96
	Full Meeting	One Day	On-Site
Professional Member	$195	$118	$235
Professional Nonmember	$235	$138	$275
Student Member	$ 70	$ 45	$ 90
Student Nonmember	$ 90	$ 55	$110
Guest or Spouse	$ 70	N/A	$ 70
K–12 Professional	$ 25	N/A	$ 35
Field Trip or Course *Only*	$ 35	N/A	$ 35

PREREGISTRATION FORM

GSA Annual Meeting, Denver, Colorado, October 28–31, 1996
Preregistration Deadline: September 20. *Copy for your records.*
Deadline for changes or cancellations is September 27.

MAIL TO: GSA Annual Meeting
P.O. Box 9140
Boulder, CO 80301-9140
FAX TO: 303-447-1133 or
303-447-0648

Please inform us by September 20 of any special considerations that you or your guest require.
☐ I will need special considerations.

Will you be working in the exhibit hall?
☐Yes ☐No

PREREGISTRATION FEES

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

***MEMBER AFFILIATION** for member discount:*

☐ (a) GSA (member # _____)
☐ (b) AASG ☐ (c) AEG ☐ (d) AGID ☐ (e) AWG ☐ (f) CF ☐ (g) GIS
☐ (h) GS ☐ (i) MSA ☐ (j) NABGG ☐ (k) NAGT ☐ (l) NESTA ☐ (m) PS
☐ (n) PRI ☐ (o) SEG ☐ (p) SGE ☐ (r) SVP

COLUMN A

	Full Meeting	One Day	Qty	Amount
Professional Member *(check affiliation above)**	☐ (1) $195	☐ (2) $118	1	$
Professional Nonmember	☐ (3) $235	☐ (4) $138	1	$
Student Member *(check affiliation above)**	☐ (5) $ 70	☐ (6) $ 45	1	$
Student Nonmember	☐ (7) $ 90	☐ (8) $ 55	1	$
K–12 Professional	☐ (42) $ 25		1	$
Guest or Spouse *(no tech. session access)*	☐ (9) $ 70		1	$
Field Trip or Course Only Fee	☐ (98) $ 35		1	$

GUEST ACTIVITIES

1. Mile High City Highlights	☐Sat (20) or ☐ Sun (21) $21	___	$
2. "For the Birds" Field Trip, Sunday	(22) $13	___	$
3. Lowdown on LoDo	☐Sun (23) or ☐ Mon (24) $ 9	___	$
4. Bones and Tracks	☐Sun (25) or ☐ Tue (26) $13	___	$
5. Browsing in Boulder	☐Mon (27) or ☐ Thur (28) $20	___	$
6. Cherry Creek Charge, Monday	(29) $11	___	$
7. Best of Colorado Springs, Tuesday	(30) $52	___	$
8. Tea and T'Arts, Wednesday	(31) $40	___	$
9. Field Day—Museum and Zoo, Wednesday	(32) $13	___	$

SPECIAL EVENTS

1. Colorado Symphony and Dinner, Saturday	(40) $65	___	$
2. "Microbrew Mania" Pub Crawl, Sunday	(41) $10	___	$
3. GSA Chorale, Tuesday	(42) $10	___	$
4. Prehistoric Journey, Wednesday	(43) $20	___	$

TICKETED GROUP FUNCTIONS

1. Geosci. Ed. Div. Breakfast, Monday	(60) $13	___	$
2. NAGT Lunch, Monday	(61) $23	___	$
3. AWG Breakfast, Tuesday	(62) $13	___	$
4. GIS Lunch, Tuesday	(63) $23	___	$
5. Hydrogeology Div. Lunch, Tuesday	(64) $23	___	$
6. MSA Lunch, Tuesday	(65) $23	___	$
7. Paleontological Soc. Lunch, Tuesday	(66) $23	___	$
8. SEG Lunch, Tuesday	(67) $23	___	$
9. MSA/GS Reception, Tuesday	☐ Prof (68) $10 ☐ Stdt (69) $ 5	___	$
10. Eng. Geol. Div. Lunch, Wednesday	(70) $23	___	$
11. History Geol. Div. Lunch, Wednesday	(71) $23	___	$

CONTINUING EDUCATION

	Professional	Student	Amount
1. Geomorphic Expression Active Tectonics	☐(150) $325	☐(151) $305	$
2. How To Do Anything with Mohr Circles	☐(152) $195	☐(153) $175	$
3. Numerical Techniques, Sedimentary Data	☐(154) $320	☐(155) $300	$
4. Applications of Environmental Isotopes	☐(156) $205	☐(157) $155	$
5. Applications of GPS in Earth Sciences	☐(158) $185	☐(159) $165	$
6. Effective Teaching of Hydrogeology	☐(160) $175	☐(161) $125	$
7. Recognition, Investigation—Landslides	☐(162) $170	☐(163) $150	$
8. Vadose Zone Hydrology	☐(164) $310	☐(165) $255	$

TOTAL COLUMN A $ _____

PAYMENT: *(All preregistrations must be prepaid. Purchase Orders not accepted.)*

☐ Check (U.S. funds payable to '96 GSA Annual Meeting)
☐ American Express ☐ VISA ☐ MasterCard ☐ Diners Club

Card Number _____ Expires _____

Signature _____

Please print clearly • THIS AREA IS FOR YOUR BADGE

Name as it should appear on your badge **(LAST NAME FIRST)**

Employer/University Affiliation

City State or Country

Mailing Address (use two lines if necessary)

City State

ZIP Code Country (if other than USA)

Home Phone Business Phone

Fax E-Mail

GUEST INFORMATION Please print clearly • This area is for badge

Name as it should appear on your guest's badge

City State or Country

COLUMN B

FIELD TRIPS

		Qty	Amount
1. The Absaroka Range	(101) $350	1	$
2. Geology of the Solitario Dome	(102) $300	1	$
3. Laramide Orogeny in Seminoe & Shirley Mtns.	(103) $245	1	$
4. Hayden's Lakes Revisited	(104) $230	1	$
5. Permian-Triassic Deposystems	(105) $280	1	$
6. Proterozoic Magmatism in SE Wyoming	(106) $240	1	$
7. Synchronous Oligocene & Miocene Extension	(107) $180	1	$
8. Geology/Geologic Hazards Glenwood Springs	(108) $180	1	$
9. Western San Juan Mountains	(109) $150	1	$
10. Sequence Stratigraphy of Muddy Sandstone	(110) $180	1	$
11. Kinematics of the Slumgullion Landslide	(111) $125	1	$
12. Petroleum System, Central Denver Basin	(112) $ 55	1	$
13. Laramide Orogeny Front Range/Denver Basin	(113) $ 55	1	$
14. Geology Tour Denver	☐ Mon (114) or ☐ Wed (115) FREE	1	$
15. Dinosaur Ridge	☐ Tue (116) or ☐ Thur (117) $ 10	1	$
16. Clear Creek Canyon	☐ Tue (118) or ☐ Thur (119) $ 10	1	$
17. USGS Mapping Tour	☐ Tue (120) or ☐ Wed (121) FREE	1	$
18. Dunes, Rivers, Lakes, & Wetlands	(122) $190	1	$
19. Evidence of Archean Rocks, SE Wyoming	(123) $240	1	$
20. San Luis Valley & Summitville Mine	(124) $200	1	$
21. Jemez Volcanic Field & Valles Caldera	(125) $300	1	$
22. Cretaceous-Tertiary Boundary, Haiti	(126) $250	1	$
23. Depositional Environments, SC Colorado	(127) $175	1	$
24. Gold Belt Back Country Byway	(128) $150	1	$
25. Oblique Laramide Convergence, Front Range	(129) $ 65	1	$
26. Tectonics & Metallogeny, Hartville Uplift	(130) $200	1	$
27. Soil-Geomorphic Relationships, Rocky Flats	(131) $ 50	1	$
28. Spanish Peaks & Raton Basin	(132) $140	1	$
29. Upper Cretaceous Coals of Interior Seaway	(133) $185	1	$
30. Field Workshop—Techniques, Soil and Ground Water	(134) $ 55	1	$

K–16 PROGRAMS

1. Dive into Partnering with Project WET, Saturday	(302) $ 5	1	$
2. Exploring the Solar System, Saturday	(303) $ 5	1	$
3. Mining History Field Trip, Saturday	(304) FREE	1	$
4. NAGT-NSF Innovative Teaching Workshop, Saturday	(305) FREE	1	$
5. Creating WWW Pages, Sunday Check one: ☐ Mac a.m. (306) or ☐ PC p.m.	(307) $110	1	$
6. Geological Exploration of the Solar System, Sunday	(308) $ 10	1	$
7. Learning from the Fossil Record, Sunday	(309) $ 10	1	$
8. End-of-Program Assessment, Sunday	(310) $ 5	1	$
9. Preparing Successful Grant Proposals, Sunday	(311) FREE	1	$
10. Mapping Your Way Using GIS, Monday	(312) FREE	1	$
11. Project Atmosphere, Monday	(313) FREE	1	$
12. Project Image, Monday	(314) FREE	1	$
13. Share-A-Thon Presenter, Monday	(315) FREE	1	$

TOTAL COLUMN B $ _____

TOTAL FEES REMITTED (A+B) $ _____

FOR OFFICE USE

	DR	CR
Bal. A/R 1233-12331		
Ref. A/P 2006		

CK#_____ A_____ V_____ M_____
Refund CK #_____ Approval _____

Exhibits

Colorado Convention Center, Hall A

Meeting Exhibitors

(as of 5/17/96)

Convenient Exhibit Hours

Sunday, October 27	5:00 p.m.–7:30 p.m.
Monday, October 28	9:00 a.m.–5:00 p.m.
Tuesday, October 29	9:00 a.m.–5:00 p.m.
Wednesday, October 30	9:00 a.m.–4:00 p.m.
Thursday, October 31	CLOSED

Equipment and Instrumentation

ASC Scientific
Bison Instruments
Buehler Ltd.
Cameca Instruments
Deltech, Inc.
Finnigan MAT
Fisons Instruments
JEOL
Leica Inc.
Magellan Systems Corporation
Meiji Techno America
MicroMass
MJP Geopacks
Mount Sopris Instruments
Philips Electronic Instruments Inc.
Prior Scientific
Rigaku/USA, Inc.
Scintag, Inc.
Spectrex Corporation
Spex Industries, Inc.
Terraplus USA Inc.
THE Company
UIC, Inc./Coulometrics

Field Supplies and Gear

Forestry Suppliers
General Supply Corporation
Geographics
J.L. Darling Corporation
Miners, Inc.

Gems, Minerals and Fossils

Cal Graeber Minerals
Donald K. Olson Minerals
Geology Stuff
Howard Minerals
Ikon Mining
Komodo Dragon
Nature's Own
Peterson-Scully Studios
Steel Fixture Manufacturing - museum storage cabinets

Geoscience Associations

American Association of Petroleum Geologists
American Geological Institute
American Institute of Professional Geologists
Association for Women Geoscientists
Association of Engineering Geologists
Association of American State Geologists
Cushman Foundation
Geochemical Society
Geoscience Information Society
International Association of Hydrogeologists
Mineralogical Society of America
National Association of Geoscience Teachers
National Earth Science Teachers Association
National Science Foundation
Paleontological Research Institute
Paleontological Society
Rocky Mountain Association of Geologists
SEPM (Society for Sedimentary Geology)
Sigma Gamma Epsilon
Society for American Archaeology
Society of Economic Geologists

Geological Society of America

Bookstore
Combined Publishers Display
Foundation
Geology and Public Policy Committee
International Division
Membership Services
Partners for Education Program
SAGE Program

Government Resources

Colorado Geological Survey
Illinois Geological Survey
Jet Propulsion Lab
Jet Propulsion Lab, IGS Central Bureau
NCAR Graphics Information
Nebraska Conservation and Survey Division
New Mexico Bureau of Mines and Mineral Resources
NOAA/National Geophysical Data Center
Oklahoma Geological Survey
U.S. Geological Survey
U.S. Geological Survey—Hazards Team
U.S. Geological Survey—Central Region
Utah Geological Survey

Institutions

Baylor University
Colorado School of Mines
Desert Research Institute
Economic Geology Research Unit
JCPDS- International Centre for Diffraction Data
Joint Oceanographic Institutions
Louisiana State University
University of Nevada, Las Vegas
University of Nevada, Reno
University of Oklahoma
Washington State University
Wright State University

Laboratory Services

Activation Laboratories Ltd.
Krueger Enterprises/Geochron Labs
X-Ray Assay Laboratories

Publishers

Blackwell Scientific Publications
Cambridge University Press
Chapman and Hall
Columbia University Press
Dorling-Kindersley Family Library
Earth Magazine
Earth Observation Magazine
Elsevier Science Publishing
GIS World
Houghton-Mifflin Company
Kendall/Hunt Publishing Company
Kluwer Academic Publishers
Micropaleontology Press
Mountain Press Publishing
Oxford University Press
Plenum Publishing Corporation
Prentice-Hall
Princeton University Press
Saunders College Publishing
Springer-Verlag New York, Inc.
University of Chicago Press
W.H. Freeman & Company
Wadsworth Publishing, ITP
West Publishing Company
Wiley & Sons, Inc.
William C. Brown Publishers
Williams & Heintz Map Corporation
Worth Publishers, Inc.
Yale University Press

Services

Geotemps, Inc.
PTI Environmental Services

Software

Arc Science Simulations
Cogni Seis
Earth'nWare, Inc.
Eighteen Software
Geomath, Inc.
Landmark Graphics Corporation
MINEsoft
Numerical Algorithms Group, Inc.
Platte River Associates
Research Systems
RockWare, Inc.
Tasa Graphic Arts, Inc.

Visit GSA's World Wide Web site, http://www.geosociety.org/meetings/96/ to browse an on-line listing of products and services for the exhibitors. A description and contact information is provided for each exhibitor. For information on becoming an exhibitor, contact Matt Ball, GSA headquarters, E-mail: mball@geosociety.org.

Convenience Information

Accessibility for Registrants with Special Needs

GSA is committed to making the Annual Meeting accessible to all people interested in attending. If you need any auxiliary aids or services because of a disability, check the appropriate box on the registration form. If you have suggestions or need further information, contact Becky Martin, GSA headquarters, E-mail: bmartin@geosociety.org. Please let us know your needs by September 20.

Computer and Office Center

Sunday, October 27 through Thursday, October 31; Colorado Convention Center.

Meeting attendees will have access to computers, laser printers, copiers, fax machines, and general office supplies. For a minimal fee, this equipment will be available for your use to produce reports, transparencies, or last-minute fliers.

Information, Messages, and Internet Services

Sunday, October 27 through Thursday, October 31; Colorado Convention Center.

The information and message desks at the Convention Center will be available to assist you during the meeting. We are happy to take messages on your behalf. Leave the following number for your home and office: (303) 446-4378.

Registered attendees will be able to access the Internet for message sending and retrieval. Browse the World Wide Web between sessions! These services are provided by GSA and conveniently located between the exhibits and poster sessions.

News Room

Sunday, October 27 through Thursday, October 31; Colorado Convention Center.

The GSA News Room provides coordination and assembly of information on topics for release to the news media. Please let them know of material that is newsworthy for the science or general and local press. Members of the press may receive complimentary meeting registration with appropriate press credentials by contacting Sandra Rush, (303) 443-8489, or June Forstrom at GSA headquarters.

Child Care Registration Form

GSA Annual Meeting, October 28-31, 1996

Date _____

Parent name(s) _____

Parent address _____

_____

Telephone Numbers: _____
work home

E-mail address _____

Child #1 — Name _____ Age_____

Child #2— Name_____ Age_____

Child #3— Name_____ Age_____

Estimate which day(s) and number of hours each day your child would be attending

Sunday_____ Monday _____

Tuesday _____ Wednesday _____

Thursday _____

Submit $35 registration fee for each child. **Amount remitted: $_____.** Cancellation must be received in writing to GSA no later than September 27, 1996, for full refund. Please submit with your payment to: **GSA Annual Meeting Child Care, P.O. Box 9140, Boulder, CO 80301.** Faxes accepted with charge card payment: 303-447-0648.

Charge card: ☐ American Express ☐ VISA ☐ MasterCard

Card # _____ Expires _____

Signature _____

Child Care

Sunday, October 27 through Thursday, October 31; Colorado Convention Center.

The New Thomas Learning Centers of Colorado, approved and screened by the City and County of Denver, will be providing child care services during the meeting. This company is a Colorado-based, licensed, insured child care corporation with 19 years of experience. They employ thoroughly screened professionals to provide quality care to the children of convention attendees.

Plan to attend the meeting while your child enjoys age-appropriate activities in a relaxed, balanced environment. The children can enjoy arts and crafts, story telling, games, puzzles, and toys. Parents are encouraged to contact Deanna Zerr, New Thomas Learning Center at (303) 639-6240 for further information and/or interviews.

Costs are $3.50/hour for children over the age of 3 years; toddlers and infants under the age of 3 years are $4.50/hour. Snacks are included. For an additional $3–$4, lunch or dinner will be provided. *Preregistration by September 20, 1996, is recommended to secure appropriate staffing.* Late registrations and on-site drop-ins will be $1 per hour higher. A deposit of $35.00 per child is required with each reservation and will be applied directly toward your child care fee. Full refunds will be given to all cancellations received in writing to GSA by **September 27, 1996.**

A packet of registration materials will be sent within two weeks after receipt of each registration. For reservations, complete the form below and submit with your payment to GSA. For further information, contact Kathy Ohmie Lynch, GSA Headquarters, extension 114 or E-mail klynch@geosciety.org.

Tertiary granodiorite intruding Pennsylvanian-Permian Maroon Formation. Rock glacier in center. Photo by John Karachewski.

Tourist Information

Denver Metro Convention and Visitors Bureau
1555 California Street, Suite 300
Denver, CO 80202-4264
(303) 892-1112, fax 303-892-1636
Also see ticket ordering information on page 28.

Weather

Fall weather in Denver is pleasantly similar to spring, with warm days and cool evenings. Medium-weight clothing with a jacket and/or topcoat for evenings should suffice. A visit to the mountains will generally require warmer clothing. However, daytime temperatures can vary from warm to crisp, so several layers of medium-weight clothes (shirts, sweaters, and jackets) will allow adjustment for maximum comfort. Sun and/or snow are possible! Don't forget to prepare for the effects of the high altitude and dry air by bringing sunscreen and lotion.

Prepare for the High Altitude

We want your stay in Denver to be productive and enjoyable. Therefore, a word of caution about the high altitude. Decreased oxygen density and low humidity require a few simple precautions to reduce the chances of high-altitude syndrome. Suggestions include: eat lightly, drink plenty of liquids, avoid alcoholic beverages for the first 48 hours, and keep physical exertion to a minimum for the first two days.

Abstracts with Programs

Advance-Copy Purchase

1996, Volume 28, Number 7

PRICE: $24 NET EACH

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

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

To Place Your Order

Prepayment is required. Check, money order (in U.S. funds, payable on U.S. banks), or major credit cards are accepted. Order directly from GSA Publication Sales by mail, phone, or fax. To assure receipt prior to the meeting, *all orders must be received by Friday, August 30.*

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

On-Site Purchase

Copies of *Abstracts with Programs* will be for sale in the registration area of the Colorado Convention Center. Price: $24 net each. **No additional discounts will apply.**

Advance-Copy Purchase Order Form

1996 Abstracts with Programs

Volume 28, Number 7

Return this form by Friday, August 30. This purchase option is only for those residing in U.S., Canada, and Mexico. No refunds given for duplicate orders. Copy this form for your records.

Ship To:

☐ Check here if GSA Member

Name _____

Address _____

City _____ State _____ ZIP _____

Daytime Phone ( ) _____

Quantity _____ at $24 net each (no additional discounts)

Amount enclosed $ _____

Method of Payment: *(prepayment required)*

Check or money order enclosed (U.S. funds, U.S. banks)
Credit card (check one) ☐ MC ☐ VISA ☐ AmEx ☐ Diners

Card No. _____ Exp. Date _____

Name of cardholder (print) _____

Signature of cardholder _____

Send To:

GSA Publication Sales, P.O. Box 9140, Boulder, CO 80301
1-800-472-1988 • (303) 447-2020 • Fax 303-447-1133
Orders must by received by August 30

Hotels

To get your first choice of hotels, we highly recommend that you get your reservation in as early as possible. Convention hotels fill quickly. All hotel reservations must be processed by the Denver Housing Bureau to get the special GSA rates.

To Make Your Hotel Reservation

Fill out the housing request form and either mail or fax it to the Denver Housing Bureau. (They will not accept phone calls for reservations, only for changes or cancellations.) See the form for the address and fax number. If you are interested in a suite, please indicate this on your form. All reservations should be received by *Monday, September 30*. From this date until October 7, the Housing Bureau will continue to accept new reservation requests, but rooms will be on a space-available basis only. The Housing Bureau will forward your form to an available hotel and the hotel will mail a confirmation.

Assignment

Hotel rooms will be assigned on a first-come, first-served basis as requests are received by the Housing Bureau. Please list your first three hotel choices in order of your preference. If the hotels you have chosen are full, the Housing Bureau will review your selection preference on the Housing Form. Be sure to mark which is more important to you, proximity to convention center or comparable room rate. You will receive an acknowledgment from the Housing Bureau with your hotel assignment within 10 days of receipt. Check all information carefully for accuracy, including arrival date, departure date, and credit card information. If you do not receive an acknowledgment within two weeks, call the Housing Bureau at (303) 892-1112, extension 601, to check the status of your reservation.

Room Deposits

All reservations require a deposit equal to one-night's stay plus 11.8% tax. The hotel will charge your credit card based on the information you provide, or you may send a check directly to the hotel upon receipt of the official hotel confirmation. If a deposit is not sent, your reservation *will* be canceled. The hotel confirmation will state the cancellation/refund policy; please read it carefully.
DO NOT SEND DEPOSIT CHECKS TO HOUSING BUREAU.

Hotel	Blocks from Conv. Center	# Rooms Reserved	Rates Single/Double Triple/Quad	Parking Rates as of 5/1/96	In-House Exercise Facility?	Indoor Pool?	Restaurants	Comments
1 Marriott City Center 1701 California St. Denver, CO 80202	**3**	**500**	**$113/$128 $138/$138**	**$15/day valet in/out priv.**	**Yes**	**Yes**	**2**	**Headquarters**
2 Adams Mark Hotel 1550 Court Place Denver, CO 80202	4	600	$99/$111 $126/$141	$12/day self in/out priv.	Yes	No	2	All guest rooms renovated in June 1996
3 Hyatt Regency 1750 Welton Street Denver, CO 80202	4	375	$116/$127 $127/$127	Self $13/day wkdays and $6/day wknds, valet $10/day $12 overnight	Under construction Access to Wellness Center $10/day	No	1	Coffee maker, oversize rooms
4 Holiday Inn 1450 Glenarm Place Denver, CO 80202	1	250	$76/$88 $98/$108	$6/day self	Yes	No	1	Newly renovated
5 Executive Tower Inn 1405 Curtis Street Denver, CO 80202	2	125	$82/$87 $97/$107	$7/day self	Yes	Yes	1	Tennis & racquetball courts
6 Westin 1672 Lawrence Street Denver, CO 80202	5	75	$115/$115 $130/$145	$7/day self $16/day valet	Yes	Yes	2	Each room has refreshment center, oversize rooms
7 Comfort Inn 401 17th Street Denver, CO 80202	4	150	$67/$77 $87/$97	$9/day valet in/out priv.	None. Access to YMCA for fee	No	None	Free continental breakfast, access to room service and restaurants of Brown Palace
8 Embassy Suites 1681 Curtis Street Denver, CO 80202	6	100	$109/$119 $129/$139	$12/day valet	None. Access to Denver Athletic Club $10/day	No	1	All suites with wet bar, coffee maker, refrigerator, complimentary breakfast and evening reception
9 Brown Palace 321 17th Street Denver, CO 80202	4	75	$119/$136 $151/$166	$14/day valet	Yes	No	4	Historic 4-star property, charter member of Preferred Hotels and Resorts
10 Ramada-Mile High 1975 Bryant Street Denver, CO 80204	> 10	40	$59/$69 $69/$69	Free	Yes	No	1	**STUDENT PROPERTY** Coffee maker, free breakfast, free shuttle to Convention Center
11 YMCA 25 East 16th Avenue Denver, CO 80202	5	n/a	Varies—contact YMCA at (303) 861-6300 for further information	No parking	Yes $3.50/day	Yes	None	**STUDENT PROPERTY** No children allowed, most rooms have shared bathrooms

Changes and Cancellations

Changes and cancellations BEFORE Monday, September 30 should be communicated to the Housing Bureau. Changes cannot be made between September 30 and October 7. AFTER October 7, you should contact the hotel *directly* with any changes. Please note that a cancellation notice must be received by the hotel AT LEAST 72 hours prior to arrival date to receive a refund on your deposit. The hotel has the right to keep your deposit if you fail to properly cancel a confirmed reservation.

Special Needs

The Americans with Disabilities Act ensures that barrier-free hotel rooms will be made available to GSA registrants. Those with special needs should specify this on the Housing Form. All properties except the Ramada Mile High and the YMCA have accessible rooms for the disabled. If you have questions or would like to know more about the accessibility of a specific hotel, please contact Becky Martin at GSA headquarters by September 20.

Student Housing

A few rooms have been reserved for students at the Ramada Inn—Mile-High Stadium. The hotel is a short driving distance from downtown; however, the Ramada will shuttle students to/from the convention center daily *upon request*. Students can sign up for one of the limited number of rooms at this property using the housing form attached.

The YMCA is another housing option for students. Rates range from $23.48 to $46.96 including tax. For further information and to reserve space, write *directly* to the facility at the address listed in the table. Do not use the housing form for reservations at the YMCA.

Hotel Information

The table on page 36 lists basic information on each property. The numbers correspond to the locations on the map. For additional information, write the hotel for a brochure or contact Becky Martin at GSA Headquarters.

Alternative Housing

Here are a few suggestions for housing alternatives:

- Check your library copy of the Hotel and Motel Redbook, which lists metro properties. Because of the many properties in the area, GSA cannot provide a complete list.
- Call 1-800-555-1212 or check the Yellow Pages to learn the 800 number for your favorite hotel chains, such as Super 8 or La Quinta, which have properties outside the downtown area. You will need to provide your own transportation to the Convention Center.

1	**Marriott**	6	Westin	A	Colorado Convention Center	E	Coors Stadium
2	Adam's Mark	7	Comfort Inn	B	Center for the Performing Arts	F	Mile High Stadium
3	Hyatt Regency	8	Embassy Suites	C	Larimer Square	G	Visitors Center
4	Holiday Inn	9	Brown Palace	D	Union Station	H	State Capitol
5	Executive Tower Inn	10	Ramada Mile High			I	Elitch Gardens Amusement Park
		11	YMCA				

HOUSING FORM

GSA Annual Meeting, October 28–31, 1996

MAIL:

GSA Housing Bureau
1555 California Street, Suite 300
Denver, CO 80202-4264

OR

FAX: 303-892-1636

HOUSING DEADLINE: SEPTEMBER 30

Please do not duplicate your reservation, by faxing *and* mailing this form. Please read all hotel information prior to filling out this form. Reservations are processed on a first-come, first-served basis. Please submit one room request per form. If more than one form is required, this form may be photocopied. Acknowledgments will be sent by fax or mail. Be sure to keep a copy for your records.

Please send acknowledgment by ☐ fax or ☐ mail to:

First Name _____ M.I. _____ Last Name _____

Company Name _____

Mailing Address _____

City/State _____ ZIP Code _____ Country _____

Area Code _____ Daytime Phone Number _____ FAX _____

Arrival Date: _____ **Time:** _____ **a.m./p.m.**

Departure Date: _____

TYPE OF ACCOMMODATION: *(Please check required room type.)*

☐ Single — 1 person, 1 bed
☐ Double — 2 people, 1 bed
☐ Double/Double — 2 people, 2 beds
☐ Triple — 3 people, 2 dbl. beds
☐ Quad — 4 people, 2 dbl. beds

SPECIAL NEEDS:

☐ Nonsmoking Room
☐ Special Room Requirements _____

HOTEL PREFERENCE:

1. _____ 2. _____ 3. _____

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

PLACE RESERVATION IN NAME OF: _____

(Name all other occupants and their addresses)

Share With: _____ Address _____

Share With: _____ Address _____

Share With: _____ Address _____

CREDIT CARD INFORMATION FOR HOTEL:

☐ American Express ☐ VISA ☐ MasterCard

Card No. _____ Exp. Date _____

Print name as it appears on card _____

Authorized Signature _____

RESERVATION DEPOSIT:

All reservations require a deposit equal to one night's stay plus 11.8% tax. The hotel will charge your credit card based on information provided above or you may send a check directly to the hotel upon receipt of official housing acknowledgment. If deposit is not sent, your reservation will be canceled. The hotel confirmation will state the cancellation/refund policy; please read this carefully. DO NOT SEND DEPOSIT CHECKS TO HOUSING BUREAU.

Travel

Getting To Denver

GSA's official travel agent, Travel King, has negotiated discounted airfares with United Airlines, Denver's primary carrier. Travel King is committed to obtaining the best possible fares for GSA Annual Meeting travelers.

Advance bookings with Saturday night stayovers are the best route to lowest fares. However, as with all airline reservations, please use caution regarding change and cancellation penalties that accompany low-fare tickets. This applies especially to field trip and continuing education participants, whose trip or course may be canceled after the September 20 preregistration deadline. Call Travel King at 1-800-458-6398 or E-mail: trvlkng@indra.com, for a reservation or more information.

GSA Student Associate Member Travel Grants

The GSA Foundation has awarded matching grants to the six GSA Sections. The money, when combined with equal funds from the Sections, is used to assist GSA Student Associates traveling to GSA meetings. The following Sections offer assistance to the 1996 Annual Meeting in Denver. The remaining Sections offer assistance to their Section meeting. For information and deadlines, contact your Section secretary.

South-Central
Rena Bonem, (817) 755-2361

Northeastern
Kenneth Weaver, (410) 554-5532

Southeastern
Harold Stowell, (205) 348-5098,
http://www.geo.ua.edu/segsa/segsa.html

Getting to Your Hotel

Denver International Airport (DIA) is 24 miles from downtown, a 30 minute ride. Airport shuttle services offer the most affordable transportation alternative.

Airport Shuttles

Denver Airport Shuttle/Dash. 1-800-525-3177. Operates from DIA with service to and from downtown Denver. One way $15 and round-trip $27 (rates may vary slightly in October). Advance reservations not required. Located on Level 5 in the center of DIA terminal. You will see their ticket counter on your way to the baggage claim area.

RTD SkyRide. Convenient bus transportation from DIA to downtown Denver seven days a week. The service costs $6 each way. For further information, call RTD at (303) 299-6000, or when you arrive at DIA, stop by the RTD Sales Counter in the Ground Transportation area on Level 5, inside door 506.

Taxicabs. Taxi service to and from the airport is available. Approximate cost from the airport to downtown is $36–$43 for one person.

Car Rental. Alamo is the official car rental agency for the meeting. Identify yourself as a GSA meeting attendee by giving Group ID number 85204 and Plan Code GR to get guaranteed, discounted, daily/weekly rates as follows: economy $27/$125; compact $31/$135; mid-size $35/$145; full size $38/$165; luxury $62/$345, van $51/$295. An additional convention discount may be available by having your Alamo agent check Rate Code 9G. Rates include unlimited mileage. An Alamo rental counter is located on the baggage claim level at the airport. Look for the blue and yellow Alamo vans. Advance reservations are recommended. Call Alamo at 1-800-732-3232.

Getting Around in Denver

GSA Shuttle. Most downtown Denver restaurants and hotels are a convenient walking distance from the Convention Center and from each other. Therefore, GSA will provide a limited, *evening* shuttle serving the GSA-selected hotels and the Convention Center.

RTD Transit. There are several modes of public transportation in downtown Denver. RTD operates a free shuttle up and down the 16th Street Mall, the core of downtown Denver.

In addition, the light rail provides convenient service for downtown offices, cultural centers, hotels, shopping, restaurants, and entertainment. The rail line uses California and Stout streets to form a loop between 14th and 19th streets. Northbound trains use California, southbound use Stout. Both northbound and southbound trains stop at the Convention Center, the 16th Street Mall, and 18th Street. One-way transportation is $1.00 during peak times (6:00–9:00 a.m. and 4:00–6:00 p.m. Monday through Friday). The off-peak rate is only $0.50 each way.

Regular RTD buses also run throughout downtown and beyond. A daily pass good for light rail or bus can be purchased for $3 per day.

For route and schedule information about RTD's light rail, 16th Street shuttle, or regular bus service call (303) 299-6000 Monday through Friday 6:00 a.m. to 8:00 p.m.; Mountain time and weekends from 8:00 a.m. to 8:00 p.m.

Taxicabs. Service within downtown Denver costs a minimum of $1.40 and $1.40 per mile. Waiting time is charged at $0.30 per minute. Each additional passenger is $0.40. Taxi stands can be found outside most of the hotels, or you can call Yellow Cab at 777-7777.

1996 Annual Meeting

Denver, Colorado
October 28–31

Sawatch Range, Gunnison County, Colorado. Taylor Park Reservoir in foreground. Photo by Mark A. Koestel.

Registration and Housing Information:
inside this issue

New! Electronic Abstracts Submission:
page 3

Abstracts Due: *July 9*

Preregistration Due: *September 20*

Program Schedule: ***September* GSA Today *and the Web***

The titles and authors database will be available August 25, on the Web (http://www.geosociety.org). You can download sessions, events, exhibits, field trips, and courses, together with a basic search and sorting software that will create your personal daily calendar.

For Information:

GSA Meetings Department
P.O. Box 9140 • Boulder, CO 80301
(303) 447-2020 • (800) 472-1988
E-mail: meetings@geosociety.org
World Wide Web: http://www.geosociety.org