

G.S.A. ARCHIVES

NOVEMBER 5-8, 1984

MGM GRAND • RENO, NEVADA

GSA NEWS & INFORMATION



# THE GEOLOGICAL SOCIETY OF AMERICA



## 97TH ANNUAL MEETING

VOLUME 6, NUMBER 8

AUGUST 1984

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## Jot Down These Numbers . . .

For information prior to the Annual Meeting, call the GSA Meetings Department at (303) 447-2020.  
For information in Reno during the meeting, call (702) 789-2000 x2321

**REMEMBER TO VOTE ABSENTEE IN THE NATIONAL AND LOCAL ELECTIONS.  
CHECK WITH YOUR COUNTY ELECTION BOARD.**

## THINK RENO!

Reno has experienced major growth within the past five years. Even so, it has maintained its small-town qualities. The major hotels are centrally located relative to the airport. Getting around Reno is easy.

It is an interesting city of contrasts. Broad, high-desert views and snow-capped mountains; modern high-rise buildings and quaint Victorian homes; historical sightseeing and all-star entertainment and casinos.

Mackay School of Mines is the host institution for the GSA meeting. The General Chairman is Lawrence T. Larson, chairman of the Department of Geology. Mackay is located on the University of Nevada—Reno campus, a few minutes from the MGM Grand Hotel.

The related sightseeing areas are just outside the city of Reno. Lake Tahoe is the most spectacular, with its glassy, blue water, so clear you can see 100 feet below the surface. Driving distance from Reno to North Tahoe is 38 miles, and to South Tahoe 59 miles. Within easy range are Carson City, 30 miles, Virginia City, 23 miles, and Squaw Valley, 45 miles.

## SYMPOSIA

The technical program consists of volunteered papers that are presented in oral or poster session and invited papers presented in symposia. The symposia list appears below. The schedule for the entire program is on page 126.

Paleontological sessions will be held at Harrah's Hotel. All other sessions will be at the MGM Grand Hotel.

1. **Time and Circumstances of the Peopling of South America.** Archaeological Geology Division; David M. Hopkins.
2. **Characterization of Western Coals.** John C. Crelling.
3. **Debris Flows/Avalanches: Process, Sedimentology, and Hazard Mitigation** (full day). Engineering Geology Division and Quaternary Geology and Geomorphology Division (combined symposium); Gerald F. Wieczorek and John E. Costa.
4. **Extensional Tectonics I: Geological Studies.** Structural Geology and Tectonics Division; Greg Davis and George Davis. **Extensional Tectonics II: Geophysical Studies.** Geophysics Division; Robert B. Smith and George A. Thompson (combined symposia; full day).
5. Withdrawn.
6. **Arid-Zone Isotope Hydrology.** Hydrogeology Division; Alan H. Welch.
7. **First Billion Years: Earth and Nearby Planets.** Planetary Geology Division; Donald U. Wise and Robin Brett.
8. **Production and Flux of Biogenic Material in the Deep Sea.** Cushman Foundation; Robert Thunell and William Curry.
9. **Earth-Surface Chemical Cycles in the Geologic Past** (full day). GSA Centennial Program and Geochemical Society (combined symposium); Robert A. Berner and C. Bryan Gregor.
10. **Maps in the Geoscience Community.** Geoscience Information Society; Claren M. Kidd.
11. **Diffusion in Mineral, Melt, and Glass Systems.** Mineralogical Society of America; Maryellen Cameron.
12. **Recent Advances in Geophysics: Implications for Instruction.** National Association of Geology Teachers and Geophysics Division; William A. Bonini and Jack E. Oliver.
13. **Paleobiologic Aspects of the Origin and Precambrian Evolution of Living Systems.** Paleontological Society; J. William Schopf.
14. **Bulk-Minable Precious Metal Deposits in Cordilleran and Island-Arc Environments.** Society of Economic Geologists; H. F. Bonham, Jr., and J. V. Tingley.
15. **Quaternary Lacustrine Sediments of the Western United States—Dating and Environmental Analysis.** Kenneth L. Verosub and Jonathan O. Davis.
16. **Groundwater Geomorphology: Role of Underground Water in Earth-surface Processes and Landforms.** Charles G. Higgins and Donald R. Coates.
17. **Use and Abuse of Statistical Methods in the Earth Sciences.** William B. Size, C. John Mann, and Daniel F. Merriam.
18. **COCORP and Reflection Seismological Information on the Basin and Range Region.** Jack Oliver. (Special poster presentation.)
19. **Gold Deposits in Archean Environments.** Society of Economic Geologists; H. F. Bonham, Jr., and J. V. Tingley.
20. **Nevada Test Site Geology, Geophysics, and Hydrogeology.** John Hess and H. L. McKague.
21. **Dynamics of Environmental Quality, Lake Tahoe Basin, California-Nevada.** Robert H. Osborne.
22. **North American Continent-Ocean Transects Program: Cordilleran Transects.** GSA Decade of North American Geology. Robert C. Speed and Jason B. Saleeby.
23. **Emplacement of Silicic Lava Domes.** Jonathan Fink.
24. **Geochemical Reconstruction of Depositional and Diagenetic Environments.** George E. Claypool.
25. **Paleoenvironmental and Tectonic Controls in Coal-forming Basins of the United States.** Coal Geology Division; Paul C. Lyons and Charles L. Rice.



# FIELD TRIPS

All field trip registrants must also register for the meeting or pay the nonregistrant fee listed on the field trip form.

**Preregistration Deadline: MUST BE RECEIVED** at GSA Headquarters no later than **OCTOBER 5**.

Preregistration for a field trip is required. Use the official field trip registration form included here. For trip availability after the preregistration deadline, please contact the Field Trip Coordinator, GSA Headquarters, (303) 447-2020. On-site registration MAY be possible for postmeeting trips not fully subscribed, at the Field Trip Desk, MGM Grand, south lobby.

Full payment must accompany preregistration. Unpaid purchase orders will not be accepted as valid registration.

**Nonregistrant Fee:** Those wishing to participate in a field trip but unable to attend the meeting must register at the nonregistrant rate indicated on the field trip registration form. Payment of this fee will entitle you to a single, one-day, meeting-registration badge. Selection of the day for which you will register can be done on-site. Payment cannot be refunded and is not transferable.

Trips are technical in nature and can be physically rigorous. Participants will be selected on a first-come, first-served basis.

**Cancellation Deadline: October 12.** Cancellation requests **MUST** be made in writing and received by October 12. **NO** refunds after this date. All refunds subject to \$10 processing fee. **NO** refunds for on-site registrants.

Personal vehicles are **NOT** permitted. There will be **NO** discount or refund for special travel arrangements made by individuals in conjunction with **ANY** field trip.

**Field Trip Guidebooks:** Following the meeting, guidebooks may be purchased by contacting: 1984 GSA Annual Meeting Guidebooks, Joseph Lintz, Mackay School of Mines, Dept. Geological Sciences, University of Nevada, Reno, NV 89557.

All trips will begin and end in Reno unless otherwise indicated in the field trip descriptions. Trips originating from Reno will depart from the Field Trip Desk, south lobby, MGM Grand Hotel. For those trips not originating in Reno, participants must make their own arrangements for transportation to the starting point.

The cost of all trips includes the cost of transportation for the trip itself and the cost of the guidebook. It may also include costs of other services as noted within each trip description. Additional items covered will be identified by the amount provided and a letter designation: B = Breakfast, L = Lunch, D = Dinner, N = Night(s) lodging.

Additional details will be provided with the registration materials sent to each trip participant. Information may also be obtained from the Field Trip Chairman, Joseph Lintz, Dept. of Geological Sciences, Mackay School of Mines, University of Nevada, Reno, NV 89557, (702) 784-6050, or the Field Trip Coordinator, GSA Headquarters.

## PREMEETING TRIPS

### STRATIGRAPHY AND PALEONTOLOGY

**1. The Mississippian-Pennsylvanian Boundary in the Eastern Great Basin.** Gary Webster, Washington State University, Pullman; Mackenzie Gordon, USGS, Reston; Ralph L. Langenheim, Jr., University of Illinois, Urbana. Three days, Nov. 1, 2, 3.

Leaves from Salt Lake City, morning of Nov. 1. Outcrops exhibiting the Mississippian-Pennsylvanian boundary in western Utah, with emphasis on the House and Confusion Ranges in Utah and the Arrow Canyon Range in Nevada. Flight to Reno from Las Vegas, evening of Nov. 3. Limit: 40. Cost: \$356; includes airfare to Reno, 3L, 2N.

**2. Late Cambrian Faunal Crises: The Basis for Biomes.** A. R. Palmer, Geological Society of America, Boulder; M. E. Taylor, USGS, Denver. Four days, plus previous evening. Oct. 31, Nov. 1, 2, 3, 4.

Arrive Oct. 31 in Las Vegas for departure the morning of Nov. 1. Proceeds northward through eastern Nevada and western Utah, then across Nevada to Reno. Focus on biome boundaries and trilobite extinctions in the light of modern extinction theories. Limit: 32. Cost: \$246; includes 4L, 4N.

### COAL GEOLOGY

**3. Coal Deposits, Stratigraphy, and the Cretaceous-Tertiary Boundary, Southern Raton Basin, New Mexico and Colorado.** Charles L. Pillmore and Romeo Flores, USGS, Denver. (Coal Division) Three days, Nov. 2, 3, 4.

Leaves from Denver morning of Nov. 2. Coal deposits and coastal and fluvial environments of the Upper Cretaceous and lower Tertiary rocks of the Vermejo and Raton Formations. Special emphasis on examination of the Cretaceous-Tertiary boundary in the Raton Formation. Limit: 45. Cost: \$420; includes 2B, 3L, 3D, 2N, airfare to Reno.

Optional: for an *additional* \$71 you will be booked on a round-trip (Denver-Reno-Denver) flight. Return to Denver will be either on November 4 or after the meeting. There will be no refunds or transfers once this is ticketed and arrangements are made through GSA. This fare available on

(continued on p. 119)

# Field Trip Registration

**PREREGISTRATION must be received by October 5. Send full payment.**

**CANCELLATION requests to be received in writing by October 12. No refunds after this date.**

*One registrant per form. Please print.*

NAME (last) \_\_\_\_\_ (first) \_\_\_\_\_  
 INSTITUTION/EMPLOYER \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY/STATE/ZIP/COUNTRY \_\_\_\_\_

( ) \_\_\_\_\_  
 Phone: Business  
 ( ) \_\_\_\_\_  
 Home

				MTG REG FEE	AMT	NON- REG FEE*	AMT	Field Trip Status For Office Use Only			
								A	S	F	C
<b>Premeeting Trips</b>											
1.	Mississippian-Pennsylvanian Boundary	Nov. 1-3	(36)	\$356	_____	\$400	_____				
2.	Late Cambrian Faunal Crisis	Oct. 31-Nov. 4	(37)	246	_____	290	_____				
3.	Coal Deposits, Southern Raton Basin	Nov. 2-4	(38)	420†	_____	464†	_____				
4.	Truckee-Carson River Hydrogeology	Nov. 3-4	(39)	100	_____	144	_____				
5.	Tectonic Development, N Sierra Nevada	Nov. 2-4	(40)	171	_____	215	_____				
6.	Paleozoic-Mesozoic Continental Margin	Nov. 2-4	(41)	134	_____	178	_____				
7.	Paleozoic Stratigraphy, SW Great Basin	Nov. 1-4	(42)	287	_____	331	_____				
8.	Tertiary Tectonics, W-Central Nevada	Nov. 2-4	(43)	164	_____	208	_____				
9.	Geology of Ruby Mountains	Nov. 1-4	(44)	268	_____	312	_____				
10.	Geology of Nevada Test Site	Nov. 2-4	(45)	215	_____	259	_____				
11.	Mono Craters Long Valley Caldera	Nov. 1-4	(46)	157	_____	201	_____				
12.	Engineering Geol.—Slide Mtn.	Nov. 4	(47)	26	_____	70	_____				
13.	Quaternary Stratigraphy, Lake Lahontan	Nov. 3-4	(48)	97	_____	141	_____				
14.	Surficial Geology, East Mojave Desert	Nov. 1-4	(49)	269	_____	313	_____				
23.	Structure, Dynamics—Lake Tahoe	Nov. 4	(50)	33	_____	77	_____				
<b>Concurrent Half-Day Trips:</b>											
A.	Magma Mixing, Sierran Plutonic Rocks	Nov. 6	(51)	21	_____	65	_____				
B.	Magma Mixing, Sierran Plutonic Rocks	Nov. 7	(52)	21	_____	65	_____				
<b>Postmeeting Trips:</b>											
15.	Mineral Deposits, Central Nevada	Nov. 8-11	(53)	225	_____	269	_____				
16.	Mesozoic-Cenozoic Convergent Margin	Nov. 9-11	(54)	166	_____	210	_____				
17.	Overthrust Belt—Argentina	Nov. 9-20	(55)	1773	_____	1817	_____				
18.	Neotectonics of Western Nevada	Nov. 9-10	(56)	124	_____	168	_____				
19.	Tertiary Ext. Tectonics, Sevier Belt	Nov. 8-11	(57)	293	_____	337	_____				
20.	Enhanced Remote Sensing Imagery	Nov. 9-11	(58)	167	_____	211	_____				
21.	Hydrogeology, Nevada Test Site	Nov. 8-10	(59)	209	_____	253	_____				
22.	Geothermal Resources, Western Nevada	Nov. 9	(60)	35	_____	79	_____				
<b>TOTAL REMITTANCE \$</b>					_____		_____				

\* If you wish to participate in a field trip and do not plan to attend the entire meeting, register using this fee. Payment of this fee will entitle you to a single, one-day meeting registration badge. This additional fee cannot be refunded or transferred.

† If you pay an additional \$71 with either the registrant or nonregistrant fee listed for trip cost, you can take advantage of round-trip fare back to Denver from Reno. Field Trip #3 only.

A = Accepted  
 S = Standby  
 F = Filled  
 C = Cancelled

<b>FOR OFFICE USE ONLY</b> Deposit Date _____ Balance Due _____ A/R Refund _____ A/P GSA Check # _____	REMIT IN U.S. FUNDS, PAYABLE TO 1984 GSA ANNUAL MEETING OR CHARGE: <input type="checkbox"/> Master Card <input type="checkbox"/> VISA Card expires: _____ / _____ <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">mo.</div> <div style="margin-right: 10px;">yr.</div> <div style="border: 1px solid black; width: 150px; height: 15px; display: flex; align-items: center;"> <!-- Card number input field --> </div> </div> card number Signature _____
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MAIL TO: 1984 GSA ANNUAL MEETING, P.O. BOX 9140, BOULDER, CO 80301.

GSA  
MEMOIR 162

# The Caribbean- South American Plate Boundary and Regional Tectonics

The fact that the debate continues on the evolution of the Caribbean plate and its borderlands is reflected in the 28 papers included in this volume. Some authors postulate a distant Pacific source for Caribbean crust; others consider the geometry, timing, and effects of collision; still others view the process of evolution from the vantage point of the craton, from the time prior to collision, through the ensuing orogeny caused by collision, to the youngest phases of Plio-Pleistocene time.

Surprising to the editors is the accumulating evidence for increasingly radical, large-scale rotations and translations in the heretofore sacrosanct cratonic "autochthon." Most evidence is for such occurrence prior to the earliest Cretaceous, but there is also evidence that such movement is continuing today.

Pocket in back of book contains a 35x29" 4-color map of the area.

EDITED BY WILLIAM E. BONINI,  
ROBERT B. HARGRAVES, AND  
REGINALD SHAGAM

Memoir 162, x + 422, 8½ x 11, hard bound, CIP, ISBN  
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# FIELD TRIPS

this field trip ONLY. For flight schedules available, contact Charles Pillmore (303) 236-1240.

## HYDROLOGY

**4. Truckee-Carson River Hydrogeology.** Patrick A. Glancy, USGS, Carson City; Roger Jacobson, Desert Research Institute, Reno. (Hydrogeology Division) Two days, Nov. 3, 4.

Departs Nov. 3, morning. Hydrogeologic phenomena in an area extending 100 miles east of Reno. Two geothermal sites, recharge areas of the eastern Sierras, Pleistocene Lake Lahontan, and modern Pyramid Lake.  
Limit: 80. Cost: \$100; includes 2L, 1D, 1N.

## TECTONICS/STRUCTURE

**5. Tectonic Development of the Northern Sierra Nevada: An Accreted Late Paleozoic Island Arc and Its Basement.** Richard A. Schweickert, Mackay School of Mines, Reno; Gary Girty, San Diego State University, San Diego; Richard Hanson, University of Zambia; David Harwood, USGS, Menlo Park. (Structural Geology and Tectonics Division) Three days, Nov. 2, 3, 4.

Leaves from Reno, morning of Nov. 2. Submarine volcanism, sedimentation, faulting, and basin development in an island arc, west side of the Sierras. Stratigraphic and structural relations of the basement, which represents an early Paleozoic accretionary complex, and its ramifications for the late Paleozoic and Mesozoic tectonics of the Cordillera from Nevada to Canada.  
Limit: 50. Cost: \$171; includes 2B, 3L, 2D, 2N.

**6. Paleozoic and Mesozoic Continental Margin Collision Zone Features: Mina to Candelaria, Nevada, Traverse.** Robert C. Speed, Northwestern University, Evanston. (Structural Geology and Tectonics Division) Two days, plus previous evening, Nov. 2 (p.m.), 3, 4.

Leaves from Reno, late afternoon or early evening, Nov. 2. Travel to Hawthorne. Systemic spatial array of tectonic units related to the Sonoma event, including forearc deposits, accretionary prism, serpentinite melange, suture, foreland basin strata, and North American foreland; Golconda allochthon at two sites.  
Limit: 30. Cost: \$134; includes 2L, 2N.

**7. Paleozoic Stratigraphy and Tectonics of the Southwestern Great Basin.** Michael D. Carr, Paul Stone, and John H. Stewart, USGS, Menlo Park; John Oldow, Rice University, Houston; Forest G. Poole, USGS, Denver; Calvin H. Stevens, San Jose State University, San Jose. Three days, plus previous evening, Nov. 1 (p.m.), 2, 3, 4.

Assembles at Los Angeles airport (LAX), evening of Nov. 1 for drive to Mojave, California. Exposures of Paleozoic tectonostratigraphic units will be compared in the El Paso Mountains, Darwin Wash, and Miller Mountain. Data concerning the southern extent of the Antler and Sonoma orogenies and possible existence of exotic terranes in the southwestern Great Basin.  
Limit: 32. Cost: \$287; includes 3B, 3L, 2D, 3N.

**8. Tertiary Tectonics of West-central Nevada: Yerington to Gabbs Valley.** Richard F. Hardyman, USGS, Denver; John Proffett, Proffett Exploration, Anchorage; E. B. Ekren, USGS, Denver. Three days, Nov. 2, 3, 4.

Leaves Reno, morning of Nov. 2. Various styles of late Tertiary faulting west of, and across, the central part of Walker Lane; Jurassic batholith revealed by Cenozoic faulting; listric faulting; mineralization areas, volcanic rocks, and fanglomerates used to establish directions and distances of faults.  
Limit: 40. Cost: \$164; includes 2B, 3L, 2D, 2N.

**9. Geology of the Ruby Mountains—East Humboldt Range, Nevada: A Cordilleran Metamorphic Core Complex.** Arthur W. Snoke, University of Wyoming, Laramie; Keith Howard, USGS, Menlo Park. Four days, Nov. 1, 2, 3, 4.

Starts from Reno airport at 1:00 p.m., Nov. 1. Stratigraphic, structural, metamorphic, and plutonic features of these two ranges. Includes migmatitic late Precambrian to middle Paleozoic miogeosynclinal sediments, a deformed Tertiary pluton, and mylonites. Organizational meeting and orientation on the evening of Nov. 1.  
Limit: 45. Cost: \$268; includes 3B, 3L, 2D, 3N.

## VOLCANISM AND ENGINEERING GEOLOGY

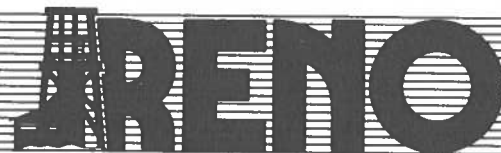
**10. Geology of the Nevada Test Site.** Holly D. Ander; Frank M. Byers, Los Alamos National Laboratory, Los Alamos; Paul P. Orkild, USGS, Denver. Three days, Nov. 2 (p.m.), 3, 4.

Reception, evening of Nov. 2. Departs Las Vegas Nov. 3, morning. Emphasizes Tertiary basin-and-range-style faulting and the Timber Mountain resurgent caldera complex. Laramide deformation of the Paleozoic sediments and, if time permits, a visit to the proposed waste isolation facility. Travel to and from Las Vegas and the Nevada Test Site. Restricted to United States citizens; documentation of citizenship required.  
Limit: 90. Cost: \$215; includes 1B, 2L, 1D, 2N, and airfare to Reno.

**11. Mono Craters, Long Valley Caldera: Volcanic and Earthquake Hazards.** Ed Harp and David Keefer, USGS, Menlo Park; Alan Ryall, Mackay School of Mines, Reno; Spencer H. Wood, Boise State University, Boise; Roy A. Bailey and C. Dan Miller, USGS. Four days, Nov. 1, 2, 3, 4.

Departs morning of Nov. 1. Volcanic, landslide, and seismic hazards of the Long Valley Caldera—Mono Craters area. Emphasizes the volcanic history of Long Valley Caldera, recent volcanic features of the Mono-Inyo Craters, and ground failures (rock falls, liquefaction) induced by the 1980 M 6+ Mammoth Lakes earthquakes. Results of seismological investigations of this earthquake sequence for the period 1978–1984 will be discussed in evening sessions.  
Limit: 90. Cost \$157; includes 3L, 3N.

(continued on p. 120)



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# FIELD TRIPS

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**12. Engineering Geology of Slide Mountain Rock Slide and Waterflood-Debris Flow.** Robert J. Watters, Mackay School of Mines, Reno. (Engineering Geology Division) One day, Nov. 4.

Departs morning of Nov. 4. Examination and study of the May 30, 1983, rock slide and debris flow on Slide Mountain, 20 miles south of Reno. Engineering and rock behavior as it affected the rock slide, reservoir failure, and water passage down Ophir Creek onto the alluvial flats. Rugged terrain, field clothes advised. Limit: 30. Cost: \$26; includes 1L.

## ARCHAEOLOGY AND QUATERNARY GEOLOGY

**13. Quaternary Stratigraphy and Archaeology of the Lake Lahontan Area: A Reassessment.** Jonathan O. Davis, Desert Research Institute, Reno; Roger B. Morrison, Golden. (Archaeological Geology Division) Two days, Nov. 3, 4.

Departs Reno, morning of Nov. 3. A re-examination of various new or controversial aspects of (1) the stratigraphic evidence for the major high- and low-level events of Lake Lahontan during the past 600,000 years; their chronology and paleoclimatic implications in the lower Truckee, Humboldt, Walker River, and Carson Desert areas; and (2) the Holocene archaeological-archaeogeological record, especially at Hidden Cave.

Limit: 40. Cost: \$97; includes 2L, 1N.

**14. Surficial Geology of the Eastern Mojave Desert.** John C. Dohrenwend, USGS, Menlo Park; Stephen G. Wells and Leslie D. McFadden, University of New Mexico, Albuquerque; Lawrence H. Lattman, New Mexico Institute of Mining and Technology, Socorro; Roger S.U. Smith, Austin. Four days, Nov. 1, 2, 3, 4.

Examination of selected areas of the Mojave Desert including the Cima volcanic field and the Cima Piedmont domes, Silver Lake, the Tecopa basin, and the piedmonts of the Nopah and McCullough Ranges. Emphasizes the surficial geology of the Cima volcanic field, radiometric and relative age dating of Quaternary alluvial deposits, morphostratigraphic correlation of alluvial fans, cumulic soils development in eolian parent materials, and landform evolution in arid environments. Trip begins in Las Vegas morning of Nov. 1 and ends in Las Vegas with flight to Reno on Nov. 4. Limit: 48. Cost: \$269; includes 3L, 3N, and airfare to Reno.

## SEDIMENTOLOGY

**23. Structure and Dynamics of the Nearshore Sedimentological System in Lake Tahoe and the Effects of Manmade Structures.** Robert Osborne, University of Southern California, Los Angeles; Ralph L. Moory, California State Lands Commission, Sacramento. One day, Nov. 4.

Departs Reno late morning (postsymposium #21). Problems encountered in constructing structures in the nearshore zone of the lake without knowledge of the dynamics of that zone. Participants will see shoreline areas that have undergone substantial change because of the influence of nearby structures and the modifications made in attempts to alleviate the effects. Areas defined by unique sediment distribution will also be viewed.

Limit: 125. Cost: \$33.00; includes 1L.

## CONCURRENT HALF-DAY TRIPS

**A. Magma Mixing in Some Sierran Plutonic Rocks.** Malcolm J. Hibbard, Mackay School of Mines, Reno. Departs Tuesday, Nov. 6, 8 a.m., and Wednesday, Nov. 7, 1 p.m. Two trips, 4 hours each.

Display of new criteria for magma mixing in plutonic rocks. Travel across Donner Summit to Kingvale, California. Limit: 45 each trip. Cost: \$21.

## POSTMEETING TRIPS

### ECONOMIC GEOLOGY

**15. Mineral Deposits of Central Nevada.** Odin Christensen, Newmont Exploration, Reno. (Geological Society of Nevada) Three days, plus previous evening, Nov. 8, 9, 10, 11.

Geologic and geochemical setting of multiple active mining districts in Nevada, including Northumberland, Round Mountain, Tonopah, Manhattan, and Battle Mountain. Limit: 40. Cost: \$225; includes 1B, 3L, 1D, 3N.

### TECTONICS AND STRUCTURE

**16. Mesozoic-Cenozoic Convergent Margin of Northern California.** Raymond Ingersoll, University of California, Los Angeles; Stephan Graham, Stanford University, Palo Alto; Richard Schweickert, Mackay School of Mines, Reno; Darrel Cowan, University of Washington, Seattle; John Kleist, Chevron Overseas Petroleum, Inc. Three days, Nov. 9, 10, 11.

Leaves from Reno, morning of Nov. 9. Across the Sierra Nevada into the Sacramento Valley for a comprehensive overview of all components of an ancient convergent margin. Ends Nov. 11, late afternoon, at the San Francisco airport.

Limit: 90. Cost: \$166; includes 3L, 2N.

**17. The Pre-Cordilleran Active Overthrust Belt, San Juan Province, Argentina.** Robert A. Whitney, Mackay School of Mines, Reno; Hugo E. Bastias, University of San Juan, Argentina. (Structural Geology and Tectonics Division) Eleven days, Nov. 9–20.

Structure, tectonics, stratigraphy, and active faulting of an actively forming back-arc overthrust belt occurring in carbonate shelf and continental slope deposits in west-central Argentina. Leaves Reno airport morning of Nov. 9; ends in Los Angeles Nov. 20. Argentine visa required; no immunization requirements. Spouses welcome. One day in Buenos Aires.

Limit: minimum 10; maximum 25. Cost \$1773; includes airfare Reno–Argentina–Los Angeles, meals (except in Mendoza and Buenos Aires), lodging.

**18. Neotectonics of Western Nevada.** John W. Bell, Nevada Bureau of Mines and Geology, Reno; David B. Slemmons, Mackay School of Mines, Reno; Robert E. Wallace, USGS, Menlo Park. (Engineering Geology Division) Two days, Nov. 9, 10.

Young faulting related to late Quaternary large-magnitude earthquake activity will be the focus of the trip. Major structural-tectonic features to be viewed include the Sierra Nevada Frontal Fault Zone, the Walker Lane, the Stillwater



Seismic Gap, and the faulting associated with the 1954 Dixie Valley–Fairview Peak earthquakes. An overview of the Quaternary geology will be included, and several trenches across active faults will be examined. Leave Reno 7:00 a.m., Nov. 9; return to Reno by 5:00 p.m., Nov. 10. Limit: 40. Cost: \$124; includes 2L, 1D, 1N.

**19. Tertiary Extension Tectonics in the Sevier Belt of Southern Nevada.** Brian Wernicke, Harvard University, Cambridge; Peter L. Guth, USMA, West Point. Three days, plus previous evening, Nov. 8 (p.m.), 9, 10, 11.

Tertiary low-angle and detachment faulting in the Sevier thrust belt across the transition from the craton to the miogeocline; outcrops in the Mormon Mountains, Meadow Valley Mountains, Sheep Range, and Desert Range, Nevada. Flight to Las Vegas early evening, Nov. 8; ends at Las Vegas airport, late afternoon, Nov. 11. Limit: 40. Cost: \$293; includes 1B, 3L, 1D, 3N, and airfare to Las Vegas.

#### REMOTE SENSING

**20. Alteration and Mineralization Detection by Enhanced Remote Sensing Imagery for Mineral Exploration in Southwest Nevada and Adjacent California.** James V. Taranik, Mackay School of Mines, Reno; Floyd F. Sabins, Chevron Oil Field Research, La Habra. Three days, Nov. 9, 10, 11.

Leaves from Reno morning of Nov. 9. Comprehensive variety of aircraft and satellite sensor data at such locales as Walker Lake, Yerington, Tonopah, Goldfield-Cuprite, Beatty, Death Valley, Pahrump Mining Districts, and the Keystone thrust fault. Ends at Las Vegas airport, late afternoon, Nov. 11.

Limit: 90. Cost: \$167; includes 2B, 3L, 2D, 2N.

#### HYDROGEOLOGY AND GEOTHERMAL

**21. Hydrogeology of the Nevada Test Site.** John W. Hess, Desert Research Institute, Las Vegas; Roger Jacobson, Desert Research Institute, Reno. Two days, plus previous evening flight, Nov. 8 (p.m.), 9, 10.

A review of the regional flow systems, the groundwater recharge, and the unsaturated flow within the Nevada Test Site and adjacent areas. Limited to United States citizens; documentation required. Flight to Las Vegas, early evening, Nov. 8; ends at the Las Vegas airport, late afternoon, Nov. 10.

Limit: 90. Cost \$209; includes 2L, 2N.

**22. Geothermal Resources of Western Nevada.** Dennis T. Trexler and Thomas Flynn, University of Nevada—Las Vegas, Reno; Donald E. White, USGS, Menlo Park; William L. Desomier, Phillips Petroleum Company, Salt Lake City. One day, Nov. 9 (a.m.).

Surface manifestation, geologic controls, and reservoir characteristics of active hydrothermal systems at Steamboat, Brady's, and Moana geothermal areas.

Limit: 74. Cost: \$35; includes 1L.

#### SEDIMENTOLOGY

**23. Structure and Dynamics of the Nearshore Sedimentological System in Lake Tahoe.** (See premeeting trip descriptions.)

#### Field Trips Sponsored by the Society of Economic Geologists

For information, contact:

Western Experience, 2450 Central Avenue, Suite P2, Boulder, CO 80302; (303) 449-3352.

#### Premeeting

*Sediment-Hosted Precious Metal Deposits.* Joseph V. Tingley and Harold F. Bonham, Nevada Bureau of Mines and Geology, Reno. Four days, Oct. 31, Nov. 2, 3, 4. (Trip is sold out.)

Reno to Winnemucca, Elko, and Ely and return. Will visit Pinson, Jerritt Canyon, Maggie Creek, Windfall, and Alligator Ridge gold mines and Taylor silver mine. Cost: \$245; includes 4N, 3L, wine and cheese party.

#### Postmeeting

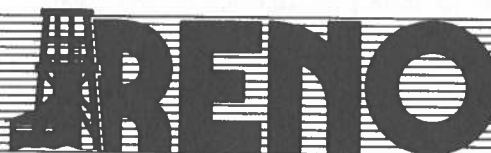
*Epithermal Deposits of the Western Great Basin.* Roger Ashley, USGS, Menlo Park. Four days, Nov. 9, 10, 11, 12.

Epithermal deposits of eastern California, western Nevada, and northwestern Arizona. Districts and mines to be visited include Monitor, Bodie, Aurora, Red Mountain (Sixteen-to-one mine), Gold Field, and Oatman-Catherine. Compare features of several types of epithermal deposits that occur in volcanic host rocks. Leaves Reno Nov. 9; travels through Bridgeport, California, and Hawthorne, Nevada, to Las Vegas, Nevada, and ends in Las Vegas Nov. 12. Limit: 60. Approximate cost: \$275.



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**1984 GSA ANNUAL MEETING & EXPOSITION**

# SHORT COURSES/FORUMS/WORKSHOPS

## SHORT COURSES

### PALEONTOLOGICAL SOCIETY SHORT COURSE ON MAMMALS

Sun., Nov. 4, 8:00 a.m.—5:00 p.m., Harrah's Hotel.

The course is designed to give an overview of modern mammalian diversity and trace the history of mammals from their origin 200 million years ago to the present day. The course emphasizes the biostratigraphic distribution of fossils, major functional innovations, and general evolutionary patterns. There is no fee. Course notes are available for \$7.50. Registration at the door. Further information: Philip D. Gingerich and Catherine E. Badgley, Museum of Paleontology, University of Michigan, Ann Arbor, MI 48109, (313) 764-0489/0490.

### MICAS

Sat., Nov. 3, 8:00 a.m.—5:00 p.m. and Sun., Nov. 4, 8:00 a.m.—5:00 p.m. Welcoming reception Friday evening, Nov. 2. All events will be held at the Reno Hilton Hotel. Sponsored by MSA.

The course will consist of two morning and two afternoon lecture-discussion sessions and one evening workshop. Two catered luncheons and coffee breaks are included. The lectures will form the basis of Volume 13 of the MSA series *Reviews in Mineralogy*. The following topics will be covered: classification and structures of micas, crystal chemistry and petrology of brittle micas, electrostatic modeling of micas, spectral methods applied to micas, phase equilibrium diagrams, optical properties of micas under the polarizing microscope, micas in pegmatites, micas in igneous rocks, micas in metamorphic rocks, F-OH and Cl-OH exchange in micas with applications to hydrothermal ore deposits, illite, glauconite, and celadonite. Authors/speakers: S. W. Bailey (University of Wisconsin), P. Cerny (University of Manitoba), D. D. Eberl (USGS), R. F. Giese, Jr. (SUNY at Buffalo), S. Guggenheim (University of Illinois, Chicago), C. V. Guidotti (University of Maine), D. A. Hewitt (Virginia Polytechnic Institute), J. L. Munoz (University of Colorado), I. E. Odom (American Colloid Co.), G. R. Rossman (Caltech), J. A. Speer (Virginia Polytechnic Institute), J. Srodon (USGS), R. E. Wilcox (USGS), and D. R. Wones (Virginia Polytechnic Institute). Fee: Professional MSA member—\$125; professional nonmember—\$155; student MSA member—\$40; student nonmember—\$50. Further information and registration: S. W. Bailey, Dept. of Geology and Geophysics, 315 Weeks Hall, University-Madison, Madison, WI 53706, (608) 262-1806.

### GEOLOGICAL USES OF DIATOMS

Fri., Nov. 9, 8:00 a.m.—5:00 p.m., MGM Grand Hotel. Sponsored by the Cushman Foundation.

Uses of marine and nonmarine diatoms to solve geological problems—biostratigraphy, paleoclimatology, paleoceanography, and paleolimnology. Instructors: Lloyd Burckle (Lamont-Doherty), John Barron (USGS), J. Platt Bradbury (USGS), William Krebs (Amoco), Constance Sancetta (La-

mont-Doherty), Hans Schrader (Oregon State). Fee: Professional, preregistration—\$80; professional, on-site—\$100; student, preregistration—\$40; student, on-site—\$50. Preregistration deadline: October 1. Fee includes course materials and refreshments. Make checks payable to Diatoms Short Course. Further information and registration: John Barron, U.S. Geological Survey, MS 915, Menlo Park, CA 94025, (415) 323-8111, ext. 4148.

### PALEOMAGNETISM AS A TOOL FOR TECTONIC AND STRUCTURAL ANALYSIS

Thurs., Nov. 8—evening reception and dinner; Fri., Nov. 9, 8:00 a.m.—5:30 p.m., with evening banquet; Sat., Nov. 10, 8:00 a.m.—4:45 p.m. Optional: Field trip, Sun., Nov. 11. All events will be held at the College Inn, Reno. Sponsored by GSA Structural Geology and Tectonics Division.

This course in paleomagnetism is aimed at nonspecialists who suspect that paleomagnetism may turn out to be useful in their line of work. Subjects to be covered: fundamentals of geomagnetism—dipole and nondipole magnetic field, dynamo theory, reversal mechanisms; fundamentals of rock magnetism—magnetic mineralogy, types of remanent magnetism (TRM, CRM, DRM, VRM, etc.), induced magnetism and magnetic susceptibility, stability of remanent magnetism; paleomagnetic field and laboratory procedures—from collecting the oriented specimen to making the final measurement; paleomagnetic statistical techniques—what to believe and what to doubt, and how to unerringly tell the difference; interpretation—structural applications at all scales, from rock fabrics and sediment transport directions to allochthonous terranes. The course will be of greatest benefit to regional geologists, structural geologists, and others who are encountering paleomagnetic data in their research or are deciding whether to build paleomagnetic investigations into the next research proposal. Instructors: John W. Geissman (Colorado School of Mines) and Rob Van der Voo (University of Michigan). Fee: \$150, includes lodging, meals, course materials, and optional field trip on Sun., Nov. 11. Further information and registration: Rob Van der Voo, Dept. of Geological Sciences, University of Michigan, Ann Arbor, MI 48109, (313) 764-1435.

### GSA COURSES/WORKSHOP

The following courses are sponsored by GSA. All will be held at the MGM Grand Hotel:

Seismic Stratigraphy and Its Geologic Implications  
Remote Sensing for Earth Scientists  
Microcomputers and the Mining Geologist  
Geowriting: Quickly. Clearly. Concisely.

**Enrollment:** Course participation is open to members and nonmembers. Registration for the meeting is not necessary. Course preregistration for the three GSA short courses and the one GSA workshop are available on the Reno registration form. On-site registration will be \$10 additional.

**Cancellations:** Fees will be refunded if we are notified before the course. Substitutions may be made at any time. No refunds will be made following the course.

For more information on any of these four courses:

GSA Course Registrar  
GSA Headquarters  
P.O. Box 9140  
Boulder, CO 80301

(303) 447-2020

### **REMOTE SENSING FOR EARTH SCIENTISTS**

Sun., Nov. 4, 9:00 a.m.—5:00 p.m.

The course provides equal time for lectures and “hands-on” interpretation of representative images by participants. Lectures and interpretation projects cover the major aspects of remote sensing—Landsat, thermal infrared, and radar images, plus digital processing of image data. Course fees include copies of the “Remote Sensing Laboratory Manual” and “Instructors Key.” This course will be particularly beneficial to those planning to participate in the postmeeting remote sensing field trip to western Nevada and adjacent California.

Faculty: F. F. Sabins, Senior Research Associate, Chevron Oil Field Research Company. Sabins has a B.S. degree from the University of Texas, Austin, and a Ph.D. from Yale University. He has been with Chevron since 1955. He also teaches in the Earth and Space Sciences Department at UCLA, received the Allan Gordon Award from the American Society of Photogrammetry, and most recently was recognized with the 1983 Pecora Award, given by the Department of the Interior and NASA for contributions to the science of remote sensing. Sabins wrote the widely used text *Remote Sensing—Principles and Interpretation*.  
Limit: 100. Fee: \$75.

### **MICROCOMPUTERS AND THE MINING GEOLOGIST**

Sat., Nov. 3, 9:00 a.m.—5:00 p.m.

This course will demonstrate how microcomputers can assist geologists, in a cost-effective way, in evaluating exploration data, developing mine plans, estimating mining economics, and preparing feasibility reports. The course will include the following topics: (1) Microcomputer hardware systems, emphasizing hardware compatibility, cost, and dealing with vendors. (2) Geologic and mining software, targeting sources and comparisons of software packages, customizing dedicated software and writing your own programs, and evaluation of costs and selection trade-offs. (3) Matching hardware and software, developing evalua-

tion requirements, and planning for future expansion. Coverage of topics will be applications oriented and designed for geologists with a minimum-to-intermediate level of computer literacy. The course will not emphasize terminology.

Faculty: Michael D. Loy, partner of Skelly and Loy Engineers-Consultants, offering comprehensive services in mining and environmental research, planning, and design. Loy has more than 12 years of professional experience in providing consulting services to the mining and mineral-processing industry. His work has focused on using computers to assist clients in all phases of mineral project development. Stephen A. Krajewski, vice-president of Industrial Ergonomics, Inc., offering consulting in geology, industrial health and safety, and ergonomics. He has more than 15 years of experience in geologic exploration and mining feasibility projects.  
Limit: 100. Fee: \$85.

### **SEISMIC STRATIGRAPHY AND ITS GEOLOGIC IMPLICATIONS**

Sun., Nov. 4, 9:00 a.m.—5:00 p.m.

Cosponsor: GSA Geophysics Division

The morning session will begin with an overview of seismic photographic interpretation. A lecture and group participation exercise will follow on why seismic reflections follow a chronostratigraphic time line and not time-transgressive formation boundaries. A second lecture will follow on seismic sequence and facies interpretation procedure. The afternoon session opens with a group participation exercise on the interpretation of stratigraphy from seismic data. The lecture that follows will cover geologic implications of seismic stratigraphy. The focus will be on six implications: episodic and cyclic sedimentation, type one and type two unconformities, condensed sections, global cycle charts of change of sea level, relation of sea-level change to tectonics, and global chronostratigraphic correlation. The lecture continues with why cyclic changes of sea level are a better explanation for “rare” events than 1,000-year storms, 500-foot tidal waves, meteorites, dust, or death stars. The course will close with a discussion session based on written and oral questions. The course is designed for professors, students, and government employees. Preference will be given to these categories of registrants.

Faculty: Peter R. Vail, Research Scientist, Exxon Production Research Co., Houston, Texas. His principal publications concern seismic stratigraphy and global changes of sea level and tectonics. Among many other awards, Vail received the 1983 Off-Shore Technology Conference Distinguished Achievement Award for Individuals and was the Bullerwell Lecturer for the United Kingdom Geophysical Society.  
Limit: 100. Fee: \$100.



# SHORT COURSES/FORUMS/WORKSHOPS

## FORUMS

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

Mon., Nov. 5, 2:00–4:00 p.m.

Are you interested in salary scales, tips for successful interviews, and an overview of employment opportunities? What are the current trends in academia, government, industry, or consulting? Attend the GSA Employment Service Forum on Monday, November 5th to hear from six experts. Each panel member will speak briefly on the outlook in his or her special area and answer questions from the audience. The 1984 speakers are: Chairman Dick Paull, University of Wisconsin; Penny Hanshaw, USGS; J. D. Edwards, Pecten International Company; Tony Neathery, Alabama Geological Survey; Jack Frost, Exxon Minerals Company; and Dave Stephenson, Water Resources Associates, Inc. For further information: Clara Hodgson, Membership Coordinator, GSA, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020.

### MINERAL RESOURCES ON THE FEDERAL LANDS: THE PUBLIC POLICY CHALLENGE

Tues., Nov. 6, 5:30–7:00 p.m.

The GSA Committee on Geology and Public Policy will present a panel discussion with audience participation. The panel will consist of Sam Adams, consultant in mineral exploration, Boulder, Colorado; James Davis, State Geologist of California; James Santini, attorney, former Congressman, Washington, D.C.; Arnold Silverman, University of Montana; and a representative from the Department of the Interior (to be announced). Conveners: Priscilla C. Grew, Commissioner, Public Utilities Commission, California, and Tom Joiner. Moderator: Genevieve Atwood, State Geologist of Utah. There will be opportunity for attendees to ask questions and to express opinions. The atmosphere will be informal.

### SEMINAR: COMPUTER TECHNOLOGY FOR EDUCATIONAL PROGRAMS IN THE GEOSCIENCES

Sun., Nov. 4, 2:00 p.m.–5:00 p.m., MGM Grand.  
Reception follows at Mackay School of Mines.

Cosponsors: GSA and Mackay School of Mines

The purpose of this seminar is to provide managers of academic programs in the geosciences with a timely perspective on issues related to implementation of computer technology for teaching and research on university campuses. This special program is designed for deans and department chairmen, but the seminar is open to all.

Seminar convener is James V. Taranik, Dean, Mackay School of Mines. Open discussion and a reception will follow the program of panelists addressing the following issues:

- Management alternatives facing geoscience administrators

- National Science Foundation support for computer instrumentation and data base development in the geosciences
- Perspectives on philanthropy supporting the implementation of computer instrumentation in geoscience education
- Computer industry support for introduction of computer technology in higher education
- New trends in development of computer technology that affect academic planning for the next decade
- Issues related to introduction of computer technology and efficiency of the educational process for the geosciences

For further information, contact the GSA Course Registrar.

## WORKSHOPS

### GEOREF WORKSHOP

Thurs., Nov. 8, 8:30 a.m.–12:00 noon, MGM Grand.  
Cosponsored by GIS and AGI.

The workshop includes an introduction to on-line searching for nonsearchers given by the GeoRef staff, a coffee break with discussion, and a panel discussion on using the bibliography compared to searching on-line. Panelists include Dederick C. Ward, University of Illinois at Urbana, Mary W. Scott, University of North Dakota, and James O'Donnell, Trinity University. No fee, no registration required. Further information: Julie Jackson, AGI, 4220 King Street, Alexandria, VA 22302, 1-800-336-4764.

### GEOWRITING: QUICKLY. CLEARLY. CONCISELY.

Two one-day workshops on Sat., Nov. 3, and Sun., Nov. 4, 9:00 a.m.–5:00 p.m.  
Sponsored by GSA.

This is a *practical* workshop that will help you break writer's block, organize for fast, efficient writing, and work smoothly with editors. It includes an easy method for dealing with grammar without pain, and also an introduction to writing in the computer age.

Faculty: Wendell Cochran, science writer, editor, and photographer. He was editor of *Geotimes* for more than 20 years, and is senior editor of *Geowriting* and co-author of *Into Print*. Cochran holds a master's degree in geology as well as a degree in journalism. He is a charter member of the Society for Scholarly Publishing and of the Association of Earth Science Editors. Since 1979 he has held many workshops on science writing, notably at the annual meetings of GSA and AAPG/SEPM.

Enrollment: Registration for the workshop is available on the Reno preregistration form. Please read the GSA short course guidelines above; they will apply to this workshop also. For more information, contact the GSA Course Registrar.

Limit: 25. Fee: \$75.

The Geoscience Exhibit opens Monday, November 5.

## Exhibitors as we go to press:

- |                                     |                                      |  |
|-------------------------------------|--------------------------------------|--|
| A A P G Bookstore                   | GSA Combined Publishers Display      | Oklahoma Geological Survey             |
| A A P G Visiting Geologists Program | GSA 1985 Annual Meeting—Orlando      | Oxford University Press                |
| Academic Press, Inc.                | General Supply Corporation           | Paleontological Society                |
| A I P G                             | Geologic Times                       | Pergamon Press, Inc.                   |
| Allen & Unwin, Inc.                 | Geoscience Information Society       | Permian Basin Section—SEPM             |
| American Geological Institute       | Geoscience Resources, Inc.           | Philips Instruments                    |
| American Geophysical Union          | Geosim Corporation                   | Plenum Publishing Corporation          |
| Applied Geologic Studies, Inc.      | High Pressure Diamond Optics         | Polaroid Corporation                   |
| Aurora Tech, Inc.                   | Hillquist                            | Prentice-Hall, Inc.                    |
| Barringer Resources                 | Hunter Textbooks, Inc.               | Princeton University Press             |
| Bausch & Lomb, Inc.                 | Hutchinson Ross Publishing           | Progressive Exploration                |
| Blake Industries                    | Image Technology Corporation         | Qualimetrics, Inc.                     |
| Brigham Young University            | International Association for Mathe- | Rigaku USA, Inc.                       |
| G. Brot, S.A.                       | matical Geologists                   | Schonstedt Instrument Company          |
| William C. Brown Company            | International Human Resource         | Scientific, Medical Publications of    |
| Buehler Ltd.                        | Development                          | France                                 |
| Burgess Publishing Company          | International Union of Geological    | Seacoast Scientific/Mann Petrographics |
| Cambridge University Press          | Sciences                             | Sharp-Shurtz Company                   |
| Cameca Instruments, Inc.            | JEOL U.S.A., Inc.                    | Sigma Gamma Epsilon                    |
| Canadian Society of Petroleum       | Jena, Seiler Instruments             | Society of Earth Science Students      |
| Geologists                          | Kendall/Hunt Publishing Company      | Society of Economic Paleontologists &  |
| Carolina Biological Supply          | Kevox Corporation                    | Mineralogists                          |
| Chapman & Hall/Methuen, Inc.        | Kluwer Academic Publishers           | Spectrex Corporation                   |
| Circum-Pacific Map Project          | Krieger Publishing                   | SPI Supplies Division, Structure Probe |
| Clay Minerals Society               | Krueger Enterprises, Inc.            | Springer-Verlag New York, Inc.         |
| Coastal Science Laboratories, Inc.  | E. Leitz, Inc.                       | Star Publishing Company                |
| Cushman Foundation                  | LKB Instruments, Inc.                | Tasa Graphic Arts, Inc.                |
| D.J. Mineral Kit Co.                | Logitech, Inc.                       | Terra-Mar Corporation                  |
| Delsi, Inc.                         | Louisiana State University           | Texas Instruments, Inc.                |
| Digital Equipment, Inc.             | Mackay School of Mines               | Tichenor Publishing                    |
| Economic Geology Publishing—SEG     | Ben Meadows Company                  | Touchstones                            |
| EG & G Geometrics                   | Merrill Publishing                   | University of Arkansas—Monticello      |
| Elsevier Science Publishing         | Mineralogical Society of America     | University of California, Davis        |
| Encyclopaedia Britannica, USA       | Mountain Press Publishing Co.        | US Geological Survey                   |
| Enraf-Nonius Service Corporation    | National Association of Geology      | VG Instruments                         |
| Finnigan Mat                        | Teachers                             | Washington State University            |
| Forestry Suppliers, Inc.            | National Science Foundation          | Wildlife Supply Company                |
| Francis Paul, Geoscience Literature | Nature's Own                         | John Wiley & Sons, Inc.                |
| W. H. Freeman & Company             | Nevada Bureau of Mines & Geology     | Williams & Heintz Map Corporation      |
| GECO Geophysical Company, Inc.      | Nikon Instruments, Inc.              | X-Ray Assay Laboratories Ltd.          |
| GSA Bookstore/DNAG                  | Olympus Corporation                  |  |

## MAPS AND CHARTS MISCELLANEA

Wall space will be available for random displays of scientific materials. The display hallway is between the session rooms and the exhibit area. No advance notice is needed. Just bring your materials to the Technical Services Center at the MGM Grand; personnel there will coordinate displays on a space- and time-available basis. Security of materials will not be provided. Displays may not offer material for sale or be used as a substitute for a poster session.

## MINI-DISPLAYS

Limited quantities of geoscience materials will be accepted for display during the GSA meeting. Maximum for flat material is 8½" x 11" and for posters 22" x 24". There will be a small fee for handling and supervising the materials. If you would like to display brochures, fliers, or posters, call the Exhibits Coordinator at GSA Headquarters, (303) 447-2020.



# Contents of Technical Program

## 1984 SYMPOSIA TITLES

## ORAL PRESENTATIONS

1. Time and Circumstances of the Peopling of South America	Nov. 6	Archaeological Geology	Nov. 7	Quaternary II	Nov. 8
2. Characterization of Western Coals	Nov. 5	Coal	Nov. 7	Sedimentary Petrology I	Nov. 7
3. Debris Flows/Avalanches: Process, Sedimentology, and Hazard Mitigation	Nov. 5	Economic Geology I	Nov. 5	Sedimentary Petrology II	Nov. 8
4. Extensional Tectonics I: Geological Studies	Nov. 5	Economic Geology II	Nov. 6	Sedimentology I	Nov. 7
5. Extensional Tectonics II: Geophysical Studies	Nov. 7	Economic Geology III	Nov. 6	Sedimentology II	Nov. 7
6. Arid-Zone Isotope Hydrology	Nov. 5	Economic Geology IV	Nov. 7	Sedimentology III	Nov. 8
7. First Billion Years: Earth and Nearby Planets	Nov. 6	Economic Geology V	Nov. 7	Stratigraphy I	Nov. 7
8. Production and Flux of Biogenic Material in the Deep Sea	Nov. 5	Economic Geology VI	Nov. 8	Stratigraphy II	Nov. 7
9. Earth-Surface Chemical Cycles in the Geologic Past (Centennial Symposium)	Nov. 6	Economic Geology VII	Nov. 8	Structure I	Nov. 5
10. Maps in the Geoscience Community	Nov. 6	Engineering Geology/Environmental	Nov. 6	Structure II	Nov. 6
11. Diffusion in Mineral, Melt, and Glass Systems	Nov. 7	Experimental Petrology I	Nov. 5	Structure III	Nov. 6
12. Recent Advances in Geophysics: Implications for Instruction	Nov. 6	Experimental Petrology II	Nov. 6	Structure IV	Nov. 8
13. Precambrian Evolution of Living Systems	Nov. 7	Experimental Petrology III	Nov. 8	Structure V	Nov. 5
14. Bulk-Minable Precious Metal Deposits in Cordilleran and Island-Arc Environments	Nov. 5	General Geology I	Nov. 6	Tectonics I	Nov. 5
15. Quaternary Lacustrine Sediments of the Western United States—Dating and Environmental Analysis	Nov. 7	General Geology II	Nov. 8	Tectonics II	Nov. 5
16. Groundwater Geomorphology: Role of Underground Water in Earth-Surface Processes and Landforms	Nov. 8	GEOCHEMISTRY I	Nov. 5	Tectonics III	Nov. 6
17. Use and Abuse of Statistical Methods in the Earth Sciences	Nov. 7	GEOCHEMISTRY II	Nov. 5	Tectonics IV	Nov. 6
18. COCORP and Reflection Seismological Information on the Basin and Range (Poster Session)	Nov. 5-8	GEOCHEMISTRY III	Nov. 7	Tectonics V	Nov. 8
19. Gold Deposits in Archean Environments	Nov. 4	GEOCHEMISTRY IV	Nov. 7	Tectonics VI	Nov. 5
20. Nevada Test Site Geology, Geophysics, and Hydrogeology	Nov. 5	GEOCHEMISTRY V	Nov. 8	Volcanology I	Nov. 5
21. Dynamics of Environmental Quality, Lake Tahoe Basin, California-Nevada	Nov. 4	GEOCHEMISTRY VI	Nov. 8	Volcanology II	Nov. 7
22. North American Continent—Ocean Transects Program: Cordilleran Transects	Nov. 5	Geology Education	Nov. 5		
23. Emplacement of Silicic Lava Domes and Diagenetic Environments	Nov. 4	Geomorphology I	Nov. 5		
24. Geochemical Reconstruction of Depositional and Tectonic Controls in Paleoenvironmental and Tectonic Controls in Coal-Forming Basins of the United States	Nov. 4	Geomorphology II	Nov. 7		
		Geophysics	Nov. 5		
		Geoscience Information	Nov. 5		
		History of Geology	Nov. 7		
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		Igneous Petrology V	Nov. 8		
		Marine Geology I	Nov. 7		
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		Metamorphic Petrology I	Nov. 5		
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		Paleontology IV	Nov. 8		
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		Precambrian Geology	Nov. 6		
		Quaternary I	Nov. 6		
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# Technical Program Schedule — 1984

SUNDAY NOV. 4	MONDAY NOV. 5	TUESDAY NOV. 6	WEDNESDAY NOV. 7	THURSDAY NOV. 8
8:00 am—11:00 am	8:00 am—11:30 am	8:00 am—12:00 noon	8:00 am—12:00 noon	8:00 am—12:00 noon
<b>Symposia:</b> 21. Lake Tahoe	<b>Symposia:</b> 2. Coal 3. Eng/Quat 6. Hydro 14. SEG <b>Technical Sessions:</b> Geochem I Ig Pet I Math/Geophys/Hydro I Met Pet I Micropaleo* Tect I <b>Posters I:</b> Tect, Struct <b>GSA Presidential Address</b>	<b>Symposia:</b> 7. Planetary 9. Cent Geochem <b>Technical Sessions:</b> Econ II Eng/Env Ex Pet II General I Ig Pet III Paleo I* Struct II Tect III <b>Posters III:</b> Econ, Hist, Micropaleo,* Quat	<b>Symposia:</b> 4. Geophys/Struct 13. Paleo* 15. Quat Lacustrine 17. Stat Methods <b>Technical Sessions:</b> Econ IV Geochem III Geomorph II Min I Sed I Strat I <b>Posters V:</b> Marine, Min/Cryst, Precamb	<b>Symposia:</b> 16. Grndwtr Geomorph 23. Silicic Domes <b>Technical Sessions:</b> Econ VI Geochem V Ig Pet IV Marine II Met Pet III Paleo III* Struct IV Tect V <b>Posters VII:</b> Coal, Geol Ed, Sed, Sed Pet
<b>LUNCHEONS:</b> 1:00—5:00 pm <b>Symposia:</b> 19. SEG Econ Geol 24. Geochem 25. Coal	2:00—6:00 pm <b>Symposia:</b> 3. Eng/Quat 8. Cushman 20. NV Test Site 22. Ocean Transects <b>Technical Sessions:</b> Geomorph I/Geochem II/ Ex Pet I GIS/Education Ig Pet II/Econ I Planetary Tect II Volc I/Met Pet II Struct I <b>Posters II:</b> Arch, Geochem, Paleo,* Struct	1:30—5:30 pm Eng, GIS, Hist, Hydro, MSA NAGT, Paleo,* Planet 1:30—5:30 pm <b>Symposia:</b> 1. Arch 9. Cent Geochem 10. GIS 12. NAGT/Geophys <b>Technical Sessions:</b> Econ III Precamb Quat I Struct III Tect IV <b>Posters IV:</b> Ex Pet, Ig Pet, Met Pet, Volc	1:30—5:30 pm Coal, Geophys, Geochem QG&G, SEG 1:30—5:30 pm <b>Symposia:</b> 4. Geophys/Struct 11. MSA <b>Technical Sessions:</b> Coal/Sed Pet I Econ V Geochem IV Hist/Arch Hydro II Marine I/Strat II/ Sed II Paleo II* Volc II <b>Posters VI:</b> Eng, Env, General, Geochem, Geomorph, Geoscience Info Neotectonics	1:00—5:00 pm <b>Technical Sessions:</b> Econ VII General II Geochem VI Ig Pet V Min II/Ex Pet III Paleo IV* Quat II Sed III Sed Pet III Tect VI <b>Posters VIII:</b> Geophys, Hydro, Planetary, Strat

\*Paleo Sessions at Harrah's.

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# SPECIAL EVENTS

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## WELCOMING PARTY

Sun., Nov. 4, 6:00–9:00 p.m.

Welcome to Reno begins Sunday evening in the MGM Grand Ballroom. Be on hand from the beginning to enjoy the special entertainment provided by the Reno Committee and the MGM. Badges are not required; however, for your convenience, registration will remain open until 7:30 p.m.

## GSA AWARDS LUNCHEON

Mon., Nov. 5, MGM Grand, 12:30–2:00 p.m.

GSA's traditional luncheon will honor the Penrose and Day Medalists as well as the Society's 97th year in support of the geosciences. All geologists and their guests are invited.

The luncheon is being hosted, in part, by the Society. This will be the only official luncheon held on Monday and is available by preregistration *only*.

The luncheon will be preceded by the GSA Presidential Address. President M. Gordon Wolman's topic will be "Structure and Scale in Geomorphology." Everyone is welcome.

## ALUMNI RECEPTIONS

Mon., Nov. 5, 7:00–9:30 p.m.

More than 50 alumni receptions will be held in both the ballrooms and private reception areas. If you would like to hold a reception on this or any other evening, contact the Events Coordinator in GSA's Meetings Department, (303) 447-2020.

## ICE HOCKEY GAME

Tues., Nov. 6, 10:00 p.m.–midnight

Amateur icers can join GSA's pick-up, no slapshot, no checking ice hockey game at the Meadow Wood Mall, Reno. You must bring your own helmet, skates, and sticks. (Sticks may be purchased at the rink.) A nominal fee will cover participation. This game is strictly for fun, so don't worry if you haven't played ice hockey before. For further information and sign-up, contact Bruce Nesbitt, Dept. of Geology, University of Alberta, Edmonton, Alberta T6G 2E3, Canada, (403) 432-5071.

## RENO RUN

Wed., Nov. 7, 8:00 a.m.

GSA is sponsoring a 5K and 10K race as a post-election day celebration. The run follows the bike path along the banks of the Truckee River. It is a flat, accurate course, passing through woods, and starting and ending at the MGM Grand. Reno's Silver State Striders will manage the race for the benefit of their junior runners program. The race is open to all comers. Ribbons will go to all finishers, and special prizes will be awarded to the first-place female and male runners. Interested in receiving a race registration form? Check the RENO RUN block on the GSA preregistration form.

Fee: \$4 T-Shirt option: \$6

## HELLO, HOLLYWOOD, HELLO!

Wed., Nov. 7, 6:00–10:00 p.m.

Who can forget the melodious tones of Maurice Chevalier as the MGM classic *Gigi* begins? Or is your favorite melody the haunting "Lara's Theme" from the Oscar-winning film *Dr. Zhivago*? No matter what your favorite movie—comedy, musical, or romance—you'll find it and much more in MGM's musical extravaganza, "Hello, Hollywood, Hello!" This tribute to MGM's past and future movies spans almost a century. Its cast of more than 100 beautifully sequined singers and dancers enacts a journey from San Francisco's 1906 earthquake to life on a distant planet in the year 2001. The production of the futuristic episode alone is worth the price of the entire show!

The Reno Annual Meeting Committee gives the show rave reviews. You won't find a larger casino or stage show anywhere; this two-hour tribute is performed on the world's largest stage. The entertainment is not the only treat—the pre-show dinner of roast prime rib of beef, mixed garden salad, baked potato, and green vegetable has chocolate mousse Tia Maria and coffee for its finale. You're on your own for cocktails, but the MGM Grand is certain to have your favorite brew. With such a popular event, you should preregister. The \$30 GSA ticket price is a 12% discount and includes sales and entertainment tax and gratuity.

Register today for "Hello, Hollywood, Hello!" When the lion roars and the curtain rises, you'll want to be there!



# EMPLOYMENT INTERVIEWS

"We have used the GSA Employment Service on three separate occasions to recruit new faculty members. On each occasion, we have been extremely satisfied with the organization, efficiency, and cordiality of the individuals on your staff. When an institution is faced with the task of recruiting faculty members, it is a pleasure to have an effective employment service." Michael Katuna, Chairman, Department of Geology, College of Charleston, found that the GSA Employment Interview Service gets results. "An institution would be rather foolish not to take advantage of this service. We have been fortunate to hire four of our faculty members over the years as a direct result of the GSA Employment Service. If the occasion arises, we will certainly utilize the GSA Employment Service again."

Do you need qualified earth scientists to fill staff needs? Are you looking for employment in the earth-sciences fields? Organizations seeking qualified earth scientists to fill staff needs and persons seeking employment in the earth-sciences fields are invited to participate in the GSA Employment Interview Service. The Employment Interview Service will be conducted in the MGM Grand Hotel, Rooms 151-188.

All interested organizations are urged to submit notices of their vacancies and their requests for computer listings of applicants. The minimum fee for a printout of two specialty listings is \$120. A specialty code narrows the field of your search. For example, a geologist with background in geo-

chemistry will be listed under the "geochemistry" specialty code.

Interview booths may be rented at a nominal fee in half-day increments from Monday through Wednesday, November 5-7, of the meeting. GSA staff will handle all interview scheduling with Employment Service applicants. Request forms are in the March and July issues of *GSA News & Information*, sent to all GSA members, or they may be obtained by contacting Clara Hodgson, Membership Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020.

Job seekers have found the Employment Interview Service critical to their successful search for positions. The one-year registration fee is \$25 for GSA Members and Student Associates in good standing and \$45 for nonmembers. This applicant fee includes the interview service at the annual meeting. Employment Service forms are in the March and July issues of *GSA News & Information*, or may be obtained by contacting the Membership Department, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020.

**Note to Applicants:** If we receive your materials by **August 20**, your record will be included in the information that **employers** receive prior to the meeting. Submit your forms early to receive maximum exposure! Don't forget to indicate on your application form that you would like to interview in November.

# GUEST PROGRAM

The Reno Guest Committee presents a program that highlights the attractions of the area. The activities offer not only a look at Nevada's rich history and scenic beauty but also a behind-the-scenes glimpse of the excitement of the casinos.

Please note that registration as a guest at the Annual Meeting is a prerequisite for participation in the Guest Program and for use of the Hospitality Room. However, guest registration does not include admission to the Technical Program.

The Hospitality Room is in the Lobby Meeting Room of the MGM Grand. Hours are from noon to 4:00 p.m. Sunday and 9:00 a.m. to 4:00 p.m. Monday through Thursday. Light refreshments and a place to relax will be provided to those registered as guests. Please wear your badge. Each registered guest who visits the Hospitality Room will receive a gift and will

be eligible for a door prize. Hostesses will be in the Hospitality Room to help you in any way they can. The Local Committee welcomes you to Reno and hopes that you enjoy your visit.

## NONTECHNICAL PROGRAM

Talks on current and historical aspects of Nevada

"Nevada—Why Would Anyone Want To Live Here?"  
Mon., Nov. 5, 9:15-10:00 a.m., MGM Grand  
Fred Horlacher, Chairman of Social Studies Department, Reed High School; 1984 Nevada Teacher of the Year.

"Basques in the American West"  
Mon., Nov. 5, 10:00-10:45 a.m., MGM Grand  
Carmelo Urza, Coordinator of University Studies in the Basque Country Consortium.



1984 GSA ANNUAL MEETING & EXPOSITION

# GUEST PROGRAM

## TOURS

All tours depart from and return to the MGM Transportation Center, near the doors at the south end of the main registration lobby. Tours will depart as scheduled. All tours are escorted and narrated by professional guides. The Lake Tahoe Tour and the Virginia City Tour are the only tours with limited space available. Reservations for these tours will be accepted on a first-come, first-served basis. Please make note of registration and cancellation deadlines.

### **Lake Tahoe—Lake in the Sky Tour and Luncheon**

Mon., Nov. 5, 11:00 a.m.—4:00 p.m. Repeated Wed., Nov. 7, 11:00 a.m.—4:00 p.m. Depart 11:00 a.m. and travel to Lake Tahoe.

Everyone from John C. Fremont to Mark Twain has agreed that this magnificent alpine lake is a “must see” for visitors to Nevada. The tour will travel through splendid mountain scenery, Incline Village, Ponderosa Ranch, Sand Harbor, Zephyr Cove, Cave Rock, and Carson City, and it includes such interesting sights as Bowers Mansion and ranches along Franktown Road. Lunch will be an elegant buffet at Harrah’s Tahoe Black Forest Restaurant with a panoramic view of Lake Tahoe. Our tour guides will relate interesting stories of fact and myth. Space is limited, and early registration is suggested. Cost: \$22; includes lunch.

### **Winner’s Circle—Gaming Academy Tour**

Mon., Nov. 5, 1:45–4:15 p.m. Repeated Tues., Nov. 6, 9:30 a.m. to noon.

First time in Reno? . . . or second or third time . . . and still trying to understand the finer points of the sometimes mystifying casino games—21, roulette, keno, or craps? The Winner’s Circle Tour will change all that. The tour will take you to a professional gaming school, where certified instructors will explain the history of gaming and evolution of the table games. Then, a behind-the-scenes tour including an insider’s view from the catwalk at the Club Cal-Neva Casino. Cost: \$11; includes transportation, gaming school fee, and drink at the Cal-Neva.

### **Virginia City Tour, followed by Mackay Silver Tea at Sierra Nevada Museum of Art**

Tues., Nov. 6, 9:30 a.m.—3:30 p.m.

Virginia City can lay claim to the largest single discovery of gold and silver in the United States. When this country boasted ten millionaires, six of them lived in Virginia City—a bold, bawdy mining town. The town has changed, but the flavor of the Comstock lives on. The tour will depart at 9:30 a.m. and travel to Virginia City for sightseeing of the town. You will be given a special tour of the Mackay Mansion

and browse the shops, saloons, old churches, and antique stores, and then lunch on your own. The tour will then return to Reno and the Sierra Nevada Museum of Art (former home of Katherine Mackay Hawkins) to view the current art exhibit and special display of several priceless pieces of the famous Mackay Silver Collection. The Silver Tea will be hosted by members of the Woman’s Auxiliary to the American Institute of Mining, Metallurgical and Petroleum Engineers and wives of local GSA members. Tea, coffee, small sandwiches, and cookies will be served. Space is limited, and early registration is suggested. Cost: \$13.50.

### **Mackay Silver Tea at Sierra Nevada Museum of Art**

Tues., Nov. 6, 12:45–2:15 p.m.

The Sierra Nevada Museum of Art, former home of Katherine Mackay Hawkins, will be the setting for the Mackay Silver Tea hosted by the Woman’s Auxiliary to the American Institute of Mining, Metallurgical and Petroleum Engineers and wives of local GSA members. View the current art exhibit and a special display of several priceless pieces of the Mackay Silver Collection. Tea, coffee, small sandwiches, and cookies will be served. This early-afternoon event is for guests not taking the Virginia City tour. Cost: \$5.

### **Nevada Yesterday and Today—Tour of Carson City Area, Nevada State Museum and Governor’s Mansion**

Wed., Nov. 7, 9:30 a.m.—3:30 p.m.

Depart at 9:30 a.m. for Carson City by way of Washoe Valley, with a stop at an interesting antique shop. In Carson City, the state capital, you will visit the Nevada State Museum, formerly the old Nevada Mint. Of particular interest will be the tour of a realistic model of an old mine. You will visit the legislative building and the recently restored capitol building. A list of menus of nearby restaurants will be provided to help you select lunch. After lunch the group will meet again at a designated location and tour the Governor’s Mansion. Return to Reno by way of the Franktown Road will include some lovely pastoral scenery. Cost: \$12.

# TRANSPORTATION/AIRLINE RESERVATIONS

## GROUND TRANSPORTATION

Thanks to a \$50 million expansion, Reno's Cannon International Airport is now both advanced and efficient. It is not the largest, but it is easy to travel through. The distances are short, the signage is clear, and the baggage claim is efficient.

The airport is serviced by Air Cal, American, Eastern, Frontier, Republic, United, USAir, Western, Wien Air Alaska, and others.

Ground transportation from the airport to hotels is quick and affordable. The public airport limousine service leaves every few minutes to all the hotels. From the airport to the MGM Grand is \$1.75 per person. To all other hotels in the Reno/Sparks area it is \$2.25 per person. Service is available on a 24-hour basis.

Also, all the hotels in the GSA room block offer free van service to and from the airport and to downtown. Vans usually come and go in half-hour intervals. Just call your hotel from the airport at the free reservations phones in the baggage claim area.

Taxi service between the MGM and the airport runs about \$3.00 and to downtown Reno about \$4.00. All taxis are metered.

In addition, during the meeting, GSA will provide a free shuttle for transportation to and from the MGM Grand to Harrah's, the Eldorado, and the Peppermill Inn.

## VIKING AIRLINE RESERVATION SYSTEM

For the third consecutive year, GSA has designated Viking Travel, Ltd., of Boulder, Colorado, as the sole airline reservation agent for the 1984 Annual Meeting in Reno.

Viking is a resource for those who want to work with a travel agent in determining the best possible airfares. Ticketing through an agency costs no more than ticketing directly through an airline, and you have the advantage of service that will survey all airlines and all routing in order to meet your requirements.

In most cases, ticketing will cost less, because several of the major carriers into Reno have made reduced-fare arrangements for GSA travelers. These fares are available only when booking through Viking. Of course, fares will vary with routing and days traveled.

United Airlines has guaranteed a "super-saver" fare for all United-served cities, including on-line connecting cities, to and from Reno, for the dates November 2-11, 1984. United will waive all restrictions, including days and time of travel and seating allotments. Tickets, however, must be issued by

Viking Travel at least one week before departure. The fare used will represent a 30%-40% savings from coach.

**USAir.** For all USAir-served cities, to and from Denver, for the dates Nov. 4, 5, 8, and 9, 1984, USAir will provide an unrestricted fare, with ticketing by Viking Travel required at least one week before departure. This fare will benefit those attending the meeting from cities *not* served by United. Viking will then add the least expensive round-trip fare for Denver-Reno-Denver to complete the routing.

**Other.** A special 3-day San Francisco package has been arranged by Viking. The package includes 4 days and 3 nights, November 8-11. Call Viking for information.

As we go to press, samples of fares that would apply without restrictions:

From	Airline	Coach	Super-Saver
Boston	United	\$884	\$419
Atlanta	Frontier	\$840	\$419
Chicago	United	\$744	\$369
Dallas	United	\$638	\$319
Denver	United	\$538	\$269
Los Angeles	United	\$188	\$118
San Francisco	United	\$220	\$110

## PROCEDURES

1. Call Viking at (800) 525-0368 (toll free) or (303) 449-6983. Call Monday-Friday, 8:30 a.m. to 5:30 p.m. MST.
2. Identify yourself as a GSA registrant.
3. The Viking agent will quote you the discounted fare and confirm your reservation.
4. Payment options: check payable to Viking Travel, Ltd.; major credit card; invoice to your firm.
5. Delivery will be via first-class mail. **TICKETS WILL BE SENT REGISTERED MAIL UPON RECEIPT OF PAYMENT OR CREDIT-CARD AUTHORIZATION.**
6. Use your home address for mailing, if this is the most reliable way to assure ticket delivery. Someone must be available to sign for the ticket. Tickets lost in the mail will be reissued only when new payment is made. In order to receive reimbursement for a lost ticket, the passenger must file a lost-ticket application with the airline; this takes up to 10 weeks to process. Of course, 99% of mailed tickets are received with no problems. With registered mail, however, tickets are rarely lost.
7. In the event of a decrease in your airfare, Viking will re-ticket you at the lower fare. If you are aware of special fare discounts from your area, call Viking for re-ticketing.

Viking will provide a customer service desk at the MGM Grand Hotel in Reno. Reservationists will be available to help anyone needing travel assistance, sightseeing information, and meeting schedules and locations. They will be glad to help you make your visit to Reno convenient and enjoyable.



1984 GSA ANNUAL MEETING & EXPOSITION

# HOUSING

GSA has blocked rooms at four hotels: The MGM Grand Hotel (headquarters); Harrah's Hotel and Casino (location for technical sessions and social functions of the Paleontological Society); the Eldorado Hotel and Casino, located downtown near Harrah's; and the Peppermill Inn and Casino, recommended for student housing. GSA endorses these hotels for quality, cleanliness, and service.

The Reno Convention & Visitors Bureau will coordinate ALL reservations. Your choice of hotel accommodations and rates will be honored, if possible, although rooms will be confirmed on a first-come, first-served basis. Telephone requests will not be honored. All reservations must be submitted on the GSA Housing Form. Cancellations should be made in writing directly to the hotel.

Descriptions of hotels are given below, including amenities available and types of credit cards accepted (see abbreviation list). Hotels will also accept personal checks, but be sure that current address and phone number are included. You will need to present a major credit card to guarantee your check.

**MGM GRAND HOTEL** (Headquarters). Accessible by airport courtesy van and GSA shuttle. The MGM Grand is northern Nevada's largest, most spectacular resort. The hotel offers an unusual combination of gaming, sports, luxury living, dining, entertainment, and convention facilities. The 2,001-room hotel offers a casino area of 100,000 square feet. Runners will find routes around the 145-acre property. Guests also enjoy complimentary use of outdoor tennis courts, the olympic-size outdoor pool, and a 50-lane bowling center. Health club facilities are available for a small daily fee. The 40-shop mall offers almost everything, from the extravagant to the basic. This recently constructed hotel has completely modern safety and emergency features, and its security force is the fourth largest in the state of Nevada. Dining service includes a 24-hour full-meal "coffee shop," a buffeteria, the Steak House for prime rib and steak, Cafe Gigi for French cuisine, China Seas for fine oriental food, and Caruso's for Italian specialties. Even room service is good, reasonable, and available 24 hours. Three of the five lounges are open 24 hours, and two of the lounges offer nightly live entertainment. The MGM Grand showroom, the Ziegfeld Theater, presents the two-hour "Hello, Hollywood, Hello!," which will be the entertainment for GSA's Special Event Night. All rooms are equipped with color TV, phone with message light, AM/FM radio, tub, and shower. NOTE: No alarm clocks. Parking is available at no charge. Check-out by 12 noon. CC: AX, MC, V, D, CB.

**HARRAH'S.** Location of all Paleontological Society functions. Located downtown, 15 minutes from the airport, accessible by downtown and airport courtesy vans. Holds a Mobil Four Star and AAA Four Diamond Rating. The 565

Be prepared: **ALL RENO HOTELS WILL REQUIRE A FIRST NIGHT'S DEPOSIT.** After the Bureau has assigned your hotel, the hotel will confirm and request a first night's deposit, which must be received within 2 weeks of the confirmation. Hotels **WILL NOT** hold a room without a deposit.

Refunds will be made to those canceling 48 hours in advance of reservation dates. **IF YOU CANCEL, BE SURE TO ASK FOR YOUR CANCELLATION NUMBER.**

If any problems occur with your reservation, GSA would appreciate it if you would stop by the Annual Meeting Office at the MGM Grand, at your convenience during the meeting, to let us know how your problem was resolved.

**DEADLINE FOR RECEIPT OF HOTEL RESERVATIONS IS OCTOBER 12.** Reservations after that date must be made directly with the hotel. Be sure to indicate that you are a GSA registrant to take advantage of the special GSA convention rate.

## HOTELS

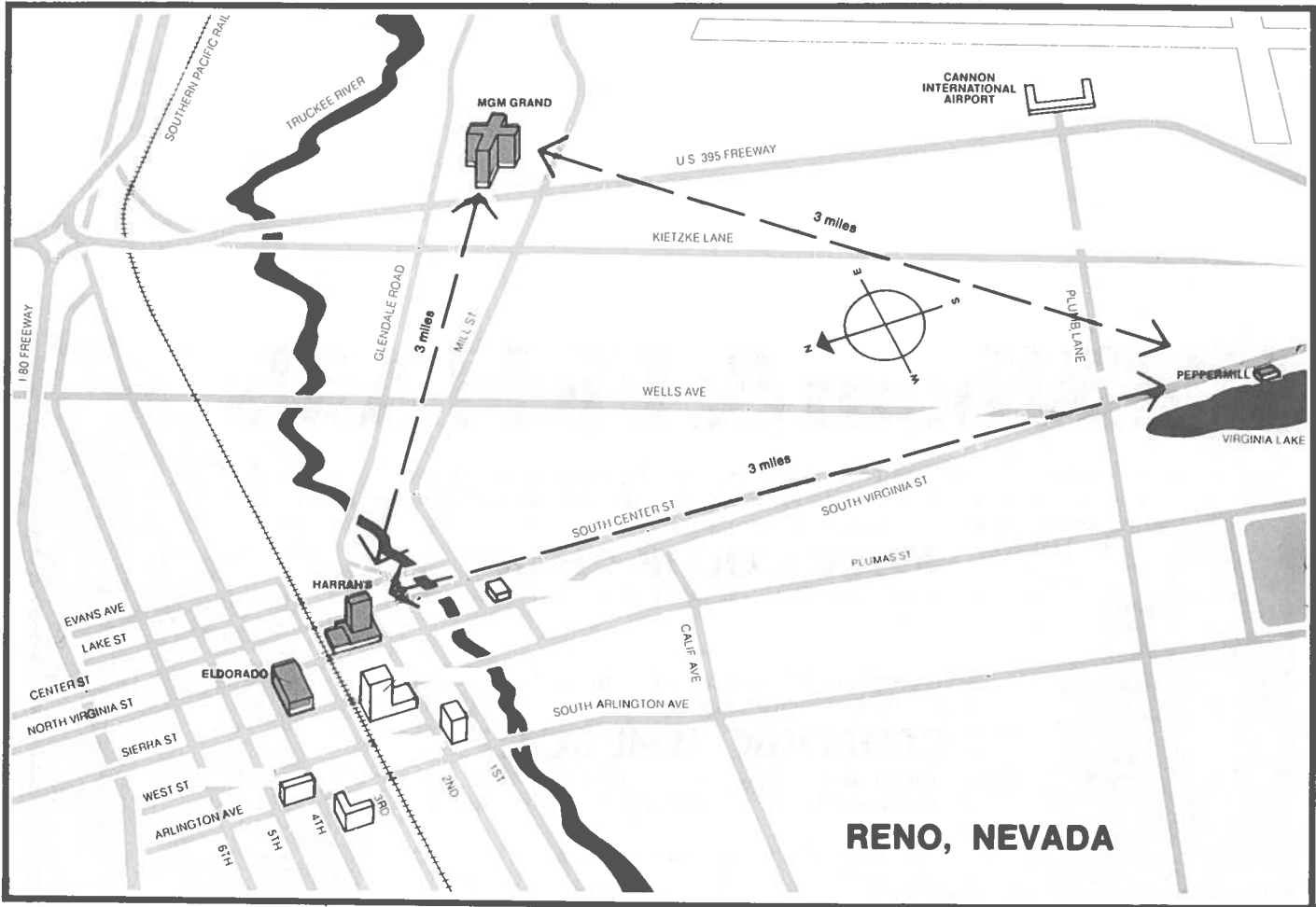
guest rooms feature a fresh rose daily, European bedding service, turn-down service, free HBO, and 24-hour room service. Meeting rooms are located on the third floor. Health facilities include heated outdoor pool, jacuzzi, and sauna. Four restaurants, including two 24-hour coffee shops. Gift shop. The Headliner Room Theater-Restaurant features famous entertainers appearing nightly (reservations required). Visit the world-famous Harrah's Automobile Collection—more than 1,100 antique, vintage, classic, and special-interest automobiles. Check-out by 12 noon. CC: AX, MC, V, D, CB.

**ELDORADO.** Located downtown, 15 minutes from the airport, accessible by airport and downtown courtesy vans. The hotel offers a blend of Reno's personality with the charm of New Orleans. The 430 sleeping rooms are equipped with color TV, phone with message light, tub, and shower. Health facilities include an outdoor heated pool and jacuzzi. Five restaurants, one 24-hour coffee shop, and two lounges. Gift shop. Free indoor and outdoor parking. Check-out by 12 noon. CC: AX.

**PEPPERMILL.** Located 3 miles from the airport, accessible by airport and downtown courtesy vans. The 250 attractive rooms are recommended by the Reno Local Committee, especially for triple and quad student rooms. Redecorated with comfortable appointments and custom hardwood furnishings. Two-story construction. Three restaurants, four 24-hour coffee shops, and four lounges. Close to a variety of full-service and fast-food restaurants and to shopping areas. Rooms equipped with color TV, phone with message light, shower. Heated outdoor pool, jacuzzi, and sauna. Free outside parking. Check-out by 11 a.m. CC: AX, MC, V.

CC = Credit Card; AX = American Express; V = Visa; MC = Mastercard; CB = Carte Blanche; D = Diners Club; BA = Bank Americard.

# HOTEL GUIDE



## GSA HOTEL RATES

All rooms subject to 7% room tax

Hotel	Single	Double or dbl/dbl	Extra person	Suites	No. of rooms available
MGM Grand (Headquarters)	\$46 & 54	\$46 & 54	\$5	\$119-200	1,600
Harrah's	\$54	\$54	\$8	\$195-225	200
Eldorado	\$38	\$38	\$6	\$ 55-200	200
Peppermill	\$26 & 36	\$32 & 42	\$2	—	150

# RENO

1984 GSA ANNUAL MEETING & EXPOSITION

# GEOLOGIC Classroom & Field Aids

An essential and handy 5" x 7½" flip chart with 115 color chips giving precise rock colors for all geologic purposes. Provides numerical designations for *hue*, *value*, and *chroma*. Form and arrangement based on Munsell system; color names based on ISCC-NBS system.

Compiled by  
Chart

## ROCK COLOR CHART

Rock-Color  
Committee of

GSA, USGS, AAPG, SEG, and AASG. With text, mask, & envelope.  
Each ..... \$12.00

A new chronostigraphic and numeric time scale in three forms for class and field use. Includes magnetic reversal stratigraphy and estimates of un-

## GEOLOGIC TIME SCALES

certain- assigned Paleozoic and Mesozoic numerical ages, with sources cited. Prepared by GSA's Decade of North American Geology project.

8½" x 11", 3-hole drilled, on heavy stock,  
package of 50 ..... \$ 8.00  
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# Official Housing Form

PLEASE COMPLETE AND RETURN BY OCTOBER 12 TO:

GSA HOUSING BUREAU  
4590 SOUTH VIRGINIA STREET  
RENO, NV 89502

PLEASE PRINT OR TYPE:

HOTEL/MOTEL PREFERENCE

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

TYPE OF ACCOMMODATIONS

(send one reservation form per room)

- |  |   |
|--|---|
| <input type="checkbox"/> Single (1 bed, 1 person)    | <input type="checkbox"/> 1 Bedroom Suite      |
| <input type="checkbox"/> Double (1 bed, 2 persons)   | <input type="checkbox"/> 2 Bedroom Suite      |
| <input type="checkbox"/> Dbl/Dbl (2 beds, 2 persons) | <input type="checkbox"/> Add rollaway to room |
| <input type="checkbox"/> Triple (2 beds, 3 persons)  |   |
| <input type="checkbox"/> Quad (2 beds, 4 persons)    |   |

RATE REQUESTED\* \_\_\_\_\_

\*Subject to 7% room tax.

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

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

NAMES OF OCCUPANTS

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

MAIL CONFIRMATION TO:

Name \_\_\_\_\_ Phone \_\_\_\_\_ / \_\_\_\_\_

University or Company \_\_\_\_\_

Address \_\_\_\_\_  
Street City State Zip

1. Make reservations by October 12. Reservations after this date are on a space-available basis only.
2. First night's deposit is required. Credit cards and checks will be accepted. Deposit due after hotel confirmation is received.
3. Notify hotel directly for changes in arrival/departure or type of accommodations.
4. Cancellation 48 hours in advance is required for refund. Request cancellation number at that time.
5. Room assignments are made in the order received. If hotels of your choice are filled, the Housing Bureau will make the best arrangements elsewhere.
6. A confirmation is *not* a guarantee. To guarantee your room past 6 p.m., notify the hotel of your credit card number.



1984 GSA ANNUAL MEETING & EXPOSITION

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# REGISTRATION

## **PREREGISTRATION DEADLINE: MUST BE RECEIVED NO LATER THAN OCTOBER 5, 1984**

1. Registration is required for all attendees, including all field trip participants and guests. Badges will be required for all activities 10:00 a.m. Sunday through 5:00 p.m. Thursday.
2. A \$35 member discount on registration applies to any professional member of GSA or Associated Society. The Associated Societies that qualify are listed on the registration form. Professional registrants who paid the nonmember registration fee and apply for GSA membership by March 31, 1985, will be entitled to a \$35 reduction in the 1985 membership fee. GSA Student Associates will receive a \$10 discount. Only ONE discount will apply per person. In order to receive the reduction, the meeting registration form must be attached to the membership application. Membership applications are available from GSA headquarters. During the meeting, you can find applications at the GSA Bookstore, Booth 129 in the Exhibit Hall, at the GSA Employment Service, or at the Information Desk in the MGM Grand Hotel.
3. Current student IDs are required to obtain student rates at both the on-site and preregistration counters.
4. Full payment MUST accompany registration. Unpaid purchase orders are not accepted as valid registration.
5. Register one professional or student per form.
6. Your check will be your receipt. Copy the form for your records.

### **REFUNDS**

GSA will refund advance registration fees for all cancellations received in writing by October 12. NO refunds will be made on cancellation notices received after this date. Refunds will be mailed from GSA after the meeting and are subject to a \$10 processing fee. NO refunds for on-site registration.

### **REGISTRATION SCHEDULE: MGM Grand, Grand Salon**

Friday, November 2	7:00 a.m. to 4:00 p.m.*
Saturday, November 3	7:00 a.m. to 4:00 p.m.*
Sunday, November 4	10:00 a.m. to 7:30 p.m.
Monday, November 5	7:30 a.m. to 5:00 p.m.
Tuesday, November 6	7:30 a.m. to 5:00 p.m.
Wednesday, November 7	7:30 a.m. to 2:00 p.m.
Thursday, November 8	7:30 a.m. to 2:00 p.m.

\*Pickup of registration packet for ONLY those who pre-registered.

### **REGISTRATION FEES**

	Advance	On-Site	One-Day (Available on-site only)
Professional—Member	\$ 70	\$ 85	\$44
Professional—Nonmember	\$105	\$120	\$60
Student—Member	\$ 35	\$ 43	\$22
Student—Nonmember	\$ 45	\$ 53	\$27
Guest	\$ 25	\$ 40	N/A



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# ABSTRACTS WITH PROGRAMS

## Purchase of *Abstracts with Programs* is available three ways:

- 1. Advance Mailing:** If you have not ordered *Abstracts with Programs* already, but wish to receive a copy for home delivery via domestic mail before October 24, complete order form below and mail to reach GSA by September 21, 1984. Price \$15.00.
- 2. Reserved On-Site:** If you have not previously purchased or want extra copies, order by filling out "Abstracts" line on Preregistration Form. A copy will be waiting for you at the Annual Meeting, Registration Area. Price \$18.00.
- 3. Open On-Site:** Purchase on-site from a limited quantity available. Price \$18.00.

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Signature \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

State/Country \_\_\_\_\_ Zip \_\_\_\_\_

NOTE: Order should be received by September 21, 1984, for GSA to guarantee arrival (domestic mail only) by October 24, 1984. Member discount does not apply.

**\*Colorado residents add sales tax.**





# 1984 GSA 97TH ANNUAL MEETING & EXPOSITION

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