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## Postglacial Ponds and Alluvial Fans: Records of Holocene Landscape History

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### ABSTRACT

Little is known about rates and patterns of Holocene hillslope erosion in areas once covered by Pleistocene ice sheets and now heavily populated. Yet, understanding past landscape behavior is prerequisite to predicting and mitigating future impacts of human-induced disturbance and climate change. Using

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northern Vermont as an example, we demonstrate that the sedimentary record preserved in humid-region ponds and alluvial fans can be dated, deciphered isotopically and stratigraphically, and used to understand the history of hillslope erosion. Our data suggest that erosion rates were higher in the early and late Holocene than in the mid-Holocene, perhaps the result of changing climate and the frequency of severe storms. In Vermont, dated

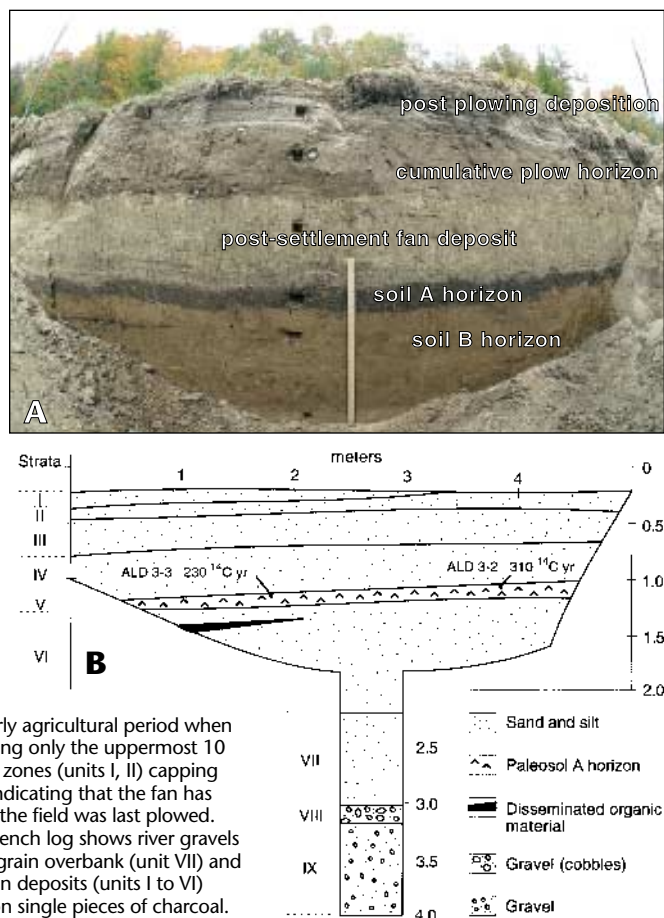
alluvial fan sediments reveal that the highest rates of hillslope erosion occurred as a consequence of European settlement. The geologic record of colonial deforestation is clear, revealing significant human impact and suggesting that past landscape response is a meaningful basis for guiding future land management practices.

### INTRODUCTION

Geologists have studied mountainous landscapes in western New England for over 150 years (Hitchcock, 1833). Major landscape features are controlled by Appalachian structure and lithology; there is a

**Holocene Landscape** continued on p. 2

**Figure 1.** Fish-eye view (A) and interpretive log (B) for a backhoe trench cut into the toe of a fine-grained Vermont alluvial fan and oriented perpendicular to fan axis (trench ALD-3, fan ALD-B). The exposure shows a dark brown soil buried by sand and silt eroded from adjacent hillslopes during and after European settlement and land clearance. Worm burrows filled with material of contrasting color are evident in and near the soil horizon. A: The reddened B horizon in the distal fan deposits (unit VI) is capped by well-developed, dark brown paleo-A horizon (unit V). The chaotic light tan zone (unit IV) above the paleosol represents first deposits after hillslope clearance but before the fan surface was plowed. Overlying darker zone (unit III) is a well-mixed, cumulative plow horizon, the thickness (35 cm) of which demonstrates that the fan remained active during the early agricultural period when plows were capable of disturbing only the uppermost 10 to 15 cm of soil. Light-colored zones (units I, II) capping the section remain stratified, indicating that the fan has been active since 1960, when the field was last plowed. The stick is 1 m long. B: The trench log shows river gravels (units VIII, IX) underlying fine-grain overbank (unit VII) and post- and prehistoric alluvial fan deposits (units I to VI) along with radiocarbon ages on single pieces of charcoal.



**Figure 2.** Shaded relief map of Vermont. RP = Ritterbush Pond, SP = Sterling Pond, WRD = Winooski River delta in Lake Champlain, AF = Aldrich, Moultroupe, and Audubon alluvial fans, MP = Montpelier. Dotted line indicates the main stem of the Winooski River. Inset map courtesy of R. Sterner.

**GSA TODAY** (ISSN 1052-5173) is published monthly by The Geological Society of America, Inc., with offices at 3300 Penrose Place, Boulder, Colorado. Mailing address: P.O. Box 9140, Boulder, CO 80301-9140, U.S.A. Periodicals postage paid at Boulder, Colorado, and at additional mailing offices. **Postmaster:** Send address changes to GSA Today, Membership Services, P.O. Box 9140, Boulder, CO 80301-9140.

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Printed in U.S.A., using pure soy inks and recyclable paper.

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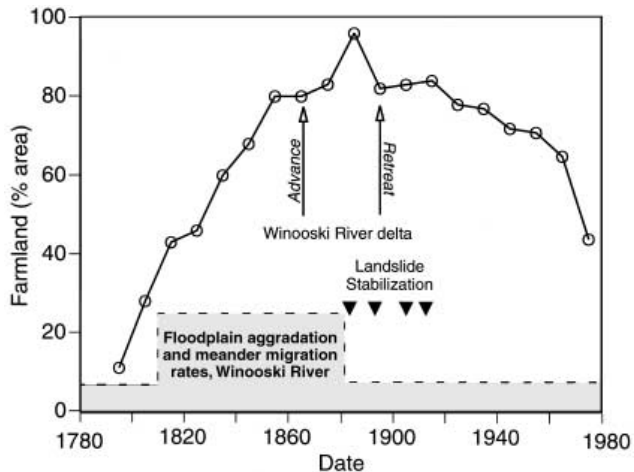
relatively thin cover of Pleistocene and Holocene sediment. Although geomorphologists have mapped the distribution of glacial sediments and determined the pattern and timing of glacier retreat (e.g., Flint, 1971; Koteff and Pessl, 1981), little is known about the rate and distribution of surface processes affecting New England hillslopes during the Holocene.

Hillslope erosion in New England was probably most rapid immediately after deglaciation when vegetation was sparse (Waitt and Davis, 1988). As forests spread over the region 11,000–12,000 <sup>14</sup>C yr B.P. (Davis and Jacobson, 1985), erosion rates declined, as indicated by decreasing late Pleistocene and early Holocene sedimentation rates in the Champlain Basin (Freeman-Lynde et al., 1980). Until the late 1700s, much of New England remained forested, although some forests may have been open woodlands with understory vegetation kept in check by Native American fires (Pyne, 1982).

During the past 200 years, humans have changed the New England landscape. Settlers cleared trees from over 80% of northwestern Vermont prior to the Civil War, using deforested hillslopes for farming and grazing livestock. Forests below 600 m elevation were almost completely removed by the early 1800s (Meeks, 1986). In response to deforestation, hillslopes eroded and rivers aggraded (Figs. 1, 2, 3, and 4). In Vermont, the transitory expansion of the Winooski River delta into Lake Champlain during the mid-1800s testifies to the amount of sediment rapidly mobilized from uplands as a result of colonial deforestation (Figs. 2 and 3). Following the opening of the American mid-continent to settlement (1850s and 1860s), 200,000 people emigrated from Vermont, abandoning marginal farmland (Severson, 1991). Since then, forests have again cloaked Vermont hillslopes, and rivers have incised their floodplains (Brakenridge et al., 1988), similar to landscape response

**Holocene Landscape** continued on p. 3

**Figure 3.** Historic landscape response in Chittenden County, northwestern Vermont. Open circles represent the percentage of land area in the county occupied by cultivated land, pastures, overgrown fields, orchards, and farm woodlots. Clearance before 1830 was for farming; later clearance was for lumber (U.S. Bureau of the Census, in Severson, 1991). The arrows mark major expansion and contraction of the Winooski River delta in Lake Champlain as deduced from historic maps (Severson, 1991). Winooski River's 2900 km<sup>2</sup> watershed represents 13% of the drainage area for Lake Champlain. Triangles indicate the maximum age of trees growing in fossil landslide scars on a tributary of the Winooski River, indicating when slides stabilized. The period of increased meander migration and floodplain aggradation in the lower Winooski River flood plain is shown schematically (Thomas, 1985).



## Memorial Preprints

The following memorial preprints are now available, free of charge, by writing to GSA, P.O. Box 9140, Boulder, CO 80301.

**Donald Fergus Campbell**  
Thomas C. Marvin

**Robert W. Fields**  
Robert M. Weidman

**Milford Wayne Goering**  
B. G. Smith

**Terah L. Smiley**  
Owen K. Davis

**Byron John Chronic**  
Frederick N. Murray

**Charles Lewis Gazin**  
Mary R. Dawson, Robert W. Wilson

At GSA in Salt Lake City

## Help Celebrate the Memory of Laurence L. Sloss

Sunday, October 19, 2–5 p.m., Room 251AB, Salt Lake City Convention Center

Sponsored by the GSA History of Geology Division

Distinguished stratigrapher, former GSA president, Penrose Medalist, and geological statesman L. L. Sloss died just a few days after the 1996 GSA Annual Meeting. Join Larry's many friends, students, and admirers in celebrating a remarkable career. R. H. Dott, Jr. (University of Wisconsin) will moderate the session, which will feature memories shared by close Sloss associates, such as Edward C. Dapples and Peter Vail, followed by comments from the audience. All are welcome, particularly students, who should profit especially from learning about an exceptional person whose contributions, most notably the concept of sequence stratigraphy, form an important part of their professional legacy.

## In Memoriam

**Thomas Henry Clark**  
Canada  
April 28, 1996

**Robert M. Dreyer**  
San Francisco, California

**John E. Nafe**  
Canada  
April 7, 1996

**Vincent D. Perry**  
New York, New York  
August 1997

### Holocene Landscape *continued from p. 2*

noted in the mid-Atlantic States (Costa, 1975).

### METHODS

In order to infer the Holocene history of hillslope behavior, we excavated shovel and backhoe trenches (1 to 4.5 m deep, 5 to 14 m long) in 23 alluvial fans in northwestern Vermont and collected continuous sediment cores from two ponds. Organic material including charcoal, wood, and gyttja (lake mud rich in organic carbon) was dated at Livermore Laboratory;  $^{14}\text{C}$  was used according to

standard protocols. In order to make our data comparable to existing literature, we report all ages in  $^{14}\text{C}$  years corrected for  $^{13}\text{C}/^{12}\text{C}$ , but not calibrated for changing initial  $^{14}\text{C}$  abundance. The stable carbon isotope composition of the total organic carbon (TOC) fraction of acid-treated sediment was determined at the University of Vermont by combusting the samples in sealed quartz tubes, analysis on a VG SIRA II mass spectrometer, and comparison to standards (values reported relative to VPDB). Replicate analyses reproduce to better than 0.1%. Loss on ignition (LOI) was measured as a proxy for organic carbon content by burning dried

samples at 450 °C for 2 h; samples for LOI were taken contiguously every 2 cm.

### ALLUVIAL FANS

The fans we investigated are very small (<2500 m<sup>2</sup>), subtle landforms found on flat, permeable river terraces below higher terraces or hillslopes covered by till or glacial lake sediments. All but one of the fans are grass-covered and show little recent activity. In northern New England, such small fans have not been well studied, although elsewhere workers have investigated humid-region fans (e.g.,

*Holocene Landscape continued on p. 4*

TABLE 1. RADIOCARBON AND AGGRADATION DATA FOR ALLUVIAL FANS, HUNTINGTON RIVER VALLEY, VERMONT

Trench	Fan*	Sediment deposited in time interval (m)	Time of deposition† ( $^{14}\text{C}$ yr B.P.)	Laboratory number	Context of sample	Time Period
ALD-2	ALD-A	4	<100	GX-21329	Basal age	Historic
ALD-3	ALD-B	1	<230 ± 60, 310 ± 60	CAMS-26105 and 26106	Above buried soil	
ALD-5	ALD-C	0.9	<100	CAMS-26108	Above buried soil	
MUL-4	MUL	0.6	<100	CAMS-16584	Above buried soil	
AUD-1	AUD	0.4	<125	CAMS-20900	Above buried soil	
ALD-4	ALD-B	1.3	1850 ± 80 to 1900 ± 50	CAMS-30358 and 30359	Basal interval	Late Holocene
ALD-5	ALD-C	2.1	840 ± 60 to 2500 ± 60	CAMS-22994 and 22995	Basal interval	
MUL-1 and 4X	MUL	Basal age	between 7360 ± 95 and 7835 ± 105	GX-20058 and 20276	Basal interval, underlying terrace	Early Holocene
AUD-1	AUD	Basal age	between 8060 ± 60 and 8530 ± 100	CAMS-20901 and 20963	Basal interval, underlying terrace	

\*UTM locations for the sampled fans: MUL (659680E, 4913800N), AUD (659730E, 4912150N), ALD (660740E, 4914110N).

†Dates bound sedimentary units.



**Figure 4.** These photographs of the Vermont State House, Montpelier, Vermont, demonstrate the dramatic deforestation of hillslopes behind the building by the late 19th century (left—May, 1874, photo VHS-96, courtesy of the Vermont Historical Society) and subsequent reforestation (right—April, 1995).

**Holocene Landscape** *continued from p. 3*

Kochel, 1990; Mills, 1982; Church and Ryder, 1972; Wells and Harvey, 1987; Patton, 1988).

The 23 fans examined so far in Vermont are finer grained, better sorted, and much more intricately stratified than those in the southern Appalachians, the result of differing parent material and different sediment transport mechanisms. Grain size analyses, sedimentary structures, observations of an active fan, and comparison to the data of Wells and Harvey (1987) suggest that stream flows, not debris flows, transported most of the sediment to the fans we studied. None of the fans are confined on their sides, and all are fed only by ephemeral streams. To a first approximation, the fans and their drainage basins can be considered closed systems. Sediment, once it leaves the steep hillslopes ( $>30^\circ$ ) and is deposited on the low-gradient fans ( $<7^\circ$ ), does not appear to be removed by subsequent flows, although small amounts may be reworked by shallow ( $<20$  cm deep) fan-head trenching and redeposited at the toe of the fan. The closed-system assumption allows us to infer rates of hillslope erosion from rates of fan deposition (Fig. 5).

Unlike fans in arid regions, fan deposition in northern Vermont can be dated directly because the fans preserve abundant wood and charcoal within a distinct stratigraphy of silt, sand, gravel, and cobbles (Figs. 1 and 6). Most beds are poorly sorted, although there are occasional thin ( $\sim 10$  cm) beds of well-sorted, clast-supported gravel, as well as black laminae that may represent decomposed leaf mats or concentrations of finely disseminated charcoal ( $>15\%$  organic carbon). We have radiocarbon dated 14 samples of wood and charcoal from five alluvial fans in order to determine the timing of aggradation (Table 1). These data show that two fans began to aggrade in the early Holo-

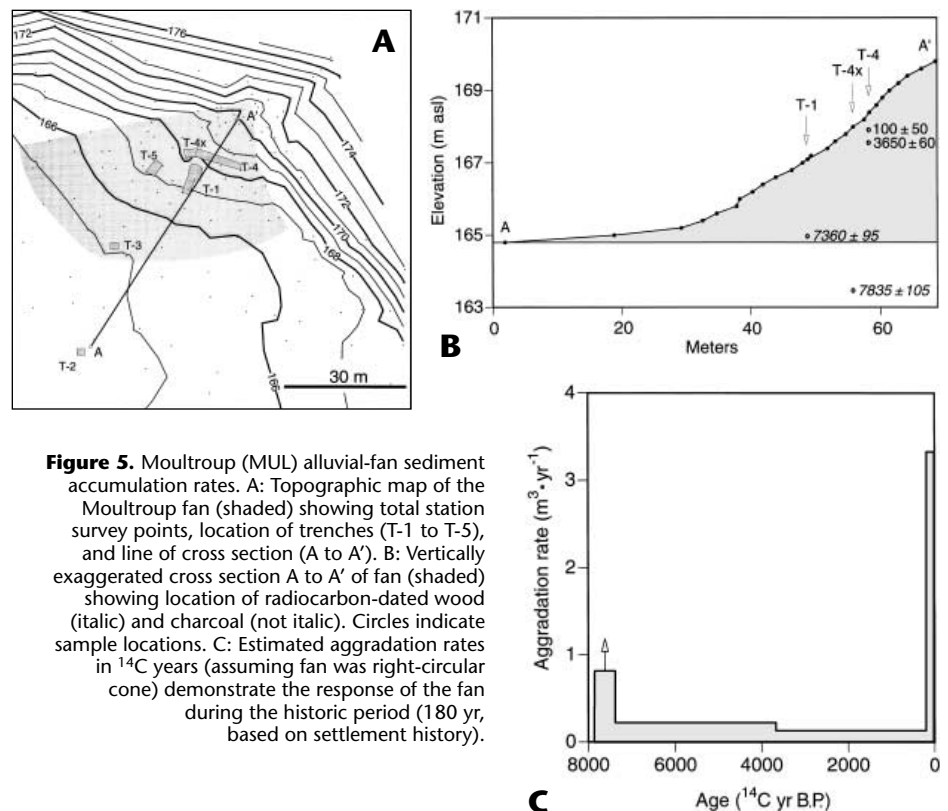
cene (between 8530 and 8060  $^{14}\text{C}$  yr B.P., and between 7835 and 7360  $^{14}\text{C}$  yr B.P.), two in the late Holocene (2500 and 1900  $^{14}\text{C}$  yr B.P.), and one fan aggraded over 4 m during historic time ( $<100$   $^{14}\text{C}$  yr B.P.).

On one fan, we have sufficient radiocarbon and stratigraphic data to estimate sediment accumulation rates over much of the Holocene. Rapid early Holocene aggradation was followed in the mid-Holocene by relative quiescence and soil formation (Fig. 5). In this and all other fans we trenched, there is a distinct soil profile near the fan surface buried by 0.5 to 4 m of poorly sorted sediment (Fig. 1). In each

case, charcoal dates just above the buried soil and the presence of cumulative plow horizons indicate that the overlying sediment postdates European settlement and is likely related to land clearance and agricultural practices (Table 1 and Fig. 1). Changes in atmospheric  $^{14}\text{C}$  over the past several hundred years preclude more precise radiocarbon dating of this young sediment.

**POND SEDIMENTS**

In order to reconstruct the history of pond sedimentation, we recovered and analyzed cores from the depocenters of



**Figure 5.** Moultroupe (MUL) alluvial-fan sediment accumulation rates. A: Topographic map of the Moultroupe fan (shaded) showing total station survey points, location of trenches (T-1 to T-5), and line of cross section (A to A'). B: Vertically exaggerated cross section A to A' of fan (shaded) showing location of radiocarbon-dated wood (italic) and charcoal (not italic). Circles indicate sample locations. C: Estimated aggradation rates in  $^{14}\text{C}$  years (assuming fan was right-circular cone) demonstrate the response of the fan during the historic period (180 yr, based on settlement history).

two Vermont ponds. Sterling Pond (0.03 km<sup>2</sup>; 917 m above sea level [asl]; 9 m maximum depth) has a small (0.3 km<sup>2</sup>), low-relief (40 m) drainage basin and is predominantly spring fed. Ritterbush Pond (0.07 km<sup>2</sup>; 317 m asl; 14 m max. depth) has a larger (2.2 km<sup>2</sup>), higher relief (>200 m) drainage basin and is fed by several streams; the coring site at Ritterbush is located >75 m from the nearest stream. Both ponds are located in drainage basins underlain by schist; however, till at both sites contains disseminated carbonate.

The cores contain organic and inorganic sediment in varying proportions. The inorganic material is derived from the eroding drainage basins. The organic material is a mixture resulting from primary productivity in the ponds and terrestrial plant debris from the surrounding watersheds. Stable carbon isotope analysis of present-day terrestrial and aquatic plants (macrophytes and algae), collected from Sterling and Ritterbush Ponds and their watersheds, indicates that these two sources of sedimentary organic matter have distinctive isotopic signatures. Terrestrial plants yield  $\delta^{13}\text{C}$  values ranging from -25‰ to -30‰, whereas aquatic plants yield values between -29‰ and -34‰. Thus, we can use stable carbon isotope analyses to determine whether organic material in our cores has a predominantly terrestrial or aquatic source. The difference in  $\delta^{13}\text{C}$  between terrestrial and aquatic plants reflects differing  $\delta^{13}\text{C}$  in their carbon sources, atmosphere and inorganic carbon dissolved in the lake water, respectively.

The two ponds have contrasting sedimentation histories reflecting differences in the hydrology of their watersheds. The Holocene part of the Sterling Pond core is relatively homogeneous gyttja with little change in LOI and  $\delta^{13}\text{C}$ . The small, gently sloping, high-elevation watershed appears unable to generate sufficient episodic runoff to transport significant amounts of terrestrial sediment to the pond. In contrast, cores from Ritterbush Pond show significant stratification and distinct, correlated changes in LOI and  $\delta^{13}\text{C}$  that we interpret as episodic inputs of terrestrial sediment derived from the large, steeply sloping watershed that surrounds the pond (Fig. 7).

In the Ritterbush Pond cores, we recognize five major intervals of terrestrial sedimentation based on low LOI and less depleted  $\delta^{13}\text{C}$  values (I, 470 to 448 cm; II, 426 to 400 cm; III, 348 to 339 cm; IV, 154 to 142 cm; V, 120 to 96 cm; Table 2, Fig. 7). The intervals are characterized by numerous millimeter- to centimeter-thick layers of gray silt and sand alternating with brown gyttja. Silt and sand layers are coincident with a drop in LOI and less negative  $\delta^{13}\text{C}$  values (-26‰ to -28‰—terrestrial carbon) in comparison to the adjacent gyttja (-30‰ to -35‰—aquatic



**Figure 6.** Trench 4 of the Moultroupan fan contains a variety of grain sizes, from silt to cobbles, reflecting different sediment sources, till and glacial lacustrine sediments. The prehistoric soil horizon and overlying postsettlement alluvium are just above the large cobble beyond the tape.

carbon). The sand and silt layers have sharp basal contacts and diffuse or sharp tops. The thicker inorganic layers are graded, suggesting that they are turbidite deposits. At the bottom of the core (495 to 479 cm), the isotopic and LOI data clearly show when aquatic primary productivity first became the dominant carbon source in the pond as LOI rises above 1% and there is a remarkable negative shift (more than -10‰) in the  $\delta^{13}\text{C}$  values.

Fourteen radiocarbon ages of pond sediments, including three replicates, allow us to estimate the onset of the five intervals during which detrital sediment influx increased. At three levels in the cores, we have sampled directly below and above what we interpret as the first discrete clastic sedimentation event within an interval of increased terrestrially derived sediment (426 and 416 cm; 348 and 339 cm; 154 and 142 cm). In each case, sediment above the inorganic horizon yields greater <sup>14</sup>C ages than sediment below the horizon (offsets are 240, 110, and 230 <sup>14</sup>C yr, respectively). This systematic age inversion is consistent with erosion and resuspension of older gyttja from the basin margin or incorporation of older

soil carbon from the basin by the flows that deposited the inorganic sediments.

Dating gyttja introduces additional systematic uncertainty. In cores from both Sterling and Ritterbush Ponds, we dated both a terrestrial macrofossil and the enclosing gyttja. In Ritterbush core RT-2, only several millimeters below interval II, a maple seed pod (426 cm; 8470 ± 60 <sup>14</sup>C yr B.P.) was 430 <sup>14</sup>C yr younger than the average of three replicates of the surrounding gyttja (426 cm; 8900 ± 40 <sup>14</sup>C yr B.P.). In the Sterling Pond core ST-1, a twig (260 cm, 3900 ± 60 <sup>14</sup>C yr B.P.) was 280 <sup>14</sup>C yr younger than the surrounding gyttja (4180 ± 50 <sup>14</sup>C yr B.P.). These age discrepancies could result from the uptake of "old" carbon by the aquatic plants (from dissolution of carbonate-bearing till) or from sinking of younger terrestrial macrofossils through older, soft, pond-bottom sediments. If the macrofossils are sinking, then the event that began interval II must have eroded about 22 cm of gyttja (430 <sup>14</sup>C yr, assuming a sedimentation rate of 0.5 mm/yr) that was once above the maple seed pod. In either case, the <sup>14</sup>C

**Holocene Landscape** continued on p. 6

TABLE 2. AGE AND DEPTH DATA FOR INTERVALS OF INCREASED TERRESTRIAL DEPOSITION, RITTERBUSH POND, VERMONT

Interval no.	Initiation depth core RT-2 (cm)	Initiation age ( <sup>14</sup> C yr B.P.)	Best initiation age estimate* ( <sup>14</sup> C yr B.P.)	Time period
V	120	2570 <sup>†</sup>	>1950 <sup>††</sup>	Late Holocene
IV	154	<2940 <sup>§</sup>	2510	
III	348	<6430 <sup>§</sup>	6000	Early Holocene
II	426	<8470 <sup>#</sup>	8470	Early Holocene
I	470	<11,940 <sup>**</sup>	<11,510	Late Glacial

\*Subtracts 430 <sup>14</sup>C yr offset for gyttja samples based on offset between gyttja and terrestrial macrofossil measured at 426 cm.

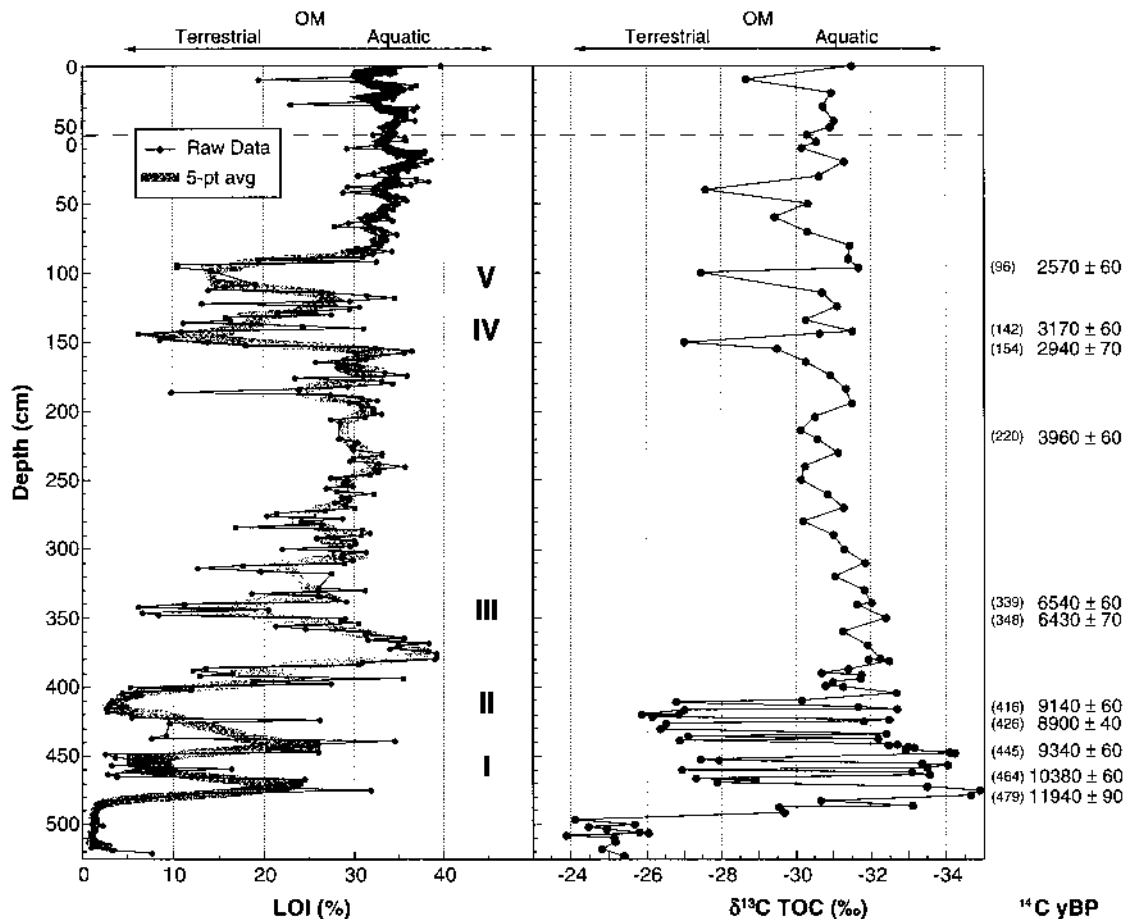
<sup>†</sup>Gyttja age just above last laminae in interval V.

<sup>§</sup>Gyttja age just below first laminae in interval.

<sup>#</sup>Age of maple schizocarp at 426 cm directly below laminae initiating interval II.

\*\*Gyttja age at 479 cm 9 cm below beginning of interval I.

<sup>††</sup>Subtracts additional 190 <sup>14</sup>C yr based on the observation that the age of sediment just above interpreted events averages 193 ± 72 <sup>14</sup>C yr (n = 3) greater than sediment just below.



**Figure 7.** Loss on ignition (LOI) and total organic carbon (TOC)  $\delta^{13}\text{C}$  for Ritterbush Pond. The results are a combination of two overlapping sequences of Livingston cores with a total length of 575 cm. Roman numerals indicate inorganic deposition intervals. Radiocarbon ages with  $1\sigma$  counting uncertainties are shown, except for the gyttja at 426 cm, which is an average,  $\pm 1\sigma$ , of three measurements. Samples used for dating were acid- and base-washed repeatedly prior to combustion. OM = organic matter.

### Holocene Landscape *continued from p. 5*

ages of gyttja below inorganic sediment layers overestimate the age of the terrestrial input events by several hundred  $^{14}\text{C}$  yr. We have used the measured gyttja—macrofossil age offset (430  $^{14}\text{C}$  yr for Ritterbush Pond) as an arbitrary correction for the interval initiation ages shown in Table 2 and Figure 8.

### DISCUSSION

Alluvial fan trenches and pond sediment cores show that New England's Holocene history is every bit as dynamic and interesting as the preceding and well-studied deglaciation. Pond sediments are a continuous, integrated record of a drainage basin; small alluvial fans directly record discreet events from single hillslopes. Although these two geologic archives are strikingly different, the initial conclusions we draw from both records are remarkably similar. Hillslopes were more active during the early and late Holocene than during the middle Holocene. This case study not only suggests that it will be worthwhile to examine similar archives elsewhere, but also illustrates the challenges facing those trying to interpret these complex and integrative records of surface processes in terms of climate change and process-response models.

The similarity between fan and pond records suggests that different hillslopes respond to the same large-scale forcing, probably climate (Fig. 8). In the early Holocene (>6000  $^{14}\text{C}$  yr B.P.), sediment eroded off hillsides onto alluvial fans and into ponds. High rates of deposition on two fans (MUL and AUD, <8530 to 7360  $^{14}\text{C}$  yr B.P.) are coincident with the time during which clastic sedimentation intervals II and III occurred at Ritterbush Pond (8470 and 6000  $^{14}\text{C}$  yr B.P.). Pollen data, lake level histories, and global circulation models suggest that in general, climate was warmer, drier, and stormier than today, although a short-lived cool, dry, and dusty episode (ca. 7500  $^{14}\text{C}$  yr B.P.) has been identified by Alley et al. (1997) in a variety of records (Fig. 8), and Dywer et al. (1996) reported a highstand in Owasco Lake (western New York) at 6900  $^{14}\text{C}$  yr B.P.

The landscape was more stable during the middle Holocene (6000 to 2500  $^{14}\text{C}$  yr B.P.), when pollen, lake level histories, and climate models suggest that northeastern North America was slowly cooling and becoming moister. Ritterbush Pond cores contain less terrestrially derived sediment (340 to 155 cm, 6000 to 2510  $^{14}\text{C}$  yr B.P.), and soil profiles developed on what appear to have been relatively stable alluvial fan surfaces. About 2500  $^{14}\text{C}$  yr ago, environmental conditions began to

change; an increase in spruce pollen suggests that eastern North America was significantly cooler and moister, an inference strongly supported by rising lake levels. High rates of deposition on two fans (ALD-C and ALD-B, 2500 to 1850  $^{14}\text{C}$  yr B.P.) are coincident with the period when inorganic deposition in Ritterbush Pond again increased (2510 to 1940  $^{14}\text{C}$  yr B.P.; clastic intervals IV and V).

Our data are consistent with gross climatic controls on hillslope activity. However, climate does not move sediment and erode hillslopes, water does, and water comes from distinct and episodic hydrologic events. There are numerous historical accounts in New England and elsewhere of both high-intensity and long-duration storm events triggering hillslope erosion (Flaccus, 1958; Bogucki, 1977; Ratte and Rhodes, 1977; Dethier et al., 1992). We believe that the record of such events is preserved as inorganic layers in the pond sediments and as discrete beds in the alluvial fans. Hurricanes and other moisture-laden storms of tropical and/or Atlantic origin do influence interior New England (Coch, 1994). These storms cause landslides and gullying as ground-water tables rise, soil pore pressures increase, and saturated overland flow runs over the landscape. If the paleoclimatic proxy data

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### **Holocene Landscape** *continued from p. 6*

are correctly interpreted, early Holocene hillslope erosion may have been driven by episodic large storms in a drier climate than today. Late Holocene erosion and aggradation were also event driven, but greater ambient levels of soil saturation may have allowed smaller storms to trigger similar landscape responses. It appears that the middle Holocene was less stormy.

Vegetation affects hillslope stability. For example, European settlement, clear-cutting, and agricultural practices removed the heavy forest cover and triggered massive aggradation on valley-bottom alluvial fans. Presumably, landsliding and gully erosion increased as soils were compacted, tree roots rotted, and the effective cohesion that those roots provided was lost. Was the New England landscape cleared of trees at any other time during the Holocene? Pollen data are definitive. New England was generally tree-covered from shortly after deglaciation until European settlement. The pathogen-induced hemlock decline at 4800 <sup>14</sup>C yr B.P. may have cleared some slopes, and pollen spectra can be interpreted to indicate increased fire frequency during the drier early Holocene (Jacobson et al., 1987), an observation supported by charcoal abundance data from several New England ponds (e.g., Anderson et al., 1986; Davis, 1985). However, we lack a record of small-scale forest disturbance from blowdown, fire, and disease, all capa-

ble of clearing vegetation from hillslopes and making small drainage basins more sensitive to hydrologic events.

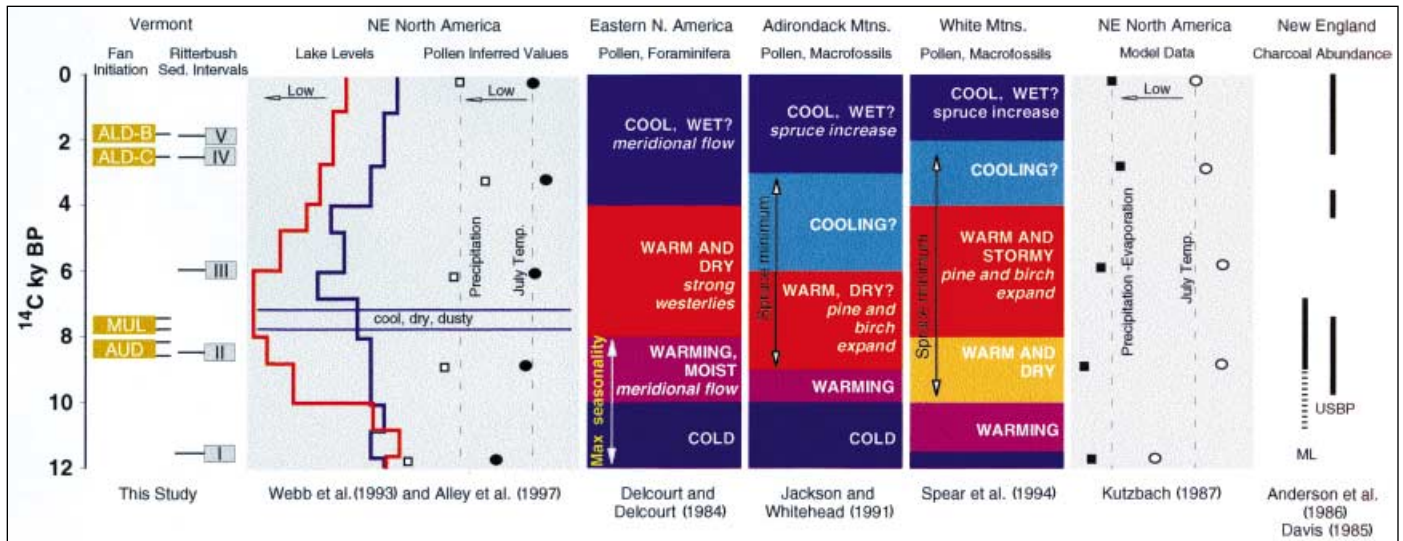
Our geologic data have implications for land management practices and reinforce the conclusion that humans are significant geomorphic agents (Hooke, 1994). In Vermont, extensive colonial land clearance and agriculture dramatically increased sediment yield from some hillslopes. The fans that we have investigated aggraded more quickly during the past 200 yr than at any time during the past 8000 <sup>14</sup>C yr (Fig. 5). Transitory expansion of the Winooski River delta into Lake Champlain, rapid meander migration, and the volume of historic alluvium in the Winooski River flood plain testify to the massive amount of sediment removed from the uplands, transported, and deposited by this river during the early and mid-1800s (Fig. 3; Severson, 1991; Thomas, 1985). The retreat of the Winooski River delta, the incision of this and other rivers into historic alluvium, and tree-core data gathered from fossil landslide scars suggest that hillslopes stabilized and sediment supply to the river decreased quickly as reforestation began to occur in the 1880s (Fig. 3). Curiously, the steep, rocky, uncultivated, and till-covered slopes around Ritterbush Pond barely responded to European deforestation, yet repeatedly and distinctly responded to events, presumably hydrologic, through the Holocene.

Hillslopes are sensitive, diverse, and dynamic systems that respond measurably to climate and land-use change. For example, fluvial terraces underlain by glacial lake sediments appear to be more sensitive to clear-cutting than are till-mantled upland basins; yet, our data show that both terrace and upland hillslopes erode in response to long-term climate change and short-term hydrologic events. As development clears slopes in New England and around the world, further work is needed to identify which parts of the landscape are most sensitive to deforestation and whether the temporal records of episodic hillslope activity we infer from northern Vermont fans and ponds are regionally coherent and represent the record of a potentially significant natural hazard.

### **ACKNOWLEDGMENTS**

Supported by grants to Bierman and Lini from the University of Vermont and Lintilhac Foundation, by faculty grant to Davis from Bentley, by the Vermont Geological Society, a GSA Mackin grant, Sigma Xi, and Burlington Gem and Mineral Club awards to Church, and by Mellon fellowship and Hawley award to Zehfuss. L. Lin and S. Brown described Ritterbush cores. J. Shane identified the macrofossil. We thank G. Ashley, B. Atwater, R. Brakenridge, D. Clark, E. CoBabe, D. Dethier,

**Holocene Landscape** *continued on p. 8*



**Figure 8.** A compilation of selected climate-change records for eastern North America and New England. Horizontal lines indicate the best age estimates (including gyttja age-offset) for initiation of deposition of the alluvial fan and Ritterbush Pond inorganic sediment. Lake levels are a summary of Webb et al.'s (1993) compilation. The red line is a temporal histogram of lakes having lowstands. The blue line is an inverse histogram of lakes having highstands. Webb et al.'s (1993) pollen-inferred values for precipitation and July temperatures are averages derived from pollen response surfaces incorporating numerous sites in eastern North America. Horizontal lines indicate the cooling event of Alley et al. (1997). The Delcourt and Delcourt (1984) compilation is based on foraminifera from North Atlantic cores and pollen from lakes in northeastern North America. Jackson and Whitehead (1991) and Spear et al. (1994) reported data from the Adirondack Mountains of New York and the White Mountains of New Hampshire, mountain ranges immediately west and east of Vermont's Green Mountains, respectively. The Kutzbach (1987) record is a result of global climate modeling. Charcoal abundance is from Upper South Branch Pond (USBP), Maine (Anderson et al., 1986) and from Mirror Lake (ML), New Hampshire (Davis, 1985).

## Holocene Landscape continued from p. 7

T. Jordan, S. Kite, M. Miller, M. Retelle, D. Rodbell, R. Thorson, and T. Webb for helpful reviews of this manuscript. We are indebted to Henry Moultrou for property access and skillful backhoe operation.

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Manuscript received April 10, 1997; revision received August 8, 1997; accepted August 15, 1997 ■



## WASHINGTON REPORT

Bruce F. Molnia

Washington Report provides the GSA membership with a window on the activities of the federal agencies, Congress and the legislative process, and international interactions that could impact the geoscience community. These reports present summaries of agency and interagency programs, track legislation, and present insights into Washington, D.C., geopolitics as they pertain to the geosciences.

### Environmental Diplomacy— The Environment and U.S. Foreign Policy

The U.S. State Department's first annual report on the environment and foreign policy represents a new way of looking at the world.

*"We have moved beyond Cold War definitions of the United States' strategic interests. Our foreign policy must now address a broad range of threats—including damage to the world's environment—that transcend countries and continents and require international cooperation to solve."*

— Vice-President Al Gore

Recently, the State Department released a first-of-its-kind report, Environmental Diplomacy—The Environment and U.S. Foreign Policy, a nontechnical summary of U.S. policy and objectives related to international environmental diplomacy. The focus of the report is contending with environmental problems such as global climate change, ozone depletion, ocean and air pollution, and resource degradation. The report details the Clinton Administration's priorities for working globally, regionally, and bilaterally to combat serious and growing international environmental threats. It represents a turning point in U.S. foreign policy. Revisions to this report will be released annually on Earth Day. Their purpose will be to update global environmental challenges and policy developments and to set U.S. priorities for the coming year.

As Vice-President Gore points out in his introduction to the report, these issues, "compounded by an expanding world population—respect no border and threaten the health, prosperity, and jobs of all Americans. All the missiles and artillery in our arsenal will not be able to protect our people from rising sea levels, poisoned air, or foods laced with pesticides. Our efforts to promote democracy, free trade, and stability in the world will fall short unless people have a livable environment."

An introductory letter from Secretary of State Madeleine Albright ties the origin of environmental diplomacy to a 1996 announcement by then-Secretary of State Warren Christopher in which he stated that the State Department would spear-

head a government-wide effort to meet the world's environmental challenges. Christopher is quoted as saying, "The United States is providing the leadership to promote global peace and prosperity. We must also lead in safeguarding the global environment upon which that prosperity and peace ultimately depend." Albright states that the global environment can be protected most effectively if nations act together. For these reasons, this effort must be a central concern of American foreign policy.

Secretary Albright states that the United States is building on three basic premises. First, that damage to the global environment, whether it is overfishing of the oceans, the build-up of greenhouse gases in the atmosphere, the release of chemical pollutants, or the destruction of tropical forests, threatens the health of the American people and the future of our economy.

Second, environmental problems are often at the heart of the political and economic challenges around the world. In Russia and central Europe, environmental disasters left over from the Soviet era shorten lives and impede reform. In central Africa, rapid population growth combined with the competition for scarce resources fuels conflict and misery. Albright states that the United States would not be doing its job as peacemaker and democracy builder if it were not also a good steward of the global environment.

Third, Albright believes, as she says President Kennedy did, that "problems

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Post Doctoral Fellowship in Economic Geology

### Mineral Exploration Research Centre Laurentian University

The Mineral Exploration Research Centre at Laurentian University invites applications for a Post-Doctoral Fellowship in the area of magmatic-hydrothermal ore deposits. The successful applicant will have a strong background in the geochemistry and petrology of Ni-Cu-(PGE) sulphide deposits and should have a working knowledge of computer modeling in such systems. The appointment will be sponsored by Inco Ltd. for a two-year term (subject to an annual review) and will commence immediately.

The research project will be focused on establishing the nature and origin of metal fractionations within and between contact and footwall ore bodies in the Sudbury Igneous Complex. The PDF will compile existing mine assay data, undertake detailed sampling in well characterized areas, supervise high precision base metal, semi-metal, and PGE analyses, and model the data to 1) establish vectors towards mineralization, and 2) determine the relative roles of magmatic fractionation, magmatic-hydrothermal mobilization, and metamorphic-hydrothermal remobilization in metal fractionation.

As one of the world's largest nickel mining centres and home to Inco Ltd., Falconbridge Ltd., Laurentian University, and the Ontario Geological Survey/Ontario Geoscience Laboratories (located in the LU campus), Sudbury provides an ideal environment for research on magmatic sulphide deposits. The appointee will work in a large group of scientists studying the geology, mineralogy, geochemistry, and petrology of magmatic and hydrothermal ore deposits, including MERC/Department of Earth Sciences faculty, several other PDFs and graduate students, mining company geologists, OGS staff geologists, and OGL staff scientists. MERC researchers have access to excellent computing and geochemical analytical equipment, including EPMA, XRFs, ICP-OES, ICP-MS, and TIMS.

Laurentian University is committed to employment equity and encourages applications from all qualified applicants including women, aboriginal peoples, members of visible minorities, and persons with disabilities. In accordance with Canadian immigration requirements, this advertisement is directed first to Canadian citizens and permanent residents.

Please send curriculum vitae and the names and e-mail addresses of three referees to:

Dr. C.M. Leshar, Director  
Mineral Exploration Research Centre  
Laurentian University  
Sudbury, Ontario P3E 2C6 Canada  
Tel: (705) 675-1151, x2276  
Fax: (705) 673-4898  
E-mail: clesher@nickel.laurentian.ca

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created by man can be solved by man." Environmental problems are not the result of natural forces or the hidden hand of chaos; they are caused by human beings. She states that these problems can be solved if America works in partnership with governments, nongovernmental organizations, and businesses that share our commitment to a cleaner and healthier world. A common theme throughout the report is that rapid population growth exacerbates these problems and has consequences that transcend national borders. "At the end of World War II, the earth's population stood at two billion; now it is nearing six billion. It took hundreds of thousands of years to reach the two billion mark; only 50 years to triple it. This gargantuan rise in population has crowded the cities, overtaken green spaces and created unprecedented demand for energy, food, and shelter."

Albright continues that to meet this challenge, the State Department will change the way it does business. Building on the appointment of an Under Secretary for Global Affairs, embassies and bureaus are developing regional environmental policies that advance larger national interests. To help coordinate these policies, the State Department is opening regional environmental hubs at U.S. embassies in Costa Rica, Uzbekistan, Ethiopia, Nepal, Jordan, and Thailand. Additionally, environmental cooperation is now an important part of U.S. relationships with countries like Japan, India, Brazil, and China.

Albright states that on a global basis, the United States is pursuing five environmental priorities (described as "Challenges for the Planet"): (1) climate change, (2) toxic chemicals, (3) species extinction, (4) deforestation, and (5) marine degradation.

Several paragraphs containing factoids or statements, several illustrations, and a quote are presented for each environmental priority. For example the "Oceans" section begins with a quote from Isaac Asimov—"Life originated in the sea, and about eighty percent of it is still there" and a statement, "The oceans, ravaged by pollution and overfishing, are in trouble."

An "Oceans" factoid paragraph states, "The United States, with one of the longest coastlines in the world and as a major maritime power and seafood consumer, has vested economic and environmental interests in protecting the oceans. In addition to providing a major food source, the oceans are maritime highways for efficient commerce and national security. They also serve as a source for oil, for medicine, and for recreation. The health and economic well-being of the world's coastal populations and communities are intimately linked to the quality of the marine environment."

The report then presents two examples of what are described as "Environmental Diplomacy at Work." These are "Protecting the Earth's Ozone Layer" and "Taking Action to Protect Tigers and Rhinos." Each is accompanied by a paragraph describing U.S. successes in dealing with these issues.

The "Regional Challenges" section of the report states that "The environmental fates of nations are inextricably and intimately linked within a region." The ability of countries to tackle these types of problems has significant implications for their internal political and economic stability, for the political and economic stability of their region, and by extension, for U.S. foreign policy. Today, for more and more U.S. diplomats working in our embassies and consulates around the world, implementing American foreign policy means working on environmental issues. The State Department now operates on the premise that countries sharing common resources share a common future and that neighboring nations are downstream and upwind, not just north and south or east and west, of each other. Threats to a shared forest, a common river, or a seamless coastline are forcing countries to expand their existing bilateral relationships to include environmental issues, and to create new regional frameworks to confront and combat shared environmental challenges.

Consequently, the State Department is integrating such regional and bilateral environmental issues into its diplomacy for three purposes: (1) to help stabilize a region where pollution or the scarcity of resources contributes to political tensions; (2) to enable the nations of one region to work cooperatively to develop initiatives to attack regional environmental problems; and (3) to strengthen our relationship with allies by working together on internal environmental problems.

The report describes how the State Department is integrating environmental issues into its diplomacy in two new ways: by establishing regional environmental hubs in key embassies to work on transboundary solutions to regional environmental problems, and by raising the profile of environmental issues in many of our bilateral relationships. The focus of regional and bilateral environmental diplomacy will be on five key environmental challenges that affect most, if not all, areas of the world: water resources, air quality, energy resources, land use, and urban and industrial growth.

As before, paragraphs containing factoids or statements, several illustrations, and a quote are presented for each environmental priority.

Last, the report describes the focus for each of the new regional environmental hubs:

- The Central American–Caribbean hub, located in San Jose, Costa Rica, will focus on the loss of forests and biological diversity and on the management of coral reefs and coastlines.
- The Central Asian hub, located in Tashkent, Uzbekistan, will work to encourage cooperation on water-related problems in the Aral Sea basin.
- The Eastern Africa hub, located in Addis Ababa, Ethiopia, will focus on desertification, deforestation, biodiversity loss, and water use.
- The South Asia hub, located in Kathmandu, Nepal, will promote regional cooperation on alternative energy, clean air, water sharing, and environmental disaster preparedness.
- The Middle East hub located in Amman, Jordan, will work on water resources, desertification, and coral reefs in the Gulf of Aqaba as part of the Middle East peace process.
- The Southeast Asian hub, located in Bangkok, Thailand, will create initiatives to promote the sustainable management of forest and marine resources.

Additionally, the State Department is using or expanding its bilateral relationships with Brazil, India, Japan, China, Russia, Ukraine, the European Union, Mexico, South Africa, and Egypt to focus on environmental issues. These bilateral frameworks will result in the development of joint initiatives with allies on global, regional, and bilateral problems.

In closing, Eileen B. Claussen, Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs (OES), states that environmental diplomacy is not an entirely new concept. She notes that OES, which dates from October 1973, has been instrumental in such diverse areas as conserving the unique resources of the Arctic and Antarctic, fighting to uphold the international moratorium on commercial whaling, and providing a forum for our scientists to collaborate with colleagues overseas in areas including health, agriculture, and basic sciences. Through these and other achievements, OES has made an important contribution to improving the quality of life for Americans and people around the world.

Claussen concludes that the State Department "produced this report outlining our priorities and actions to build greater understanding of, and broader participation in, our efforts to tackle the growing number of increasingly complex international environmental challenges. We are committed to working with you, hearing from you, and moving forward together."

The Environmental Diplomacy report can be viewed at the OES Web site—<http://www.state.gov/www/global/oes/earth.html>. ■

## GSA Congressional Science Fellow Named for 1997–1998



**David J. Verardo**

David J. Verardo has been chosen as the twelfth GSA Congressional Science Fellow. He will work as a special legislative assistant on the staff of a committee or member of the U.S. Congress from September 1997 through August 1998.

Verardo plans to use his broad geoscience experience to promote sustainable and accountable federal investment in scientific and technological research and prudent stewardship of America's natural resources and environment. In his application for the fellowship, he stated, "Geologic data are essential for sensible public policy formulation. Without their consideration, the nation's enviable record of public safety and economic vitality is at risk. The unique panorama of geologic time permits us to observe the full range of natural processes on Earth and aids in developing a fundamental comprehension of the natural world. A perspective limited only to that of human influence impairs our understanding of natural variation."

Verardo received his Ph.D. in earth and environmental science in 1992 from the City University of New York and his B.A. in geology from Long Island University. He is actively engaged in climate

research as well as professional practice in engineering geology. Verardo is a registered professional geologist and a member of the Geological Society of America, the Association of Engineering Geologists, and the American Geophysical Union.

### The Fellowship

The Congressional Science Fellowship gives a geoscientist first-hand experience with the legislative process and the opportunity to view science policy issues from the lawmaker's perspective. At the same time, the Fellow assists in the analysis of public policy issues by providing scientific and technical expertise.

Funded by GSA and a grant from the U.S. Geological Survey, the fellowship demonstrates the value of science-government interaction and enhances involvement of the earth science community in the public policy arena. The program places highly qualified, accomplished scientists, engineers, and other professionals with the offices of individual members of Congress and committees for a one-year assignment. Fellows perform in much the same way as regular staff members; they have the opportunity to be involved in varied legislative, oversight, and investiga-



tive activities. They offer their special knowledge, skills, and competence for the opportunity to acquire experience and the chance to contribute to the formulation of public policy.

To prepare for their assignments, Fellows attend a two-week orientation conducted by the American Association for the Advancement of Science. Fellowship requirements include exceptional competence in some area of the earth sciences, cognizance of a broad range of issues outside the Fellow's particular area, and a strong interest in working on a range of public policy programs. The Fellow reports periodically to the GSA membership and to the U.S. Geological Survey during the one-year period. ■

### About People

GSA Fellow **Paul R. Krutak**, Hays, Kansas, has been designated the 1997 President's Distinguished Scholar at Fort Hays State University.

Member **Lisa Pratt**, Indiana University at Bloomington, is the recipient of the 1997 Outstanding Educator Award from the Association for Women Geoscientists Foundation.

## Dibblee Award Honors Parke Snavelly

*Dorothy L. Stout, Cypress College, Cypress, California*

"A Day in the Field With Tom Dibblee," on May 17 at the site of the historical St. Francis Dam, marked the presentation of the Dibblee Medal to U.S. Geological Survey scientist Parke D. Snavelly, Jr., the fourth recipient. The Dibblee Medal honors the extraordinary geologic mapping achievements of Tom Dibblee, and underlines the importance of geologic field mapping as a means of providing solutions to complex geological problems.

The crowd attending the event heard Ray Wells, of the USGS, laud Snavelly's 53 years with the Survey and his mapping and analyses of much of the Cenozoic Coast Ranges and sedimentary basins of western Oregon and Washington. That work has "led to a better understanding of the energy resource and hazard potential of sedimentary basins and accreted terranes in the tectonically active Cascadia forearc," Wells said. In response, Snavelly, in conveying the importance of field mapping (Snavelly was suffering from Lyme disease, so his son, Parke D. Snavelly III, read the response), stated that "the tectonic or stratigraphic history of an area cannot be properly interpreted in the absence of the understanding established through field mapping," adding that geologic mapping is "a form of exploration in which one feels the excitement of discovering geologic relationships that might never have been observed before."

Tom Dibblee, in his 85th year, continues to map, and this day was marked by the release of five more Dibblee geologic maps, of Warm Springs Mountain, Whitaker Peak, Green Valley, Sleepy Valley, and Ritter Ridge. Dibblee's maps have been used by thousands of geologists, and have been described as indispensable to the earth sciences and for the benefit of humankind. For more information on the Dibblee Foundation: <http://dibblee.geol.ucsb.edu>.

# GSA ANNUAL MEETING PROGRAM: New Initiatives as GSA Enters the Next Millennium

Sharon Mosher, GSA Annual Program Committee Chair, Department of Geological Sciences, University of Texas at Austin, Austin, TX 78712, mosher@mail.utexas.edu

New initiatives and a new technical program structure for the GSA Annual Meeting are being implemented as GSA prepares to enter the next millennium. The GSA Annual Program Committee has developed a master plan for the future to increase the vitality and impact of the Annual Meeting Program and to better meet the programming needs of GSA membership. The key components of the new program structure are Keynote, Topical, General, Late-Breaking Research, and Hot Topic Sessions, as outlined below.

**Keynote Sessions**—Four to eight half-day, nonconcurrent (one per half day; minimum of one per day) sessions with all invited speakers. These sessions expand and replace the single Keynote Symposium currently offered at the Annual Meeting. These sessions will be selected on a competitive basis, the primary criterion being excellence. The sessions should be on the leading edge in a scientific discipline or area of public policy, address broad fundamental problems, be interdisciplinary, or focus on global problems. GSA Council has approved, in principle,

funding to support these sessions. Individual GSA members, GSA Divisions, and Associated Societies are encouraged to organize Keynote Sessions. The session schedule will be flexible, including variable talk lengths, types and lengths of discussion periods, and other creative program formats, such as informal (no abstract) poster sessions during oral sessions, and will be determined by the organizer. One or more keynote talks at the beginning of the session by well-regarded, effective speakers who give an overview of the topic for fellow scientists not in the specialty field is encouraged. Keynote Session proposals will be reviewed by a panel of rotating Joint Technical Program Committee representatives, that provides broad discipline coverage, and the Annual Program Committee will make the final decision. Four Keynote Sessions will be offered at the 1998 GSA Annual Meeting in Toronto and up to eight at future meetings. **Proposals are due January 2, 1998.**

**Topical Sessions**—Half-day sessions on a specific topic with a mix of volunteered and invited speakers. These sessions

merge the current Theme Sessions and Symposia, combining the most successful elements of each. The new format allows a mix of invited and volunteered papers for more dynamic sessions. A flexible schedule similar to that for Keynote Sessions will be allowed. Individuals may contribute papers to any Topical Session, and organizers may invite specific papers to ensure a successful and excellent session. Individual GSA members, GSA Divisions, and Associated Societies may propose and organize topical sessions. Four invited speakers are automatically allowed, but an organizer may request more invitations with a justification for the larger number. Two JTTC representatives will review the proposals; the Technical Program Chair and the Annual Program Committee will make the final decision. Topical Sessions will be offered at the 1999 Annual Meeting in Denver in place of the Theme Sessions and Symposia.

**Late-Breaking Research Sessions**—Sessions highlighting exciting new data or

*New Initiatives continued on p. 13*


## LANDFORMS AND THEIR ENVIRONMENTS

<p><b>H. FRATER</b>, Dusseldorf, Germany</p> <h3>LANDFORMS OF THE EARTH</h3> <p>This cross-platform CD-ROM provides insight into the remarkable variety of the Earth's landforms. In each chapter, different multimedia presentations demonstrate various aspects of surface formation. Beginning with plate tectonics, numerous photographs document the individual landscapes and their origin. An animated model that uses selected typical landscapes illustrates how the changes take place. In addition, numerous videos introduce the most interesting landscapes of the American west coast. The CD-ROM includes a built-in navigator that allows movement within the application from one chapter to another without loss of orientation.</p> <p>1997/CD-ROM \$34.95 ISBN 3-540-14620-4</p>	<p><b>A. PARKER and J.E. RAE</b>, University of Reading, UK (eds.)</p> <h3>ENVIRONMENTAL INTERACTIONS OF CLAYS</h3> <p><i>Clays and the Environment</i></p> <p>Topics covered in this volume include the environmental interactions of clays, transport of radionuclides in smectine clay, roles of clay and oxide minerals in soils, interactions of non-volatile micro-organic pollutants and clay minerals in surficial environments, the biogeochemical and ecological significance of interactions between colloidal minerals and trace elements, clay barriers in landfills, and clay minerals and health.</p> <p>1997/APPROX. 232 PP., 73 ILLUS., 49 TABLES, HARDCOVER \$84.95 ISBN 3-540-88739-1</p>	<p><b>R.G. BAILEY</b>, US Forest Service, Fort Collins, CO</p> <h3>ECOREGIONS</h3> <p><i>The Ecosystem Geography of the Oceans and Continents</i></p> <p>"Bob Bailey [is] the man behind the ecosystem mapping of the world." —LINGUA FRANCA</p> <p>This book applies the principles described in <i>Bailey's Ecosystem Geography</i> to describe and characterize the major terrestrial and aquatic ecological zones of the Earth. Bailey's system for classifying these ecoregions has been adopted by major organizations such as the US Forest Service and The Nature Conservancy, and this book is a significant contribution to a long tradition of classifying and studying the world's ecological regions. It includes two color maps that show the major ecoregions of the continents and oceans.</p> <p>1997/APPROX. 300 PP., 107 ILLUS., 10 TABLES ISBN 0-387-98211-2, SOFTCOVER \$39.95 ISBN 0-387-98205-6, HARDCOVER \$79.95 FOLLOWS TWO FULL-COLOR MAPS IN EACH POCKET</p>
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**New Initiatives** continued from p. 12

breakthroughs over the summer. A minimum of one oral and one poster session will be available so that exciting new results generated over the summer, after the abstract deadline, can be presented at the GSA Annual Meeting. This opportunity is available starting with the 1997 Annual Meeting; see the July, August, and September issues of *GSA Today* for details.

**General Sessions**—Oral and poster general sessions with all volunteered papers. These sessions, which represent the majority of the program, remain the same. Poster sessions will be expanded as much as possible to allow more papers to be presented. Poster sessions will not be scheduled concurrently with oral sessions in the same discipline, to allow for well-attended, dynamic sessions.

The **Hot Topics** at lunch and **IEE**- and **SAGE**- sponsored programs will continue to be part of the Annual Meeting along with field trips, short courses, and informal programming on Sunday.

#### MEETING DAYS

The Annual Meeting days will be changed to Sunday through Wednesday as soon as the shift can be made permanently. Because of the long lead-time on convention center and hotel contracts, this change will not go into effect until after 2000. Membership surveys over the past few years have indicated that most members would prefer this timing to decrease the cost of attending the meeting and the number of workdays missed.

#### SITE—AN UNRESOLVED QUESTION

Where should the GSA Annual Meeting be held? Surveys indicate members prefer a diversity of meeting sites, but attendance is low at all but a few sites. GSA cannot afford to continue sponsoring meetings in locations where it does not at least break even financially, and low attendance seriously affects the vitality of the meeting. Meetings are increasingly expensive, but members, through attendance and survey responses, enjoy attending meetings at some of the more expensive locations (i.e., Boston). If we repeat sites on a set rotation as we have for Denver, we can negotiate less expensive rates. An excellent discussion of this problem is given in the article "Annual Meeting Costs—A Perspective" by Donald Davidson and Sue Beggs in the May 1997 issue of *GSA Today*.

GSA needs sites that are attractive to members on a repeated basis (such as every three years). Consider where you would be willing to go to a GSA Annual Meeting every three years, or if a set rotation is not adopted, in which cities you will *not* attend an Annual Meeting. Results from recent surveys indicate that many members favor a Denver, Boston, and

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Seattle rotation. You will be asked these questions on exit surveys at upcoming Annual Meetings.

One goal of the new programming initiatives is to offer a GSA Annual Meeting program that appeals to all geoscientists regardless of the location. The Technical Program Chair (who organizes the meeting program) will not need to be from the local community when the meeting no longer focuses on the regional geology of the meeting site. Field trips would still be offered at the Annual Meeting, but more would be shifted to the Section meetings or to independent GSA-sponsored field conferences.

#### ROLE OF THE WEB

**Abstracts:** This year 62% of abstracts were submitted on the Web. No more need for overnight delivery services! As more abstracts are submitted this way, the abstract deadline will move closer to the meeting, and costs of the abstract volume production will decrease.

**Virtual Joint Technical Program Committee (JTPC):** This year the Annual Meeting program was built on the Web rather than at a JTPC meeting in Boulder. This change to a "virtual JTPC meeting" allowed scheduling of sessions to be more carefully monitored to minimize conflicts between similar sessions in different disci-

plines and to arrange for room proximity for sessions with similar content. It also allowed for better coordination between groups and more efficient exchange of abstracts. Now that the system is developed, better coordinated meetings are possible. In the future, this change will allow an abstract deadline closer to the meeting date and will decrease the costs of the meeting and abstract volume. Thanks go to Mark Duvall and Art Smoot, who were responsible for writing the innovative software allowing scheduling of the entire program on line. They, along with Sue Beggs and John Bartley, Technical Program Chair for Salt Lake, should be commended for achieving an outstanding result in a very short time.

**No-hassle submission of proposals:** Proposals for Keynote or Topical Sessions (and currently Symposia and Theme Sessions) can be submitted on the Web. Electronic submission allows review of proposals by representatives with wider discipline coverage without an earlier submission deadline.

**Information:** The Web allows you access to the Annual Meeting program, abstracts, and general information before hard copies are available.

**New Initiatives** continued on p. 14

New Initiatives continued from p 13

### IMPORTANCE OF GSA DIVISIONS AND ASSOCIATED SOCIETIES

GSA Divisions and Associated Societies play an extremely important role in organizing the Annual Meeting. With the new program initiatives, they will play an even larger role in the decision-making process and in long-range planning of the overall technical program. Active participation by GSA membership in the GSA Divisions and the Associated Societies is the best way to influence programming and to work toward a more dynamic Annual Meeting. We have instituted changes in the JTPC representative structure, however, to give better representation to at-large members of discipline groups not represented by a GSA Division or Associated Society.

### GOALS

The new initiatives and program structure encourage excellence in programming and provide an opportunity for flexible scheduling and creative programming. The new structure fosters all-invited sessions, gives special topic session organizers the ability to ensure a successful, excellent program, and allows all members to contribute papers to sessions with invited speakers. We have implemented

changes that should increase discussion and networking, bring in new fields and areas, encourage interdisciplinary science, minimize scheduling conflicts, and increase the number of people who can present papers at the GSA Annual Meeting. We have also incorporated a broader representation of disciplines in the decision-making process to ensure a diverse, representative program. New initiatives will allow new and important scientific discoveries in a timely manner and the abstract deadline for all abstracts to be moved closer to the meeting. With these program changes, the GSA Annual Meeting should be an increasingly dynamic and stimulating meeting for all GSA and Associated Society members and should appeal to a wider audience.


The Annual Program Committee (Sharon Mosher, Chair; John Bartley, G. Randy Keller, Orrin Pilkey, Jonathan Price, Denis Shaw; and ex officio members Terry Pavlis, John Humphreys, Sue Beggs, and Don Davidson) would like your comments and suggestions on the new initiatives and on other ways to improve the GSA Annual Meeting program. Each individual and group has different needs, and the details of what we have proposed affect everyone differently. We ask for your help in making the impact of these changes positive for all. We look forward

to working with you toward a more stimulating and dynamic Annual Meeting program as GSA enters the next millennium.

Please send your comments to: mosher@mail.utexas.edu or sbeggs@geosociety.org. ■

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### Environmental Geology of Urban Areas

*GEOtext 3*  
Edited by Nicholas Eyles, 1997, 590 pp.

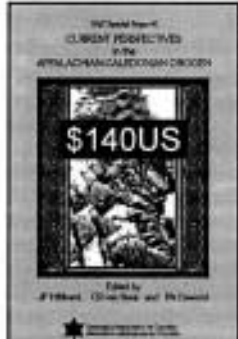


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### Current Perspectives in the Appalachian-Caledonian Orogen

*Special Paper 41*  
Editors JP Hibbard, CR van Staal and PA Cawood, 1996, 428pp.

This extensive volume is a chronicle of the many current ideas on the Appalachian-Caledonian Orogen, and is organized based on the symmetry that was recognized in the Newfoundland Appalachians over thirty years ago by Dr. Harold (Hank) Williams of Memorial University of Newfoundland. This two-sided symmetry is manifested in three elements; the Laurentian margin (platform), the Iapetan Oceanic Realm (mobile belt) and the Gondwanan-related terranes (platform). The geological evolution of these elements forms the focus of the first three sections of this volume. The concluding section brings all of these elements together in considering the timing and nature of Laurentian-Gondwanan interactions.



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----- CELEBRATING FIFTY YEARS -----

## 1997 Honorary Fellows Named

*The four eminent geoscientists named as GSA Honorary Fellows for 1997 are John Allen, Daniel Bernoulli, Umberto Cordani, and Dan McKenzie.*

### John R. L. Allen

John R. L. Allen is known especially for his pioneering work in sediment transport processes. His studies and publications have addressed theory, experiment, and field observations, and he is considered especially adept at applying mathematical approaches to sedimentary processes.

Allen was born in Birmingham, England, in 1932. He earned his doctorate at the University of Sheffield, and then taught at the University of Reading. His early studies of ancient stream deposits in the Old Red Sandstone expanded into multifaceted studies of ripples, dunes, high-velocity plane bedding, turbidity currents, salt marshes, and geochronology.

Allen's many publications include several that are considered classic studies and are still cited and used. His books on the origin and interpretation of sedimentary structures are the standard in the field. He has trained many students, and his research has influenced virtually every field of geology and engineering involving the examination of sediments and sedimentary rocks. He is currently Research Professor for Sedimentology at Reading.



John Allen

### Daniel Bernoulli

Bernoulli's work as a stratigrapher and sedimentologist has had an important impact on the understanding of mountain belt evolution, particularly the stratigraphy of the Alpine fold belt. Bernoulli was one of the leaders in establishing the links between tectonics and sedimentation in rifted continental margins.

Born in Basel, Switzerland, in 1936, Bernoulli completed his doctorate at the University of Basel. After a brief stint as a geologist for Shell Royal Dutch, he taught at Basel for nearly 20 years before becoming the director of the Geological Institute at the ETH in Zurich.

Bernoulli has published numerous articles explaining use of the sedimentary record to interpret complex tectonic histories. He has worked with colleagues in Europe and the United States. His studies of Deep Sea Drilling Project cores led to the recognition that many facies in the Alps can be compared with the sediments of the early Atlantic.

Bernoulli has been termed a "consummate field geologist" whose work has broad application to deciphering the global ancient record.



Daniel Bernoulli

### Umberto G. Cordani

Cordani has focused on applying isotope geochronology to the Brazilian shield. At the beginning of his career, Cordani worked on K-Ar dating of volcanic rocks. Later, his research focused on characterizing the major age provinces of South America through Rb-Sr geochronology. Among his accomplishments is development of ways of applying the Rb-Sr method to the study of shales and related rocks. He has published more than 150 papers on geochronology and tectonics in South America, the Caribbean, and oceanic islands.

Born in Italy in 1938, Cordani became a Brazilian national in 1960 after he graduated from the University of São Paulo. He went on to earn his doctorate from the University of California at Berkeley. His many contributions to the international geological community include a term as president of the International Union of Geological Sciences. A guiding force in geoscience in Brazil, he has served as director of publication for the Brazilian Geological Society and as the chief editor of several journals. He has been a visiting professor at several universities around the world, and he is well known for his participation in a range of activities in the international scientific community. Umberto Cordani serves currently as director of the Institute of Advanced Studies of the University of São Paulo.



Umberto Cordani

### Dan P. McKenzie

In the 1960s, Dan McKenzie began the work on plate motions that would contribute to the formulation of the plate tectonics theory. He was one of the pioneers in the use of plate tectonics to explain the major features of Earth, including the eastern Pacific, the Indian Ocean, the south Atlantic, and the northeast Atlantic. McKenzie assisted in creating a subdiscipline of mantle dynamics, and he was co-author of a paper in which observations of convection beneath the oceanic lithosphere were first described.

Born in 1942 in Cheltenham, England, McKenzie earned his Ph.D. at Cambridge University. He held positions at several institutions in the United States while advancing to professor of earth sciences at Cambridge.

The McKenzie model of the evolution of extensional basins has influenced significantly the study of the thermal history of sedimentary basins. McKenzie is recognized for his numerical model of continental deformation and for his work on deformation in active tectonic systems.



Dan McKenzie



## 1998 John C. Frye Environmental Geology Award

In cooperation with the Association of American State Geologists (AASG), GSA makes an annual award for the best paper on environmental geology published either by GSA or by one of the state geological surveys. The award is a \$1000 cash prize from the endowment income of the GSA Foundation's John C. Frye Memorial Fund.

The 1998 award will be presented at the autumn AASG meeting to be held during the GSA Annual Meeting in Toronto, Canada.

### Criteria for Nomination

Nominations can be made by anyone, on the basis of the following criteria:

(1) paper must be selected from GSA or state geological survey publications, (2) paper must be selected from those published during the preceding three full calendar years, (3) nomination must include a paragraph stating the pertinence of the paper, (4) **nominations must be sent to Executive Director, GSA, P.O. Box 9140, Boulder, CO 80301. Deadline: March 30, 1998.**

### Basis for Selection

Each nominated paper will be judged on the uniqueness or significance as a model of its type of work and report and its overall worthiness for the award. In addition, nominated papers must establish an environmental problem or need, provide substantive information on the basic geology or geologic process pertinent to the problem, relate the geology to the problem or need, suggest solutions or provide appropriate land use recommendations based on the geology, present the information in a manner that is understandable and directly usable by geologists, and address the environmental need or resolve the problem. It is preferred that the paper be directly applicable by informed laypersons (e.g., planners, engineers).

### 1997 Award Recipient Named

The 1997 award, to be presented at the GSA Annual Meeting in Salt Lake City to Michael J. Chrzastowski, Myrna Killey, Robert A. Bauer, Paul B. DuMontelle, Anne L. Erdmann, Beverly Herzog, John M. Masters and Lisa R. Smith is for their report "The Great Flood of 1993," Illinois State Geological Survey Special Report 2. The report is concise and covers a variety of aspects about the relationships between geologic factors and the flood. It is also easy to read and written in terms a nongeologist can understand as well as being nicely illustrated and attractively presented.

Like many of us, I teach a large (up to 200), introductory, geology lecture-course to nonmajors. So I was interested and educated to read, in the August issue of *GSA Today* [v. 7, no. 8, p. 14], how Jonathan Levy, of Miami University, brings a small-class atmosphere and some small-class benefits to his own big courses. Here's an additional device I find effective, to supplement the ones mentioned by Levy.

At each lecture, about 12 students (picked alphabetically) sit in the front row and serve as our "Panel of Experts." They sign in when seated, so I know their names and positions. The Panel's job is to answer questions that arise from me or from the class. This sounds terrifying at first, but all quickly learn I am not out to skewer anyone. In fact I explain right away that wrong answers by Panelists can be quite helpful, because they are likely to represent similar mistaken ideas or approaches in the minds of half the class. Whether or not an answer is wrong, I often ask other Panelists if they agree with the first one. Or I compare a Panelist's answer with a vote by the whole class.

With a wireless microphone available, the Panel becomes doubly useful. This allows me to stroll along the front row, conferring even more individually with Panelists, and perhaps commenting on diagrams they are drawing. Once again, I am talking through one or two students (e.g., two students with conflicting diagrams), to the whole class. Sometimes I hand my laser pointer to a Panelist and have him or her identify features I ask for in a picture on the projection screen. I ask for a bed. They point to a joint. And we all lurch toward understanding.

Win Means  
University at Albany, SUNY  
Albany, NY 12222

### USGS Library

In early April this year, the American Geological Institute (AGI) issued a "fact sheet" detailing a proposed cut of funding for the library of the U.S. Geological Survey (USGS) for book acquisition and for journal subscription. This information received much publicity through an article and an editorial in *Nature* (v. 386, no. 6626, April 17, 1997, p. 631 and 637). According to these sources, the book budget would be reduced from about \$150K to \$78K, and the journal subscription budget would be reduced from about \$815K to \$422K. The journal subscription reduction would translate into 2,240 canceled subscriptions, this on top of the 1,667 cancellations already effected in recent years.

Protests from the user communities both inside and outside of the government, including an eloquent letter from Ed Roy, President of AGI to USGS Director Gordon Eaton, had led the USGS to put the plan on hold. According to Chief Geologist Patrick Leahy, the Policy Council of USGS had decided that "the impact of reductions [should] be kept to a minimal level *this year*" (letter to E-an Zen, May 22, 1997; italics added). For the long term, no commitment was made, but the issue is being debated by a newly formed Library Board.

Recently, a report by the Committee for Appropriations of the U.S. House of Representatives stated that "the Committee is concerned with the viability of the USGS library, which serves many users and purposes, and expects the USGS to maintain in fiscal years 1997 and 1998 funding for the library, (including acquisitions) at no less than the library's fiscal year 1996 level" (p. 47).

While it is nice to see such strong support from the House Appropriations Committee, the reality of the Survey's budget reduction cannot be ignored, and the Survey library likely still faces a rough time ahead. The library, however, is more than just a research and reference library for a government science agency. Its book, journal, and map collections are arguably the best in the world, and they are heavily used by earth scientists and by planners and decision makers who deal with earth-related issues. Its resources are relied upon by university libraries, which are undergoing their own drastic budget reductions, and by the highly successful GeoRef system of AGI to disseminate earth science information quickly through the electronic medium to users the world over.

The USGS library is a national treasure, and all of us, whether affiliated with the USGS or not, have a stake in its strength, health, and continuity.

We invite friends of the USGS library to get together during the 1997 GSA Annual Meeting in Salt Lake City and share ideas to help Director Eaton and Chief Geologist Leahy deal with the long-term issues of the USGS library. For this purpose, we have reserved the Cottonwood Room in the Marriott Hotel, on Tuesday, October 21, between 5:00 and 7:00 pm. We invite you to join us. Come!

John M. Aaron  
Reston, Virginia

William T. Holser  
University of Oregon, Eugene

E-an Zen  
University of Maryland, College Park



Letters continued on p. 17



## The Value to the Country of Geologic Mapping

Although making and using geologic maps is the traditional method by which most geologists approach regional geologic investigations, explaining geologic mapping to the layman has never been easy. In the last 100 years, as most funding for geological research—as for all other sciences—has been taken over by national and state governments, defending this geologic mapping base to the nonscientist has become critical for the survival of an essential element of geologic research. For example, the National Science Foundation no longer funds geologic mapping proposals in research grants. Furthermore, as long-standing members of the USGS, we are fully aware that our managers formerly camouflaged much of our mapping activities under more understandable work elements such as studies of mineral deposits or earthquakes, or of the regional geologic framework, purportedly to make it more palatable to the Congress. About a decade ago, however, geologic mapping was successfully sold as a budget line item on its own merits, as the predecessor to the current National Cooperative Geologic Mapping Program (NCGMP) in the Geologic Divi-

sion. So clearly the argument that Congress cannot understand the value of geologic mapping does not necessarily apply. This breakthrough greatly encouraged field geologists, who do most geologic mapping. Nonetheless, mapping must be argued each year against doubters outside, as well as within, the USGS. The hoped-for renewal of the National Geologic Mapping Act, currently before Congress, is one more hurdle in this ongoing effort.

Few people in the United States are not affected each minute of each day by what geoscientists discover, from the many metal and other rock products that we use to petroleum that supplies energy needs and fibers for our clothes and business and household goods. Sufficient quantities of clean water are a requirement of life, and geologic knowledge helps protect the public from natural geologic and hydrologic hazards and helps mitigate environmental hazards. Thus the geosciences are among the most practical of the sciences, but like all the others have been under increasing criticism for not saying so to the layman taxpayer. Because of this criticism, most geologists now attempt more presentations in the popular media and concentrate even more on the practical aspects of their work. The USGS has joined this surge toward “societal rele-

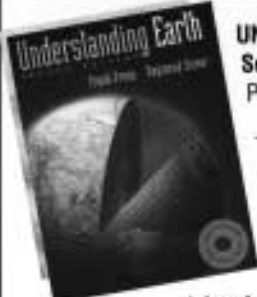
vance.” The three of us, all long-time field geologists, here suggest that, of the many geoscience activities, few are more beneficial to the average U.S. citizen than the production and use of geologic maps.

Two of us (Rowley and Dixon) now manage the Las Vegas Urban Corridor/Nevada Test Site Project of the NCGMP. The project is a \$2.5 million/year effort that uses geologic mapping to address environmental geology issues, especially ground-water problems such as contamination by underground nuclear tests and finding new water resources for the burgeoning population in the arid Southwest. In addition to these activities, we spend about a third of our time engaged in public relations, explaining and demonstrating the usefulness of our project and the NCGMP. We try to educate the layman and potential customers to whom we are promoting geologic mapping, but we also find it necessary to repeatedly defend the program to USGS managers and to congressmen who seem to regard it as an easy target for budget cuts. Just recently, it was suggested that the NCGMP be abolished and geologic mapping be privatized. Yet our experience shows that a “critical mass” of field geologists and their supporting paleontologists, isotopic daters, etc. are

**Letters** continued on p. 18

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## Conferees Tackle Ethics Questions

Heidi A. Horten, South Pass Resources, Scottsdale, AZ 85259

The July 1997 GSA Presidential Conference "Ethics in the Geosciences" explored the complex issue of ethics and its practice (or nonpractice) by geologists. The conference was an eclectic gathering of 69 geoscientists and non-geoscientists representing the professional divisions of academia, industry, government (USGS, National Research Council, state geologists, state regulatory agencies), and two members of the clergy. The nongeoscientists included philosophers, a federal judge, attorneys, an urban-regional planner, and representatives of scientific institutions. GSA and the GSA Foundation, American Association of Petroleum Geologists (AAPG) and the AAPG Division of Professional Affairs, and American Institute of Professional Geologists (AIPG) and the AIPG Foundation sponsored the conference, which was held in Oregon.

During five days of presentations and discussions, the conference participants touched on a broad range of perceived and experienced problems: from ethical issues in academic research and teaching, certification, and registrations, to conflicting ethical systems and the issues of teaching and fostering ethical behavior. The crux of these issues for geoscientists: there is more to our profession than scientific knowledge and skills. Individual integrity is not enough; to be truly ethical, one must have personal integrity as well as an ongoing awareness and insight into the

ethical problems existing throughout the geoscience profession. Awareness and insights do not come naturally but through reading and reflection on ethical issues, discussion with peers, and practice (including mentoring of the young on the nature of ethical behavior). In other words, geoscientists must become alert to, and active in, the subject of ethics in order for the practice of geology to be truly ethical. Pride in being a geoscientist generates the moral courage to foster, uphold, and protect the credibility and reputation of the profession.

Having reached this understanding and the realization that there was so much to explore, comprehend, and act upon, the attendees wanted to provide the most appropriate launch pad for further efforts in the promotion of ethical behavior among geologists. The decision was to define the core values for the profession—to verbalize those particular goals and ideals that most geologists hold dear (but that are distinct from the requirements and duties of the profession). The values were compiled during the final hours of the conference. In addition, the group decided on the following immediate courses of action:

1. Identification of a sponsoring organization, possibly the American Geological Institute, through which guidelines for ethical behavior—based on the core values—would be developed and presented to the total geoscience community.

2. Writing of articles and reports for immediate publication. Identified products include a report to the National Science Foundation, case studies provided by conference participants and compiled and published by AAPG, articles by individual attendees on issues raised at the conference, and summary articles published in the various geoscience society newsletters and publications.

3. Other short-term actions by individual participants include development of materials on ethical issues for use in the college classroom; establishment of a Web site for posting of case histories and commentaries; letters of recommendation to USGS leadership to urge continual, formal discussions and inclusion of ethics in the USGS handbook; regular discussions on ethics in society newsletters; presentations on ethical issues at societal annual and sectional meetings; lunch seminars at places of employment; presentation of conference material at the Sigma Gamma Epsilon September 1997 meeting; and presentation of conference results to the European Federation of Geologists.

An extensive review of the conference discussions, findings, and results and a list of core values will be published in the November 1997 issue of *Geotimes*. If you have questions or want more information, contact Dave Stephenson, principal convener, at (602) 948-7171 or sprigeo@aol.com.



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needed if we are to define the framework of an area. Abolishing geologic mapping as a specifically funded national program would relegate field geologists to a subsidiary, noncontributory role peripheral to other programs. Currently only State geological surveys and the USGS supply personnel dedicated to the profession of making geologic quadrangle maps at various scales. Such field geologists are a pool of desperately needed talent that should be treasured and enhanced, not discarded.

Well over half of the funding for the Las Vegas Urban Corridor/Nevada Test Site Project comes from cooperators outside the USGS, and for this and other reasons the project teaches several lessons about doing geology in the real world. The first lesson is that the products that outside cooperators and other customers want the

most are 1:24,000-scale digital geologic quadrangle maps and geophysical maps. This fact certainly helps validate the societal usefulness of these maps, which are used to identify the subsurface structural framework of ground-water flow paths, and in conjunction with stratigraphic studies and in cooperation with colleagues of the Water Resources Division of the USGS and of outside agencies, allows the development of ground-water flow models, identification of flow paths, and finding places to drill for water resources or monitoring wells. Mapping of Quaternary deposits also is valuable because it identifies gravel resources, and seismic and flood hazards, and provides climate-change and other geologic contexts to human habitation in an area. Another popular project emphasis, using both cooperator and USGS funds, consists of digital geologic mapping at mostly 1:100,000 scale to

understand the regional geologic framework of the area. This scale of mapping allows the early recognition of current and future geologic hazards and provides geologic information to the public and to land planners.

Other lessons concern the benefits of cooperation and the importance of publications. Geologic mapping is most useful when tied closely to ongoing studies by the Water Resources Division, State geological surveys, universities, local municipalities, and nearby national and state parks, because these groups know the local problems and provide expertise on their solution. Working cooperatively with outside funding agencies is especially important in urban areas because it involves us directly in the most critical local issues, and only by funding us directly will an



**Letters** continued on p. 19

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outside agency fully use our work; we provide essential framework data that they directly apply to solving problems. This collaboration requires us to do practical products on time. High productivity in publications also is a requirement for maintaining outside funding. All work, whether or not funded by outside cooperators, is of publication-quality science because we are too busy to accept trivial chores, and outside cooperators demand objective science of the highest quality.

Experience shows that geologic mapping is the catalyst for good geologic science and provides the primary database of the geologic profession. Mapping is not a peripheral part of geology, but instead it is its foundation. Mapping provides the basis for the entire geologic framework of an area or a continent, and thus it opens up the applications of all other fields to understand this framework. Mapping is the basis for stratigraphy and, because one cannot understand the structure without the stratigraphy (and vice versa), it is the basis for structural geology. Detractors have minimized geologic mapping by suggesting that it deals only with spatial relationships of rocks, and they thus imply that it is a routine task that can be done by unthinking and unimaginative persons. Yet those of us who practice this art as our

profession maintain strongly that our best thinking is done in the field, where geologic contacts and structures are best considered with respect to each other. All major scientific and economic discoveries in upper crustal rocks depend upon geologic field relations, and only when these relations are accurately (and imaginatively) determined can these discoveries be made. Adequate geologic interpretations and ideas are related to map scale, and thus mapping the same area at different scales and by new generations of geologists often leads to new concepts and different results, a fact that few laymen can understand. Can valuable geologic maps be made by inexperienced geologists? That question was answered by the late USGS geologist Jack Harrison, who differentiated inexperienced "field mappers" at one end of a spectrum from grizzled or talented "field geologists" at the opposite end. The former can make geologic maps that may be minimally useful, but the latter bring an understanding of geologic processes, the recognition of questions to ask, and creative insights that result in new ideas and solutions to old problems, both scientific and societal. The contrast between routine (mapper quality) and scientific (field-geologist quality) geologic mapping is dramatic and revealing: only the scientific-quality work provides adequate bases for multidisciplinary follow-up investigations. The

field geologist enlists and guides other specialists, including geophysicists, hydrologists, petrologists, and others. Historically, an outstanding field geologist has always been among the world's wisest and best geologists. Analysis of geologic hazards, mineral resources, GIS databases, and changes in Earth's surface rely on information derived from the regional geologic framework. But importantly, the field geologist's knowledge and skill are required bases for interpreting this framework, and other specialists depend not only on his or her maps but on his or her interpretations. In other words, geologic mapping by a skilled scientist whose laboratory is in the field is the basis for broad interdisciplinary studies of the crust. Because mapping bears on almost all disciplines and geologic problems, its strength—like geology in general—is that it is multipurpose in its intent and multipurpose in its value. Without geologic mapping, geology could not continue to evolve to meet the country's ever-changing needs.

*Peter D. Rowley  
Gary L. Dixon  
U.S. Geological Survey  
Las Vegas, NV 89119*

*Thomas A. Steven  
U.S. Geological Survey (retired)  
Denver, CO 80227 ■*

# GSA Divisions and Sections Award Grants for 1997

June Forstrom, GSA Grants Administrator

## DIVISION RESEARCH GRANTS

Nine of the 12 GSA divisions offer grants for outstanding student research within the fields of the respective divisions. Recipients of these grants for 1997 are listed below. The three divisions that do not currently offer any awards to students are Geoscience Education, History of Geology, and International.

### Archaeological Geology Division

The Archaeological Geology Division awarded two grants this year. A student travel grant was awarded to Elizabeth Miksa, University of Arizona, for her paper "Pinal Schist as a Temper Source for Hohokam Plainware Pottery," which will be presented in the division's technical session at the GSA Annual Meeting in Salt Lake City.

This year the division made the first presentation of the Claude C. Albritton, Jr., Memorial Student Research Award to Jason A. Rech, University of Arizona, for his paper "The Reconstruction of Pleistocene/Holocene Environments in the Northern Gobi Desert, Mongolia." The Claude C. Albritton, Jr. Memorial Fund was established at the GSA Foundation in 1991 with contributions from the family and friends of Claude Albritton. The division continues to seek contributions to the fund in memory of Claude Albritton to provide scholarships for graduate students in the earth sciences and archaeology.

### Coal Geology Division

The Coal Geology Division presented the annual Antoinette Lierman Medlin Research Award to Raphael Wuest, University of British Columbia, for his proposal "Onset of Organic-Rich Sediment Accumulation and Peat Evolution in a Modern Intermontane Freshwater Mire in the Tropical Environment of Tasik Bera, West Malaysia: Implication for Coal Formation." The Medlin Field Award was presented to Sarah Vessey, University of British Columbia, for her proposal "Relationships Between Coal Quality, Sedimentology, and Stratigraphy within the Jurassic-Cretaceous Mist Mountain Formation at Line Creek, Southeastern British Columbia, Canada."

### Engineering Geology Division

The student research grant awarded by the Engineering Geology Division for an outstanding research proposal in 1997 was presented to Karen L. Boven, University of Michigan, for her project "Stable Isotope Systematics of the Municipal

Waste Landfills: Landfill Dynamics and Groundwater Contamination."

### Geophysics Division

The Geophysics Division presented the Allan V. Cox Student Research Award this year for an outstanding student research proposal submitted to the GSA Research Grants Program to Monika Cogoini, University of Oklahoma, for her project, "Testing for a Connection Between Magnetic Susceptibility Variations and Paleoclimatic Changes in Upper Paleozoic Strata."

### Hydrogeology Division

Awards for outstanding student research from the Hydrogeology Division were presented this year to four students: Jenney M. Hall, University of Kansas, for "Nitrate Transport at the Geohydrologic Experimental and Monitoring Site (GEMS), Douglas County, Kansas"; Eung-Seok Lee, Indiana University, for "Hydrochemical and Isotopic Study at Major Karst Springs in South-Central Indiana, U.S.A."; Anthony J. Rossman, Miami University, for "Determining the Significance of the Autochthonous (Indigenous) Microbial Community in the Transport of Allochthonous (Invasive) Bacteria"; and Georgios P. Tsoulias, University of Texas, Austin, for "Use of Ground-Penetrating Radar for the Characterization of Fractures in Geologic Formations and Their Contribution to Fluid Flow."

### Planetary Geology Division

The Planetary Geology Division presents the Stephen E. Dwornik Best Student Paper Awards annually to students who are U.S. citizens and are pursuing advanced degrees in planetary sciences. The awards are presented each year for papers given in March at the Lunar and Planetary Science Conference. Recipients of the 1997 awards are Dante Lauretta of Washington University, for the best oral presentation, for his paper "The Origin of Ni-bearing Sulfides in CI Carbonaceous Chondrites," and Jannette Akridge of the University of Arkansas, for the best poster presentation, for "Fusion Crust and the Measurement of Surface Ages of Antarctic Ordinary Chondrites." Recipients of the awards are presented with a citation and a \$500 cash prize in an awards ceremony held at NASA Headquarters in Washington, D.C., early in the summer.

### Quaternary Geology and Geomorphology Division

The Quaternary Geology and Geomorphology Division awarded the J.

Hoover Mackin Grant to Joel L. Pederson, University of New Mexico, for "Variable Hillslope Processes and Sediment Delivery to Tectonically Quiescent Basins: A Late Miocene to Quaternary Record of Buried, Relict, and Modern Hillslopes and Their Deposits." Two Arthur D. Howard Research Grants were awarded this year. Recipients are Jason P. Briner, Utah State University, for "Pleistocene Glacial Chronology of the Southwestern Ahklun Mountains, Alaska," and Daniel John Koning, University of New Mexico, for "Fault Segmentation and Tectonic Geomorphology of the Alamo Gordo Fault, New Mexico."

### Sedimentary Geology Division

The Sedimentary Geology Division presented its 1997 award for an outstanding student research proposal to Steven L. Goodbred, Jr., College of William and Mary, for his project "Late Holocene Development of the Ganges-Brahmaputra Delta: The Role of Floodplain and Delta Plain Sequestration of River Sediments."

### Structural Geology and Tectonics Division

The Structural Geology and Tectonics Division presented its twelfth annual awards for outstanding student research this year to Jeffrey C. Evans, Utah State University, for "Structural and Tectonic Evolution of the Syn-rift Salt Lake Formation (Miocene), Northeastern Basin and Range," and Paul Kapp, University of California, Los Angeles, for "Structural Evolution of the Fenghuo Shan, Northern Tibet, and Its Implications for the Formation of the Tibetan Plateau."

## SECTION RESEARCH GRANTS

Four of the six GSA regional sections award grants for research to students attending colleges and universities within each section's respective geographical boundaries; the Cordilleran and Rocky Mountain Sections do not currently offer student research grants. Grants awarded in 1997 by the sections are listed below.

### North-Central Section

The North-Central Section awards grants for undergraduate research projects to students who attend a college or university within the North-Central Section geographic area. Research proposals are submitted and evaluated competitively. Recipients for 1997 are: Thomas P. Becker, Case Western Reserve University; Jacob Benner, Cornell College; Beth Fisher, University of Wisconsin-Eau Claire; Carrie

Lee, Miami University; Matthew Schrenk, University of Wisconsin–Madison; Nathaniel S. Wanner, Ohio University; and Jennifer R. Wingate, Wright State University.

### South-Central Section

The South-Central Section awarded grants to two undergraduate students: Candice Carrell, Baylor University, for “Water Quality of Three North Jamaican Rivers and their Impact on Coral Reef Health,” and Craig Whitted, also of Baylor University, for “Riit Reinforcement and Stream Embankment Stability in Cohesive Materials: A Case Study of a 12,000 Foot Reach of Mill Creek.”

The section also awarded research grants this year to four graduate students: Danielle L. Carpenter, University of Texas, Austin, for “Geologic History of the Chiquero Formation, Southern Peru: Implications for Neoproterozoic–Early Paleozoic Geography and Environment”; Shubab D. Khan, University of Texas, Dallas, for “Geochemistry and Tectonic Setting of Chalt and Shamran Volcanics, Northern Pakistan”; Staci Loewy, University of Texas, Austin, for “Tectonic Evolution of a Proterozoic Terrane, Arequipa-Antofalla Massif: A Test of the ‘SWEAT’ Hypothesis”; and Emmet McGuire, Fort Hayes State University, for “Structure of the San Rafael Swell (Southern) Emery County, Utah.”

### Northeastern Section

The Northeastern Section awarded grants to nine undergraduate students: Riley Brown, University of Maine–Orono; Norman S. Buchanan, Castleton State College; Jason Douglass Godbout, University of New Brunswick; Jason Alan James, Acadia University; Sarah E. Kopczyński, Colby College; Barnas G. Monteith, Tufts University; Michael Munzing, Salem State College; Geoffrey Pignotta, University of Ottawa; and Laura Place, University of Pittsburgh, Johnstown.

### Southeastern Section

GSA's Southeastern Section awarded research grants to seven graduate students and one undergraduate student this year. Lynda Bolton, an undergraduate student at the University of South Carolina—Aiken, received a grant for her project “Mesoscopic Brittle Structures, Worcester Basin (England) Border Fault.” The seven graduate student awardees are: Andrey Bekker, Virginia Polytechnic Institute, for “A Combined Sedimentological and Geochemical Analysis of the Nash Fork Formation, Medicine Bow Mountains, WY: Evidence for a Rise of Oxygen in the Paleoproterozoic Atmosphere”; Rebekah J. Chace, University of Alabama, for “Garnet Sm–Nd Thermochronologic Studies in the North Cascades, Washington State”; Robert Alan Drake, Auburn University, for “Analysis of Natural Fractures in the Early

Tertiary Wasatch Formation, Piceance Creek Basin, Western Colorado”; Sunil Mehta, University of Kentucky, for “Investigation of the Source of Regional Salinization of the Ogallala Aquifer, Southern High Plains, Texas”; Kelly Kathleen Rose, Virginia Polytechnic Institute, for “Deformation Mechanisms and Resultant Strains in Folded Quartz Sandstones, A Field and Laboratory Based Study, Southern Appalachians”; Greg L. Rudolph, East

Carolina University, for “Holocene Evolution of Pamlico Sound and Pea Island, North Carolina: Valley Infill Sequences in Response to Glacio-Eustatic Sea-Level Fluctuations”; and Alan Spraggins, University of Tennessee, for “Investigation of Deformation Intensity in the Appalachian Plateau to Detect Southern Alleghanian Blind Thrusting and Structural Continuity Through an Orocline.” ■

## 1998 RESEARCH GRANTS PROGRAM FOR STUDENTS



**T**he primary role of the Research Grants Program is to provide partial support for research in earth science by graduate students at universities in the United States, Canada, Mexico, and Central America. GSA strongly encourages women, minorities, and persons with disabilities to participate fully in this grants program. Eligibility is not restricted to GSA members. New application forms are available each fall in the geology departments of colleges and universities offering graduate degrees in earth sciences. Forms are mailed to GSA Campus Representatives, department secretaries, and chairpersons in the United States, Canada, and Mexico. They are also available upon request from the Research Grants Administrator, Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301. *Please use only the current 1998 application and appraisal forms.*

Confidential evaluations from two faculty members are required from candidates for the M.S. or Ph.D. degree and must accompany applications submitted. PLEASE USE THE “APPRAISAL OF APPLICANT” FORMS, WHICH ACCOMPANY THE 1998 APPLICATION FORMS. Application forms will not be accepted by facsimile or E-mail.

The Geological Society of America awarded over \$300,000 in grants in 1997. The grants went to 188 students doing research for advanced degrees. The average amount awarded was \$1616. The largest grant was \$2500, but there is no predetermined maximum amount. Funding for this program is provided by a number of sources, including GSA's Penrose and Pardee endowments, the National Science Foundation, industry, individual GSA members through the GEOSTAR and Research Grants funds, and numerous dedicated research funds that have been endowed at the GSA Foundation by members and families.

The Committee on Research Grants will meet in March to evaluate applications and award grants. In April, all applicants for grants will be informed of the committee's actions by the Executive Director of the Geological Society of America.

**ALL APPLICATIONS MUST BE SUBMITTED ON THE 1998 FORMS  
AND POSTMARKED BY FEBRUARY 1, 1998**

*Please note the new, earlier deadline date which begins in 1998.*

## **GSA Penrose Medal, Day Medal, and Honorary Fellows**

### **Penrose Medal**



The Penrose Medal was established in 1927 by R. A. F. Penrose, Jr., to be awarded in recognition of eminent research in pure geology, for outstanding original contributions or achievements that mark a major advance in the science of geology. The award is made only at the discretion of the Council. Nominees are selected by the Council

and may or may not be members of the Society. Penrose's sole objective in making the gift was to encourage original work in purely scientific geology, which is interpreted as applying to all scientific disciplines represented by the Society. Scientific achievements should be considered rather than contributions in teaching, administration, or service. Mid-career scientists who have already made exceptional contributions should be given full consideration for the award.

### **Day Medal**



The Day Medal was established in 1948 by Arthur L. Day to be awarded annually, or less frequently, at the discretion of the Council, for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. Day's intent was to recognize out-

standing achievement and inspire further effort, rather than reward a distinguished career. Scientific achievements should be considered rather than contributions in teaching, administration, and service.

### **Honorary Fellows**

Geologists who have distinguished themselves in geological investigations or in notable service to the Society may be elected as Honorary Fellows. In practice, nearly all candidates are non-North Americans who live and work outside of North America. The most noteworthy exceptions were astronauts. Most Honorary Fellows have been elected after many years of outstanding and internationally recognized contributions to the science. The program was established by the GSA Council in 1909, and since then, except during a few war years, one or more Honorary Fellows have been elected annually. The Council of the Society encourages the membership to submit names of qualified candidates for this honor. In preparing a nomination, it is imperative that the original research and scientific advances of the candidate be stressed. All supporting data, especially degrees received, publications, positions, etc., should also be verified by the nominator.

### **How to Nominate**

To ensure thorough consideration by the respective committees, please submit for each candidate a brief biographical sketch, such as used in *American Men and Women of Science* and *Who's Who in America*, a summary of the candidate's scientific contributions to geology that qualify the individual for the award, and a selected bibliography of no more than 20 titles.

A nomination for any one of these three awards *must be supported* by signed letters from each of five (5) GSA Fellows or Members in addition to the person making the nomination. The letters may be attached to the nomination form or may be sent to the Executive Director separately. For Honorary Fellow nominations, please verify degrees received, publications, positions held, etc. The names of unsuccessful candidates proposed to the Council by the respective committees will remain for consideration by those committees for three years. For those still under consideration, it is recommended that an updated letter of renomination be sent to the Executive Director.

The nomination form (p. 23) is also available on the GSA Web site at <http://www.geosociety.org>, in the Administration Section. The **deadline** for receipt of nominations at the office of the Executive Director is **February 2, 1998**. ■

## **About the Honorary Fellow Program**

On page 23 you will find a form to be used in nominating candidates for Honorary Fellowship in the Geological Society of America. Each year this honor is bestowed on non-North Americans who live and work outside of North America and have distinguished themselves in geological investigations or in notable service to the Society. Under exceptional circumstances, North Americans have been named Honorary Fellows. This amendment to the bylaws was made in 1969 when the Apollo II astronauts who first walked on the moon were elected.

The program was established by the GSA Council in 1909, and since then, except during a few war years, one or more Honorary Fellows have been elected annually. Most

Honorary Fellows have been elected after many years of outstanding and internationally recognized contributions to the science. At present there are 62 living geologists who have received this honor.

The Council of the Society encourages the membership to submit names of qualified candidates for this honor. In preparing a nomination, it is imperative that the original research and scientific advances of the candidate be stressed. All supporting data, especially degrees received, publications, positions, etc., should also be verified by the nominator. Use the form on page 23 for nominating a candidate for Honorary Fellowship.

# THE GEOLOGICAL SOCIETY OF AMERICA

## Nomination for Penrose Medal, Day Medal, or Honorary Fellowship

(please circle one)

NAME OF CANDIDATE: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

Telephone: \_\_\_\_\_

REQUIRED INFORMATION (Please attach)

### BIOGRAPHICAL INFORMATION

Suggested sources: *American Men and Women of Science, Who's Who in America*  
GSA Service Record (obtainable from headquarters)  
Other

### SUMMARY OF SCIENTIFIC CONTRIBUTIONS TO GEOLOGY

Not more than 200 words.

### SELECTED BIBLIOGRAPHY

No more than 20 titles.

### LETTERS OF SUPPORT

Nominations for any one of these three awards **MUST BE SUPPORTED** by signed letters from five (5) GSA Fellows or Members in addition to the person making the nomination. The letters may be attached to this nomination form or may be sent to the Executive Director separately. Supporting letters must discuss the original research and scientific advances of the candidates. Please also verify all other supporting data.

Name of person making the nomination: \_\_\_\_\_ Phone: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

Letters of support will be submitted by:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

RETURN TO: GSA Executive Director, P.O. Box 9140, Boulder, CO 80301, Phone: (303) 447-2020

DEADLINE: Completed nominations must be received by **February 2, 1998**. To be considered, nomination materials must meet the above criteria. Reprints or articles will not be accepted.

## Call for Nominations

# Young Scientist Award (Donath Medal)

The Young Scientist Award was established in 1988 to be awarded to a young scientist (35 or younger during the year in which the award is to be presented) for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences. The award, consisting of a gold medal called the Donath Medal,

and a cash prize of \$15,000 was endowed by Dr. and Mrs. Fred A. Donath.

*For the year 1998, only those candidates born on or after January 1, 1963, are eligible for consideration.* In choosing candidates for the Young Scientist Award, scientific achievement and age will be the sole criteria. Nominations for the 1998 award must include:

- biographical information,
- a summary of the candidate's scientific contributions to geology (200 words or less),
- a selected bibliography (no more than 10 titles),
- supporting letters from five scientists in addition to the person making the nomination.

The nomination form (p. 25) is also available at our Web site at <http://www.geosociety.org>, in the Administration Section. Nominations for the 1998 Young Scientist Award must be received at GSA headquarters by *February 2, 1998*. ■

## GSA Medalists and Honorary Fellows

### Richard A. F. Penrose, Jr., Medalists

1927 Thomas Chrowder Chamberlin	1941 Norman Levi Bowen	1956 Arthur Holmes	1971 Marshall Kay	1986 Laurence L. Sloss
1928 Jakob Johannes Sederholm	1942 Charles Kenneth Leith	1957 Bruno Sander	1972 Wilmot H. Bradley	1987 Marland P. Billings
1929 <i>No award given</i>	1943 <i>No award given</i>	1958 James Gilluly	1973 M. King Hubbert	1988 Robert S. Dietz
1930 Francois Alfred Antoine Lacroix	1944 Bailey Willis	1959 Adolf Knopf	1974 William Maurice Ewing	1989 Warren Bell Hamilton
1931 William Morris Davis	1945 Felix Andries Vening-Meinesz	1960 Walter Herman Bucher	1975 Francis J. Pettijohn	1990 Norman D. Newell
1932 Edward Oscar Ulrich	1946 T. Wayland Vaughan	1961 Philip Henry Kuenen	1976 Preston Cloud	1991 William R. Dickinson
1933 Waldemar Lindgren	1947 Arthur Louis Day	1962 Alfred Sherwood Romer	1977 Robert P. Sharp	1992 John Frederick Dewey
1934 Charles Schuchert	1948 Hans Cloos	1963 William Walden Rubey	1978 Robert M. Garrels	1993 Alfred G. Fischer
1935 Reginald Aldworth Daly	1949 Wendell P. Woodring	1964 Donnel Foster Hewett	1979 J Harlen Bretz	1994 Luna B. Leopold
1936 Arthur Philemon Coleman	1950 Morley Evans Wilson	1965 Philip Burke King	1980 Hollis D. Hedberg	1995 John C. Crowell
1937 <i>No award given</i>	1951 Pentti Eskola	1966 Harry H. Hess	1981 John Rodgers	1996 John Robert Lawrence Allen
1938 Andrew Cowper Lawson	1952 George Gaylord Simpson	1967 Herbert Harold Read	1982 Aaron C. Waters	1997 John D. Bredehoeft
1939 William Berryman Scott	1953 Esper S. Larsen, Jr.	1968 J. Tuzo Wilson	1983 G. Arthur Cooper	
1940 Nelson Horatio Darton	1954 Arthur Francis Buddington	1969 Francis Birch	1984 Donald E. White	
	1955 Maurice Gignoux	1970 Ralph Alger Bagnold	1985 Rudolf Trümpy	

### Arthur L. Day Medalists

1948 George W. Morey	1958 John Verhoogen	1968 Frederick J. Vine	1978 Samuel Epstein	1988 Claude J. Allègre
1949 William Maurice Ewing	1959 Sir Edward C. Bullard	1969 Harold C. Urey	1979 Walter M. Elsasser	1989 Dan McKenzie
1950 Francis Birch	1960 Konrad B. Krauskopf	1970 Gerald J. Wasserburg	1980 Henry G. Thode	1990 William S. Fyfe
1951 Martin J. Buerger	1961 Willard F. Libby	1971 Hans P. Eugster	1981 Donald L. Turcotte	1991 Ian Carmichael
1952 Sterling Hendricks	1962 Hatten Schuyler Yoder	1972 Frank Press	1982 Eugene M. Shoemaker	1992 Susan Werner Kieffer
1953 John F. Schairer	1963 Keith Edward Bullen	1973 David T. Griggs	1983 Harmon Craig	1993 Hugh P. Taylor, Jr.
1954 Marion King Hubbert	1964 James Burleigh Thompson, Jr.	1974 A. E. Ringwood	1984 Wallace S. Broecker	1994 David Walker
1955 Earl Ingerson	1965 Walter H. Munk	1975 Allan Cox	1985 Freeman Gilbert	1995 Thomas J. Ahrens
1956 Alfred O. C. Nier	1966 Robert M. Garrels	1976 Hans Ramberg	1986 E-an Zen	1996 Robert A. Berner
1957 Hugo Benioff	1967 O. Frank Tuttle	1977 Akiho Miyashiro	1987 Don L. Anderson	1997 Edward Irving

### Young Scientist Award (Donath Medalists)

1989 Mark Cloos	1991 Brian Philip Wernicke	1993 Michael Gurnis	1995 Ward Earl Sanford	1997 Edouard G. Bard
1990 Leigh Handy Royden	1992 John Peter Grotzinger	1994 An Yin	1996 Paul R. Bierman	

### Honorary Fellows

Edwin "Buzz" Aldrin	Umberto G. Cordani	Valdar Jaanusson	Desmond A. Pretorius	Ali Mehmet Celal Şengör
John R. L. Allen	Bruno d'Argenio	Emilie Jäger	B. P. Radhakrishna	Boris Sergeevich Sokolov
Neil Armstrong	Gabriel Dengo	Ihsan Ketin	Hans Ramberg	Richard L. Stanton
Jean A. Aubouin	Kingsley C. Dunham	Teiichi Kobayashi	Victor A. Ramos	Rashid A. Khan Tahirkheli
Daniel Bernoulli	Stanislaw Dzulynski	Hans Laubscher	John G. Ramsay	Paul Tapponnier
Krzysztof Ludwik Birkenmajer	François Ellenberger	Henno Martin	Alfred Rittmann	Bernard P. Tissot
Alfonso Bosellini	Hans Füchtbauer	Dan P. McKenzie	Alexander B. Ronov	Livio Trevisan
George Malcolm Brown	William S. Fyfe	Michael W. McElhinny	Rupert W. R. Rutland	Rudolf Trümpy
S. Warren Carey	Augusto Gansser	German K. Müller	Kristján Sæmundsson	Guangzhi Tu
Maria Bianca Cita	David Headley Green	Mervyn Silas Paterson	Rushdi Said	Harry B. Whittington
Michael Collins	Francisco Hervé	Leo Y. Picard	Hitoshi Sakai	Alwyn Williams
William Compston	Dorothy Hill	Wallace S. Pitcher	Mircea Sandulescu	Yang Zun-yi
Douglas Saxon Coombs	Ferenc Horvath	Jean Piveteau	Harrison Hagan Schmitt	
P. G. Cooray	Kenneth J. Hsü	Isabella Premoli-Silva	Eugen Seibold	



# THE GEOLOGICAL SOCIETY OF AMERICA

## Nomination for 1998 Young Scientist Award (Donath Medal)

NAME OF CANDIDATE: \_\_\_\_\_ Date of birth: \_\_\_\_\_  
*For the year 1998, only those candidates born on or after January 1, 1963, are eligible for consideration.*

ADDRESS: \_\_\_\_\_

REQUIRED INFORMATION (Please attach)

### BIOGRAPHICAL INFORMATION

Provide in a format similar to that found in *American Men and Women of Science, Who's Who in America*.

### SUMMARY OF SCIENTIFIC CONTRIBUTIONS TO GEOLOGY

Not more than 200 words.

### SELECTED BIBLIOGRAPHY

No more than 10 titles.

### LETTERS OF SUPPORT

Nominations for the Donath Medal **MUST BE SUPPORTED** by signed letters from five (5) scientists in addition to the person making the nomination. The letters may be attached to this nomination form or may be sent to the Executive Director separately.

Name of person making the nomination: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

Letters of support will be submitted by:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

RETURN TO: GSA Executive Director  
P.O. Box 9140  
Boulder, CO 80301  
Phone: (303) 447-2020

DEADLINE: Completed nominations must be received by **February 2, 1998**. To be considered, nomination materials must meet the above criteria. Reprints or articles will not be accepted.

## Call for Nominations for 1998 GSA Distinguished Service Award

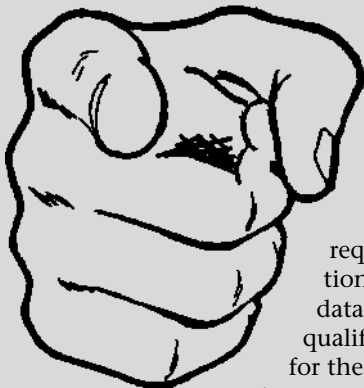
The GSA Distinguished Service Award was established by Council in 1988 to recognize individuals for their exceptional service to the Society. GSA Members, Fellows, Associates, or, in exceptional circumstances, GSA employees may be nominated for consideration. Any GSA member or employee may make a nomination for the award. Awardees will be selected by the Executive Committee, and all selections must be ratified by the Council. Awards may be made annually, or less frequently, at the discretion of Council. This award will be presented during the Annual Meeting of the Society. Letters of nomination and any supporting information should be addressed to Executive Director, GSA, P.O. Box 9140, Boulder, CO 80301.

**Deadline for nominations for 1998 is March 2, 1998.**

Recipients to date:

- 1988..... *Campbell Craddock, Robert D. Hatcher, Jr.  
Eldridge M. Moores, William A. Thomas*
- 1990..... *William B. Heroy, Jr.*
- 1991..... *Dorothy M. Palmer*
- 1992..... *A. R. (Pete) Palmer*
- 1993..... *Michel T. Halbouty*
- 1994..... *F. Michael Wahl*
- 1995..... *John E. Costa, Henry T. Mullins,  
Arthur G. Sylvester*
- 1996..... *David M. Fountain, Royann (Gardner) Cygan  
Louis C. Pakiser, Jr., Anthony Reso*
- 1997 ..... *Robert L. Fuchs, Richard A. Hoppin  
Faith E. Rogers, Bennie W. Troxel*

## YOU Can Help Direct GSA's Future



The GSA Committee on Nominations requests your help in compiling a list of GSA members qualified for service as officers and councilors of the Society. The committee requests that each nomination be accompanied by basic data and a description of the qualifications of the individual for the position recommended (vice president, treasurer, councilor).

Nominations for 1999 officers and councilors must be received at GSA headquarters no later than **FEBRUARY 18, 1998.**

Please send nominations and back-up material to Administrative Department, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

## Call For Nominations — National Awards for 2000

(Deadline: April 30, 1998)

Nominations for the national awards described below are being solicited for 2000. Each year GSA members have been invited to participate by recommending possible candidates.

Those who wish to make nominations are urged to do so by sending background information and vitae, and specifying the award for which the candidate is being submitted by April 30, 1998, to the GSA External Awards Committee, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020, fax 303-447-1133. The nomination process is coordinated by AGI on behalf of its member societies, and a roster of candidates will be finalized by the AGI Member Society Council at its spring 1999 meeting for nomination to the respective offices sponsoring the national awards.

### WILLIAM T. PECORA AWARD

The Pecora Award, sponsored jointly by NASA and the Department of the Interior, is presented annually in recognition of outstanding contributions of individuals or groups toward the understanding of Earth by means of remote sensing.

The award recognizes contributions of those in the scientific and technical community as well as those involved in the practical application of remote sensing. Consideration will be given to sustained or single contributions of major importance to the art or science of the understanding of Earth through observations made from space.

### NATIONAL MEDAL OF SCIENCE

The medal is awarded by the President to individuals "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, engineering, or social and behavioral sciences."

There are now many younger American scientists and engineers who may be reaching a point where their contributions are worthy of recognition. The committee is giving increasing attention to these individuals as well as to those outstanding women and minority scientists who deserve recognition.

### VANNEVAR BUSH AWARD

The Vannevar Bush Award is presented from time to time to a person who, through public service activities in science and technology, has made an outstanding contribution toward the welfare of mankind and the nation.

The award is given to a senior statesman of science and technology and complements the NSF's Alan T. Waterman Award, which is given to a promising young scientist. The two awards are designed to encourage individuals to seek the highest levels of achievement in science, engineering, and service to humanity.

The nomination should be accompanied by a complete biography and a brief citation summarizing the nominee's scientific or technological contributions to our national welfare in promotion of the progress of science.

### ALAN T. WATERMAN AWARD

The Waterman Award is presented annually by the NSF and National Science Board to an outstanding young researcher in any field of science or engineering supported by NSF.

Candidates must be U.S. citizens or permanent residents and must be 35 years of age or younger, OR not more than five years beyond receipt of the Ph.D. degree by December 31 of the year in which nominated.

Candidates should have completed sufficient scientific or engineering research to have demonstrated, through personal accomplishments, outstanding capability, and exceptional promise for significant future achievement.

Remember: Background information and vitae of nominated candidates should be sent by April 30, 1998, to the GSA External Awards Committee, P.O. Box 9140, Boulder, CO 80301. ■

## SOUTHEASTERN SECTION, GSA 47th Annual Meeting

Charleston, West Virginia  
March 30–31, 1998

The 1998 meeting of the Southeastern Section of the Geological Society of America in Charleston, West Virginia, will be hosted by the West Virginia Geological and Economic Survey.

### CALL FOR PAPERS

Papers are invited for presentation in oral technical sessions, symposia, theme sessions, and poster sessions. Although papers dealing with all aspects of the southeastern or Appalachian regions of the United States are especially encouraged, papers dealing with other regions are also welcome. Abstracts not accepted for symposia (invited) or theme (volunteered) sessions will be considered for regular technical sessions.

### REGISTRATION

**Preregistration deadline:  
February 27, 1998**

Please preregister to qualify for lower registration fees and to assist the local committee in planning. On-site registration, at a higher fee, will also be available. A reduced registration fee during the preregistration period will be offered to students and to precollege teachers. Preregistration by mail will be handled by the GSA Registration Coordinator, P.O. Box 9140, Boulder, CO 80301-9140. Preregistration forms will be in the January 1998 issue of *GSA Today*.

### ABSTRACTS

**Abstract deadline:  
November 21, 1997**

Abstracts for all sessions must be submitted camera-ready on official 1998 GSA abstract forms, available from the Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020, ext. 161, ncarlson@geosociety.org. An original and five copies of all abstracts (volunteered and invited) should be sent to Peter Lessing, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879. We encourage participants in symposia and theme sessions to send an extra copy to the convener of the session. Abstracts will be reviewed for information content, format, and originality. GSA rules prohibit individuals from presenting more than one volunteered abstract. Abstracts submitted for symposia are not affected by this limitation.

### FIELD TRIPS

Contact the field trip leaders listed below for details about specific field trips. For general questions concerning field trips, or to propose an additional field trip, contact B. Mitchel Blake, field trip coordinator, (304) 594-2331, blake@geosrv.wvnet.edu. The postal address for all West Virginia Geological and Economic Survey (WVGES) field trip leaders is: West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV, 26507-0879.

#### Field Trips (Tentative)

##### 1. **The Mississippian-Pennsylvanian Boundary in Southern West Virginia Revisited: A Eustatic Unconformity?**

Jack B. Beuthin, Dept. of Geology, University of Pittsburgh—Johnstown, Johnstown, PA 15904, (814) 269-2945, beuthin+@pitt.edu; Donald Neal, Dept. of Geology, East Carolina University, Greenville, NC 27858-4353, (919) 328-4392, gneal@ecuvm.cis.ecu.edu.

##### 2. **Extensional Structures Along the Allegheny Front in Virginia and West Virginia Near the Giles County Seismic Zone.**

John M. Dennison, Dept. of Geology, University of North Carolina at Chapel Hill, Chapel Hill, NC, 27599-3315, (919) 966-4516, fax 919-966-4519.

##### 3. **Coal Geology, Paleobotany, and Regional Stratigraphy of the Middle Part of the Kanawha Formation, Southern West Virginia.**

*Sponsored by the Coal Division.* B. Mitchel Blake, WVGES, (304) 594-2331, blake@geosrv.wvnet.edu; Cortland F. Eble, Kentucky Geological Survey, 228 Mining and Mineral Resources Bldg., University of Kentucky, Lexington, KY, 40506-0107, (606) 257-5500, eble@kgs.mm.uky.edu; William C. Grady, WVGES, (304) 594-2331, grady@wvugeo.wvnet.edu; Ronald L. Martino, Dept. of Geology, Marshall University, Huntington, WV 25755, (304) 696-2717, martinor@marshall.edu.

##### 4. **Teays Valley Paleohistory and Pennsylvanian Fossil Collecting.**

*Sponsored by NAGT, WVGES, WVU Dept. of Geology and Geography, GSA, and the Paleontological Society.* Bob Behling, Dept. of Geology and Geography, West Virginia Univer-

sity, P.O. Box 6300, Morgantown, WV 26506-6300, (304) 293-5603, rbehling@wvu.edu; John Callahan, Dept. of Geology, Appalachian State University, Boone, NC 28608, (704) 262-3049, callahanje@conrad.appstate.edu; Thomas Repine, WVGES, (304) 594-2331, repine@geosrv.wvnet.edu.

**5. Upper Devonian (Frasnian-Famennian) Extinction Event in the Catskill Delta of Virginia and West Virginia.** *Sponsored by the Paleontological Society.* Thomas J. Rossbach, Municipal Engineering Services, P.O. Box 97, Garner, NC 27529, (919) 772-5393; Jack C. Hall, University of North Carolina, Wilmington, NC 28403-3297, (910) 962-3488, hallj@uncwil.edu.

### SYMPOSIA

In addition to the general discipline sessions, 10 symposia are planned for the meeting. Anyone interested in these should contact the conveners for information. If you have suggestions for additional symposia, contact Peter Lessing, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2331, lessing@geosrv.wvnet.edu. The postal address for all West Virginia Geological and Economic Survey (WVGES) conveners is: West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879.

**1. Historical Investigations of Appalachian Geology.** *Sponsored by History of Geology Division.* Peter Lessing, WVGES, (304) 594-2331, lessing@geosrv.wvnet.edu; Gregory Good, Dept. of History, West Virginia University, P.O. Box 6303, Morgantown, WV 26506-6303, (304) 293-2421, ext. 5247, ggood@wvu.edu.

**2. Ichnology and Taphonomy.** Andrew K. Rindsberg, Geological Survey of Alabama, P.O. Box O, Tuscaloosa, AL 35486-9780, (205) 349-2852, arindsberg@ogb.gsa.tuscaloosa.al.us; Anthony J. Martin, Geosciences Program, Emory University, Atlanta, GA 30322, (404) 727-6491, paleoman@learnlink.emory.edu; Ronald R. McDowell, WVGES, (304) 594-2331, mcdowell@geosrv.wvnet.edu.

**3. Applied Topics in Coal Geology.** James Hower, University of Kentucky, Center for Applied Energy Research, 2540 Research Park Dr., Lexington, KY 40511-8410, (606) 257-0261, hower@alpha.caer.uky.edu; Cortland F. Eble, Kentucky Geological Survey, 228 Mining and Mineral Resources Bldg., University of Kentucky, Lexington, KY 40506-0107, (606) 257-5500, eble@kgs.mm.uky.edu.

**4. Structure and Tectonics of the Central and Southern Appalachians: Recent Milestones.** Mark Evans, Geol-

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ogy and Planetary Science, 321 Old Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15260, (412) 624-8779, mae6+@pitt.edu.

**5. GIS Applications to Coal Geology.** Craig Neidig, Office of GIS Coordinator, 1615 Washington St., E., Suite 106, Charleston, WV 25311, (304) 558-4218, neidig@wvwc.wvnet.edu; Nick Fedorko, WVGES, (304) 594-2331, fedorko@geosrv.wvnet.edu.

**6. Activities for Enhancing the Quantitative Skills of Earth Science Students.** Glenn Stracher, Dept. of Science and Mathematics, East Georgia College, 131 College Circle, Swainsboro, Georgia, 30401, (912) 237-7831, stracher@mail.ega.peachnet.edu; Michael Hohn, WVGES, (304) 594-2331, hohn@geosrv.wvnet.edu.

**7. Hydrologic and Hydrochemical Impacts of Surface Mining.** Joe Donovan, Dept. of Geology and Geography, West Virginia University, P.O. Box 6300, Morgantown, WV 26506-6300, (304) 293-5603, jdonovan@wvu.edu.

**8. Hydrologic and Hydrochemical Impacts of Underground Mining.** Henry Rauch, Dept. of Geology and Geography, West Virginia University, P.O. Box 6300, Morgantown, WV 26506-6300, (304) 293-5603, hrauch@wvu.edu.

**9. Hydrogeology and Hydrogeochemistry of Natural Waters.** Henry Rauch, Dept. of Geology and Geography, West Virginia University, P.O. Box 6300, Morgantown, WV 26506-6300, (304) 293-5603, hrauch@wvu.edu; Joe Donovan, Dept. of Geology and Geography, West Virginia University, P.O. Box 6300, Morgantown, WV 26506-6300, (304) 293-5603, jdonovan@wvu.edu.

**10. Watershed Restoration and Management.** Paul F. Ziemkiewicz, 203 NRCCE, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064, (304) 293-7292, pziemkie@wvu.edu.

## THEME SESSIONS

Seven planned theme sessions (all papers volunteered) are listed below. If you are interested in convening an additional theme session, contact Peter Lessing, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2331, lessing@geosrv.wvnet.edu.

**1. Undergraduate Research.** Sponsored by Sigma Gamma Epsilon. Donald Neal, Dept. of Geology, East Carolina University, Greenville, NC 27858-4353, (919) 328-6360, glneal@ecuvvm.cis.ecu.edu.

**2. NAGT-GSA K-12 Geoscience Education.** John Callahan, Dept. of Geology, Appalachian State University, Boone, NC 28608, (704) 262-3049, callahanje@conrad.appstate.edu.

**3. Statemap Geological Mapping Poster Session.** David Matchen, West Virginia Geological and Economic Survey, (304) 594-2331, matchen@geosrv.wvnet.edu.

**4. Undergraduate Research Poster Session.** Sponsored by the Council for Undergraduate Education. William Ranson, Dept. of Geology, Furman University, Greenville, SC 29613-0440, (803) 294-2052, ranson\_bill@furman@furman.edu.

**5. Geoscience Programs for K-12 Educators.** Thomas Repine, West Virginia Geological and Economic Survey, (304) 594-2331, repine@geosrv.wvnet.edu.

**6. Sequence Stratigraphic Applications to the Appalachians.** Sponsored by Southeastern Section of SEPM. Steven Holland, Dept. of Geology, University of Georgia, Athens, GA 30602-2501, (706) 542-0424, stratum@gly.uga.edu.

## POSTER SESSIONS

Four half-day poster sessions are planned for the meeting. Please indicate your preference for a poster session on the GSA abstract form.

## STUDENT RESEARCH PROGRAMS

Sigma Gamma Epsilon will sponsor an oral theme session (theme session 1, above) devoted to student research. The session is designed to showcase student scholarship without restriction on subject matter, classification, or membership in Sigma Gamma Epsilon. Interested students should contact Donald Neal, Dept. of Geology, East Carolina University, Greenville, NC 27858-4353, (919) 328-6360, glneal@ecuvvm.cis.ecu.edu.

The Council for Undergraduate Research will sponsor a student poster session (theme session 4, above), to showcase senior theses and other undergraduate research projects. First authors must be undergraduate students and responsible for the bulk of the research, preparation of posters, and presentation of results. For more information, contact Bill Ranson, Dept. Of Geology, Furman University, Greenville, SC 29613-0440, (803) 294-2052, ranson\_bill@furman@furman.edu.

## K-12 WORKSHOP AND FIELD TRIP

Two half-day theme sessions (theme sessions 2 and 5) are planned for K-12 and college-level introductory geoscience teachers. Session 2 will deal with a variety of educational issues. Contact John Callahan, Dept. of Geology, Appalachian State University, Boone, NC 28608, (704) 262-3049, callahanje@conrad.appstate.edu. Session 5 will explore the role of nontraditional geoscience education programs. Contact Thomas Repine, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2331, repine@geosrv.wvnet.edu.

## ROY SHLEMON MENTORS IN APPLIED GEOLOGY PROGRAM: Workshop for Students, OR What Your Professor Did Not Tell You About the Real World

The Roy Shlemon Mentors in Applied Geology Program, sponsored by the GSA Institute for Environmental Education, is a program developed to present workshops for upper-level undergraduate and graduate students. This workshop is designed to make students more aware of what will be expected of them when they enter the work place. The workshop will consist of two parts: (1) short presentations by representatives of major segments of the geological industry, and (2) a brief question-and-answer period, in which industry representatives will be available for questioning individually or in small groups.

Undergraduate and graduate students are especially encouraged to attend. For more information, contact Douglas G. Patchen, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2331, dpatchen@wvu.edu.

## PHOTO CONTEST

For the photographic contest being planned for this meeting, the subject matter must be geological but is not restricted to the southeastern United States. Both color and black-and-white prints will be considered. For additional information, contact Peter Lessing (see Symposia for address).

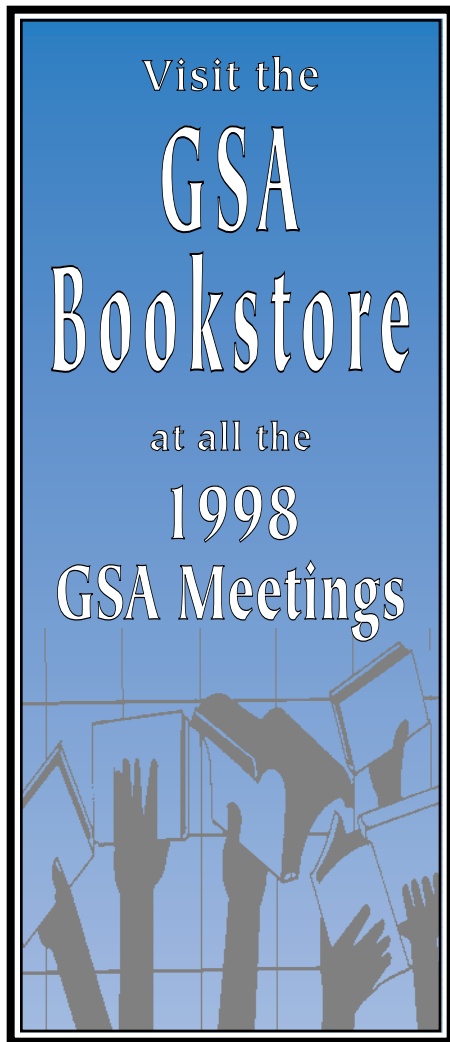
## EXHIBITS

Exhibit facilities for business, educational, and governmental institutions will be conveniently located in the Embassy Suites Hotel, adjacent to the technical sessions. Booth space is limited, so plan to reserve early. Exhibits will be open all day Monday and Tuesday morning. For space reservation or further information, contact Ken Ashton, West Virginia Geological and Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2331, ashton@geosrv.wvnet.edu.

## STUDENT TRAVEL GRANTS

Limited funds for travel expenses of students presenting papers at the meeting are available from the GSA Southeastern Section. Students must be members of GSA to apply. For information, contact Harold Stowell, Dept. of Geology, University of Alabama, Tuscaloosa, AL 35486, (205) 348-5098, hstowell@wgs.geo.ua.edu. Also, all information and necessary forms may be found on the World Wide Web at: <http://www.geo.ua.edu/segga/segga.html>.

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Travel grant requests must be postmarked no later than March 3, 1998.

#### ACCOMMODATIONS

Blocks of rooms have been reserved for attendees at: Embassy Suites (\$112 per night for a two-room suite for up to four people); Elk River Town Center Inn (\$49 and \$59, single or double); and Holiday Inn Civic Center (\$75, single or double). Rates do not include 9 percent sales tax.

#### WELCOME PARTY AND GUEST ACTIVITIES

The welcome party Sunday evening will be in the Embassy Suites exhibit area. All party attendees must be registered; on-site registration will be available in the Embassy Suites lobby prior to the party.

Trips are planned to Tamarack (The Best of West Virginia) Arts and Crafts Center on Monday, and to the state capitol, cultural center, and museum on Tuesday. The Charleston Town Center Mall, with shopping and restaurants, is located across the street from the Embassy Suites. ■

#### Preliminary Announcement and Call for Papers

## CORDILLERAN SECTION, GSA 94th Annual Meeting

Long Beach, California

April 7-9, 1998

The Department of Geological Sciences at California State University—Long Beach will host the 1998 meeting of the Cordilleran Section of the Geological Society of America. The meeting will be during spring break on the CSULB campus.

#### REGISTRATION

**Preregistration deadline:**  
**March 6, 1998**

Forms for registration and housing will accompany the Final Announcement in the January 1998 issue of *GSA Today*. GSA and CSULB are committed to making every event at the 1998 Cordilleran Section meeting accessible to all people interested in attending. All event areas at CSULB are wheelchair-accessible. Equipment for the hearing impaired is available. If you have such special requirements, there is a space to indicate this on the registration form, or you can contact Stan Finney, General Chair, [scfinney@csulb.edu](mailto:scfinney@csulb.edu). If possible, please let us know by March 1, 1998.

*Abstracts with Programs* for the meeting may be purchased with your GSA membership, or on-site in the registration area.

#### HOUSING

Large blocks of rooms have been reserved at five hotels—Guesthouse Hotel (meeting headquarters), Long Beach Marriott, Holiday Inn—Long Beach Airport, Best Western Golden Sails Hotel, Sea Port Marina Hotel, at distances of one to three miles from the campus. Housing registration will be handled by the individual hotels, which the participants must contact directly. Reduced conference rates are available only to those identifying themselves as participants in the Cordilleran Section GSA meeting. Housing reservation information and deadlines will be included in the final announcement in the January 1998 issue of *GSA Today*.

#### CALL FOR PAPERS

Papers are invited for presentation in oral technical sessions, symposia, theme sessions, and poster sessions. Technical sessions and poster sessions might include any of those listed on the GSA abstract form. Symposia and likely theme sessions are listed below. Potential contributors are encouraged to contact the organizers of the specific symposium or theme for information.

Although papers dealing with all aspects of the Cordilleran region are especially encouraged, papers dealing with other regions are also welcome. Abstracts not accepted for symposia (invited) or theme (volunteered) sessions will be considered for regular technical sessions.

Technical sessions will allow 12 minutes for presentation and 3 minutes for discussion. Symposia may allow the same 12 minutes for presentation, or longer at the option of the conveners. Five four-hour poster sessions are planned.

**Abstracts deadline:**  
**December 12, 1997**

Abstracts for all sessions must be submitted camera-ready on official 1998 GSA abstract forms. An original and five copies are required of each abstract, and are to be sent directly to James Sample, Technical Program Chair, Dept. of Geological Sciences, California State University—Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, (562)985-4589, [csample@csulb.edu](mailto:csample@csulb.edu). Participants in symposia and theme sessions are requested to send an extra copy to the convener of the session. Abstracts will be reviewed for information content, format, and originality. GSA rules prohibit individuals from presenting more than one volunteered abstract. Abstracts submitted for symposia are not affected by this limitation.

#### TECHNICAL PROGRAM

In addition to the general discipline sessions, 11 symposia and theme sessions, 12 field trips, and 3 workshops are already planned for the meeting. If you have suggestions for additional symposia, contact Technical Program Chair James Sample (address just above).

#### SYMPOSIA

1. **Active Tectonics and Seismic Hazards of Metropolitan Southern California.** James Dolan, Dept. of Earth Sciences, University of Southern California, Los Angeles, CA 90089-0740, (213) 740-8599, [dolan@usc.edu](mailto:dolan@usc.edu).

*Cordilleran* continued on p. 30

**2. Quaternary Mapping and Hazards Mapping of the LA Basin (poster session).** John Foster, Dept. of Geological Sciences, California State University, Fullerton, CA 92834-9480, (714) 278-7096, john\_foster1@qmail.fullerton.edu.

**3. Southern California A real Mapping Project (SCAMP) (poster session).** (U.S. Geological Survey and California Division of Mines and Geology) Douglas M. Morton, USGS, Dept. of Earth Sciences, University of California, Riverside, CA 92521, (909) 267-6397, SCAMP@ucr.ac1.ucr.edu; Michael P. Kennedy.

**4. Neoproterozoic-Cambrian Stratigraphy, Southern Nevada-Eastern California: A Tribute to John H. (Jack) Stewart.** Chris Fedo, Dept. of Geology, George Washington University, Washington, DC 20052, (202)994-6964, cfedo@gwis2.circ.gwu.edu; John D. Cooper.

**5. Current Issues in Paleobiology: Anoxia, Developmental Biology and Quantitative Issues Involving the Fossil Record.** (Paleontological Society) David K. Jacobs, Dept. of Biology, University of California, Los Angeles 90095-1606, (310) 206-3987, djacobs@ucla.edu.

**6. Late Cretaceous Denudation of the Peninsular Ranges Batholith.** Marty Grove, Dept. of Earth and Space Sciences, University of California, Los Angeles, CA 90095-1567, (310) 825-7975, marty@argon.ess.ucla.edu; David Kimbrough.

**7. Mineral Resource Issues in the West.** Russ Miller (213)620-5025 and Dinah Shumway, (909) 275-0434, California Division of Mines and Geology, 107 S. Broadway, Room 1065, Los Angeles, CA 90012, fax 213-620-3691.

## THEME SESSIONS

**1. Active Folding and Buried Reverse Faults.** Edward Keller, Dept. of Geological Sciences, University of California, Santa Barbara, CA 93106, (805) 893-4207, keller@magic.geol.ucsb.edu.

**2. Undergraduate Research Poster Session.** (Geology Division, Council on Undergraduate Research), Susan DeBari, Geology Dept., San Jose State University, San Jose, CA 95192-0102, (408) 924-5027, fax 408-924-5053, susan@geosun1.sjsu.edu.

**3. Partnerships for Earth Science Education for Future (Pre-Service) Teachers.** Elizabeth L. Ambos, Dept. of Geological Sciences, California State University, Long Beach, CA 90840-3902, (562) 985-4931, fax 562-985-8638, bambos@csulb.edu, Edward Ng, and Fred Shair.

**4. Shallow Subsurface Investigations Using Geophysical Methods.** Elizabeth L. Ambos, Dept. of Geological Sciences, California State University, Long Beach, CA 90840-3902, (562) 985-4931, fax 562-985-8638, bambos@csulb.edu.

## FIELD TRIPS

Preregistration forms, costs, and updated information on field trips will be printed in the final announcement for the meeting in the January 1998 issue of *GSA Today*. For details before then, contact the field trip leaders listed below. General questions should be addressed to Field-Trip Chair Rick Behl, Department of Geological Sciences, California State University—Long Beach, (562) 985-5850, behl@csulb.edu. Note: CSU is California State University, SDSU is San Diego State University, UC is University of California.

**1. Giant Oil Fields of the Los Angeles Basin: New Life from Old Fields.**

1 day. Donald Clarke, City of Long Beach, (562) 570-3915.

**2. THUMS Oil Islands and Oil Tour of Historical Long Beach.** ½ day. Donald Clarke, City of Long Beach, (562) 570-3915; George Otott, Jr., THUMS Long Beach Co., (562) 624-3400.

**3. The St. Francis Dam Disaster.**

1 day. Jack Green, CSU—Long Beach, (562) 985-4198.

**4. Late Cretaceous Denudation History of the Peninsular Ranges as Recorded in Upper Cretaceous Sedimentary Rocks, Northern Santa Ana Mountains.** 1 day. Patrick L. Abbott, SDSU, pabbott@geology.sdsu.edu, (619)582-2015; David Kimbrough, SDSU; Marty Grove, UC Los Angeles.

**5. San Antonio Canyon: Cultural Geography, Geology, Geomorphology, and Environmental Geology of an Alpine Valley in southern California.** 1 day. Larry Herber, Cal Poly, Pomona, LJHerber@CSUPomona.edu, (909) 869-3454.

**6. Igneous and Tectonic Response of the Eastern San Gabriel Mountains to Neogene Extension and Rotation of the Transverse Ranges.** 1 day. Jon Nourse, Cal Poly, Pomona, JANourse@aol.com, (909) 869-3460; Peter Weigand, CSU Northridge; Garrett Hazelton, UCLA.

**7. Active Tectonics and Earthquake Hazards, Santa Barbara Fold Belt: Anticlinal Uplift and Reverse Faulting of Wave-Cut Platforms.** 1½ days. Edward Keller, UC Santa Barbara, keller@magic.geol.ucsb.edu, (805) 893-4207.

**8. The Independence Dike Swarm and Mafic Rocks of the Sierra Nevada Batholith.** 2½ days. Allen Glazner, Univ. North Carolina, afg@unc.edu, (919) 962-0689; John Bartley, Univ. Utah; Drew Coleman, Boston University.

**9. Deformation in the Metamorphic Aureole of the Eureka Valley-Joshua Flat-Bear Creek Composite Pluton, White-Inyo Mountains, California.** 2½ days. Sven Morgan, Virginia Tech, morgans@vt.edu, (540) 231-5765.

**10. Anatomy of a Craton Margin: Neoproterozoic to Basal Cambrian**

**Sequence Stratigraphy, Eastern Mojave Desert, California.** 3 days. John Cooper, CSU—Fullerton, john\_cooper@qmail.fullerton.edu, (714) 996-1573; Chris Fedo, George Washington University.

**11. Extension, Segmentation, and Evolution of the Gulf of California Extensional Province and San Andreas Fault System, Baja California, Mexico.** 3 days. Gary Axen, UC Los Angeles, gaxen@ess.ucla.edu, (310) 825-6928; Arturo Martin-Barajas and John Fletcher, CICESE.

**12. Geology and Marine Geophysics of Catalina Island and the California Continental Borderland.** 3 days. Dan Francis, CSU—Long Beach, (562) 985-4929.

## WORKSHOPS

**1. Roy Shlemon Mentors in Applied Geology Program: Workshop for Students.** The Roy Shlemon Mentors program, sponsored by the GSA Institute for Environmental Education, supports workshops in applied geology for upper-level undergraduate and graduate students. This one-day workshop, April 6, will address practical aspects of engineering geology. There is no charge to students for this workshop, but space is limited. Students wishing to attend should write a short note expressing their interest in the workshop by March 1, 1998, to Jack Green, Dept. of Geological Sciences, California State University—Long Beach, Long Beach, CA 90840. Twenty applicants will be selected and notified by March 15, 1998.

**2. Four Easy Pieces: A Workshop in Geophysical Instrumentation.** Elizabeth Ambos, (562) 985-4931, bambos@csulb.edu; and Roswitha Grannell, CSU—Long Beach.

**3. Analysis of Aquifer Test Data.** Isam Amin, (562) 985-2250, isam@csulb.edu, CSU—Long Beach.

## STUDENT SUPPORT

The GSA Cordilleran Section has funds available for partial support of GSA Student Associates of the Section who are presenting papers at the meeting. Apply to Cordilleran Section Secretary Bruce A. Blackerby, Dept. of Geology, California State University, Fresno, CA 93740, (209)278-2955, bruceb@csufresno.edu. Applications should include certification that the student is presenting a paper and is a GSA Student Associate of the Cordilleran Section. *All letters must be received by January 15, 1998.*

The local committee has funds available for partial support of students who will assist with the audio-visual equipment at the meetings. Apply to General Chair Stan Finney, Dept. of Geological Sciences,

**Cordilleran** continued from p. 30

CSU—Long Beach, Long Beach, CA 90840, (562) 985-8637, scfinney@csulb.edu. Applications should state the student's interest in attending the meeting. *All letters must be received by January 15, 1998.*

### STUDENT RESEARCH PROGRAMS

The Council on Undergraduate Research will sponsor a student poster session to showcase results of undergraduate research. Abstracts are invited from any discipline in the geological sciences, but the presentation must be the result of the student's own participation in an undergraduate research project. The undergraduate must be the sole or leading author on the abstract. There will be a "best poster" award given during the meeting to the most outstanding undergraduate presentation. For more information, contact Susan DeBari, Geology Dept., San Jose State University, San Jose, CA 95192, (408) 924-5027, susan@geosun1.sjsu.edu.

### STUDENT PAPER AWARDS

For the first time, the Cordilleran Section will give awards for the best student papers. There will be separate awards

for oral and poster presentations, with a single best paper award of \$250 and two honorable mention awards of \$100 in each category. The principal author and presenter must be a graduate or undergraduate student and must be a Student Associate of the Cordilleran Section of GSA. Abstracts of papers submitted for consideration for these awards should be so indicated on the abstract form.

Volunteers are needed to judge presentations for student paper awards. Help ensure the successful inauguration of this important program. To volunteer, contact Gary Girty, Student Paper Awards Chair, Dept. of Geological Sciences, San Diego State University, San Diego, CA 92182, (610) 594-2552, ggirty@geology.sdsu.edu.

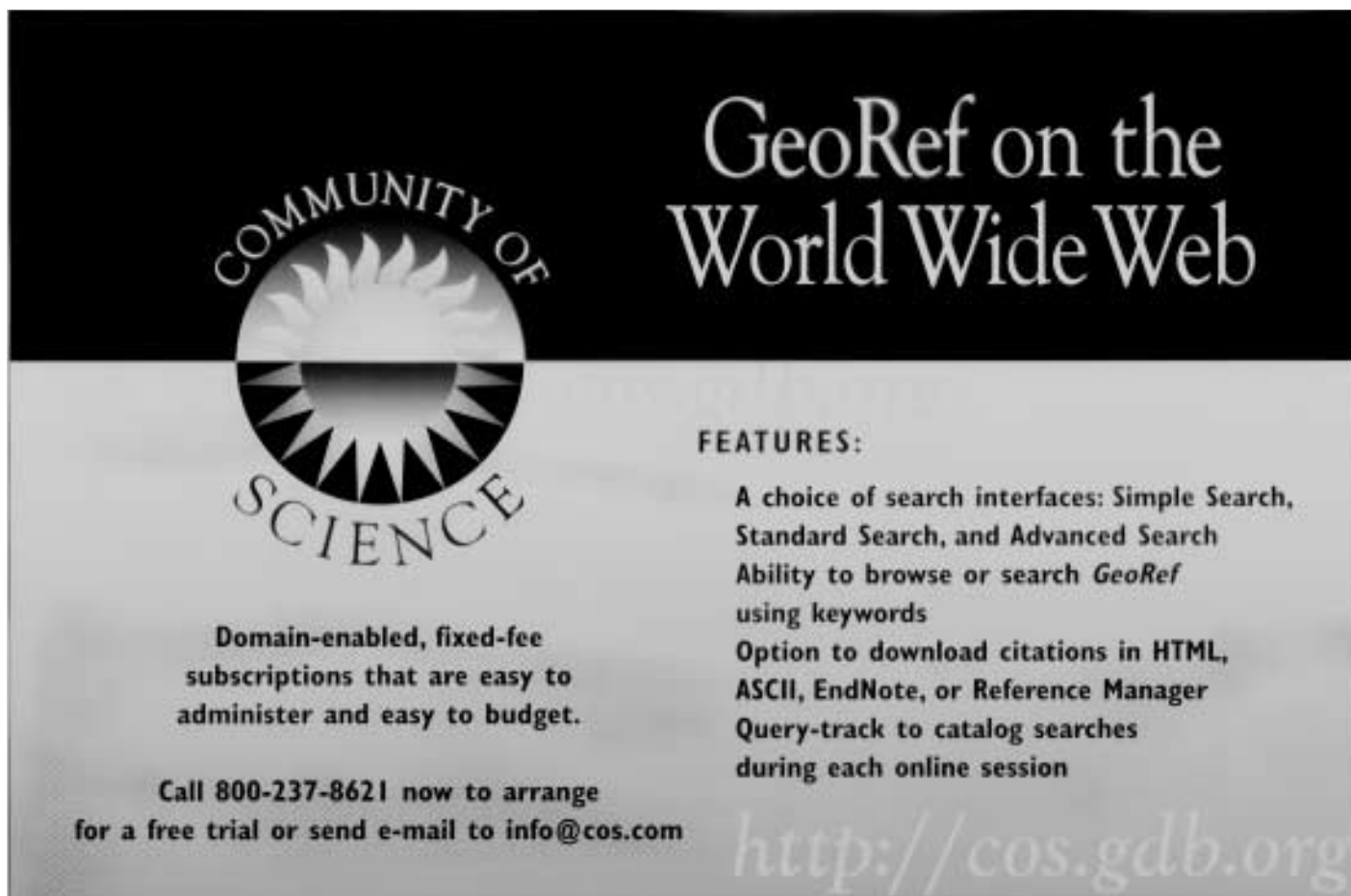
### EXHIBITS

Exhibits will be located along with poster sessions and primary food concessions on the concourse and court levels of the CSULB Pyramid events center. This focal point of the meeting facilities will attract a large audience and provide excellent opportunities for exhibitors, both commercial and nonprofit. Applications for exhibit space are available from Exhibits Chair Barbara Grubb, Raymond

Alf Museum, 1175 W. Baseline Road, Claremont, CA 91711, (909) 482-5238, bgrubb@webb.org, or General Chair Stan Finney, CSULB, (562) 985-8637, scfinney@csulb.edu.

### DETAILED INFORMATION

Further information about meeting functions, housing, and activities will be in the Final Announcement in January 1998 *GSA Today*, and in the *Abstracts with Programs* for the Cordilleran Section meeting. Some symposia, workshops, and other activities are still in the planning stages, and further suggestions are welcomed. Direct general questions and suggestions to the local chair, Stan Finney. Additional important information, updated regularly, will be posted on the home page of the Department of Geological Sciences at CSULB at <http://seis.natsci.csulb.edu>. ■



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# CALENDAR

Only new or changed information is published in *GSA Today*. A complete listing can be found in the **Calendar** section on the Internet: <http://www.geosociety.org>.

## 1998 Penrose Conferences

### May

May 14–18, **Linking Spatial and Temporal Scales in Paleoecology and Ecology**, Solomons, Maryland. Information: Andrew S. Cohen, Dept. of Geosciences, University of Arizona, Tucson, AZ 85721, (520) 621-4691, fax 520-621-2672, [acohen@ge.arizona.edu](mailto:acohen@ge.arizona.edu).

### June

June 4–12, **Evolution of Ocean Island Volcanoes**, Galápagos Islands, Ecuador. Information: Dennis Geist, Dept. of Geology, University of Idaho, Moscow, ID 83844, (208) 885-6491, fax 208-885-5724, [dgeist@uidaho.edu](mailto:dgeist@uidaho.edu).

### July

July 4–11, **Processes of Crustal Differentiation: Crust-Mantle Interactions, Melting, and Granite Migration through the Crust**, Verbania, Italy. Information: Tracy Rushmer, Dept. of Geology, University of Vermont, Burlington, VT 05405, (802) 656-8136, fax 802-656-0045, [trushmer@zoo.uvm.edu](mailto:trushmer@zoo.uvm.edu).

## 1997 Meetings

### November

November 4–7, **Western States Seismic Policy Council 19th Annual Conference**, Victoria, British Columbia, Canada. Information: Steven Ganz, Western States Seismic Policy Council, 121 Second St., 4th Floor, San Francisco, CA 94105, (415) 974-6435, fax 415-974-1747

### December

December 9–10, **Field Installation of Geosynthetics, 11th Geosynthetic Institute–Geosynthetic Research Institute Conference**, Philadelphia, Pennsylvania. Information: GSI/GRI, 130 Wood Rd., Springfield, PA 19064, (215) 895-2343, fax 215-895-1437.

## GSA Division News

Divisions will be recognizing the following individuals at the 1997 GSA Annual Meeting in Salt Lake City for their service to the Division and/or contributions to the geological sciences.

### Coal Geology Division

Edward C. Beaumont, Distinguished Service Award  
James C. Hower, Distinguished Service Award

### Engineering Geology Division

Jeffrey R. Keaton, Distinguished Practice Award  
Jerome V. DeGraff, Meritorious Service Award

### Hydrogeology Division

Stanley N. Davis, Distinguished Service Award  
Leonard A. Wood, Distinguished Service Award  
Jeffrey S. Hanor, 1998 Birdsall-Dreiss Distinguished Lecturer

### Quaternary Geology & Geomorphology Division

Stanley A. Schumm, Distinguished Career Award

For a listing of other award recipients to be honored at the Annual Meeting in Salt Lake City, see page 17 of the July 1997 issue of *GSA Today*.

## 1998 Meetings

### March

March 9–11, **Society for Mining, Metallurgy, and Exploration (SME) Annual Meeting**, Orlando, Florida. Information: Meetings Dept., SME, P.O. Box 625002, Littleton, CO 80162-5002, (800) 763-3132, (303) 973-9550, fax 303-979-3461, [smenet@aol.com](mailto:smenet@aol.com), <http://www.smenet.org>.

March 19–21, **GSA Northeastern Section Meeting**, Holiday Inn by the Bay, Portland, Maine. Submit Abstracts to: Marc C. Loiselle, Maine Geological Survey, 22 State House Station, Augusta, ME 04333-0022, (207) 287-2801, [marc.c.loiselle@state.me.us](mailto:marc.c.loiselle@state.me.us). *Abstracts deadline: November 14, 1997.*

March 19–20, **GSA North-Central Section Meeting**, Ohio State University, Columbus, Ohio. Submit abstracts to: David H. Elliot, Dept. of Geological Sciences, Ohio State University, 125 South Oval Mall, Columbus, OH 43210, (614) 292-5076, [delliot@magnus.acx.ohio-state.edu](mailto:delliot@magnus.acx.ohio-state.edu). *Abstracts deadline: November 14, 1997.*

March 23–24, **GSA South-Central Section Meeting**, OU Continuing Education Center, Norman, Oklahoma. Submit abstracts to: Judson Ahern, School of Geology & Geophysics, University of Oklahoma, 100 E. Boyd St., Suite 810, Norman, OK 73019-0628, (405) 325-3253, [jahern@ou.edu](mailto:jahern@ou.edu). *Abstracts deadline: December 1, 1997.*

March 30–31, **GSA Southeastern Section Meeting**, Embassy Suites, Charleston, West Virginia. Submit abstracts to: Peter Lessing, WV Geological & Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2321, [lessing@geosrv.wvnet.edu](mailto:lessing@geosrv.wvnet.edu). *Abstracts deadline: November 21, 1997.*

### April

April 5–7, **Perspectives in Amino Acid and Protein Geochemistry**, Washington, D.C. Information: Glenn A. Goodfriend, Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd., NW, Washington, DC 20015-1305, (202) 686-2410, ext. 4432, fax 202-686-2419, [goodfriend@gl.ciw.edu](mailto:goodfriend@gl.ciw.edu).

April 7–9, **GSA Cordilleran Section Meeting**, California State University, Long Beach, California. Submit abstracts to: James C. Sample, Dept. of Geological Sciences, California State University, Long Beach, CA 90840, (562) 985-4589, [csample@csulb.edu](mailto:csample@csulb.edu). *Abstracts deadline: December 12, 1997.*

### May

May 20–21, **Response of the Earth's Lithosphere to Extension**, Royal Society [London] Discussion Meeting, London. Information: R. B. Whitmarsh, [bob.whitmarsh@soc.soton.ac.uk](mailto:bob.whitmarsh@soc.soton.ac.uk).

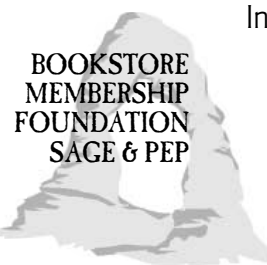
May 25–26, **GSA Rocky Mountain Section Meeting**, Northern Arizona University, Flagstaff, Arizona. Submit abstracts to: Wendell Duffield, U.S. Geological Survey, 2255 Gemini Road, Flagstaff, AZ 86001, (520) 556-7000, [wduffield@iflag2.wr.usgs.gov](mailto:wduffield@iflag2.wr.usgs.gov). *Abstracts deadline: December 12, 1997.*

### June

June 8–12, **GCIP Mississippi Hydrometeorology Conference, Predicting Climate Variability and Its Implications for Water Resource Management**, St. Louis, Missouri. Information: Adrienne Calhoun, GCIP Project Office, NOAA, Office of Global Programs, 1100 Wayne Ave., Suite 1210, Silver Spring, MD 20910, fax 301-427-2222, [calhoun@ogp.noaa.gov](mailto:calhoun@ogp.noaa.gov).

Send notices of meetings of general interest, in format above, to Editor, *GSA Today*, P.O. Box 9140, Boulder, CO 80301, E-mail: [editing@geosociety.org](mailto:editing@geosociety.org).

## GSA Headquarters Services



In addition to the regular exhibit hours, the Services area will be open again on Thursday, from 9:00 a.m. to 2:00 p.m.

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# GSAF UPDATE

Donna Russell and Julie Wetterholt, GSA Foundation

## COME SEE US

at the 1997 GSA Annual Meeting in Salt Lake City!

We invite you to visit with the Foundation trustees and staff at the Foundation booth, located in the Headquarters Services area of the Convention Center, in Salt Lake City during the 1997 GSA Annual Meeting.

We will have a special appreciation gift for all Century Plus Roster donors (gifts of \$150 or more), and a prize drawing will be held on Wednesday, October 22 for those who have made gifts to the Foundation in 1997.

We will have plenty of information on GSA's programs, activities, Foundation funds, and how you may make a charitable gift to support geological research and education.

### See you there!

#### THIS MONTH'S BUMPER STICKER

Good company and good discourse  
are the very sinews of virtue.

—Izaak Walton

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Making a geologic reconnaissance  
in December 1962 near the  
Darwin Glacier at 80° south  
in Antarctica and realizing  
that I was the first human  
to walk there.

—Charles C. Rich



# October BULLETIN and GEOLOGY Contents



The Geological Society of America  
**BULLETIN**  
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## GSA SECTION MEETINGS—1998

**NORTHEASTERN SECTION**, March 19–21, Holiday Inn by the Bay, Portland, Maine. Submit abstracts to: Marc C. Loiselle, Maine Geological Survey, 22 State House Station, Augusta, ME 04333-0022, (207) 287-2801, marc.c.loiselle@state.me.us. *Abstracts Deadline: November 14, 1997.*

**NORTH-CENTRAL SECTION**, March 19–20, Ohio State University, Columbus, Ohio. Submit abstracts to: David H. Elliot, Dept. of Geological Sciences, Ohio State University, 125 South Oval Mall, Columbus, OH 43210, (614) 292-5076, delliot@mag-nus.acx.ohio-state.edu. *Abstracts Deadline: November 14, 1997.*

**SOUTH-CENTRAL SECTION**, March 23–24, OU Continuing Education Center, Norman, Oklahoma. Submit abstracts to: Judson Ahern, School of Geology & Geophysics, University of Oklahoma, 100 E. Boyd St., Suite 810, Norman, OK 73019-0628, (405) 325-3253, jahern@ou.edu. *Abstracts Deadline: December 1, 1997.*

**SOUTHEASTERN SECTION**, March 30–31, Embassy Suites, Charleston, West Virginia. Submit abstracts to: Peter Lessing, WV Geological & Economic Survey, P.O. Box 879, Morgantown, WV 26507-0879, (304) 594-2321, lessing@geosrv.wvnet.edu. *Abstracts Deadline: November 21, 1997.*

**CORDILLERAN SECTION**, April 7–9, California State University, Long Beach, California. Submit abstracts to: James C. Sample, Dept. of Geological Sciences, California State University, Long Beach, CA 90840, (562) 985-4589, csample@csulb.edu. *Abstracts Deadline: December 12, 1997.*

**ROCKY MOUNTAIN SECTION**, May 25–26, Northern Arizona University, Flagstaff, Arizona. Submit abstracts to: Wendell Duffield, U.S. Geological Survey, 2255 Gemini Road, Flagstaff, AZ 86001, (520) 556-7000, wduffield@iflag2.wr.usgs.gov. *Abstracts Deadline: December 12, 1997.*

### Assistant Professor Geology

The Department of Geology at the University of Rhode Island invites applications for a tenure-track faculty position beginning in the fall of 1998. We seek applicants whose primary interest is in the field of contaminant hydrogeology. A Ph.D in hydrology, geology or within the environmental sciences is required at the time of appointment. The following are also required: potential for developing an externally funded and nationally recognized research program in hydrogeology; an undergraduate degree (or equivalent) in geology; training and research experience in hydrogeology, organic chemistry and contaminant transport; the ability to teach an upper-division course in environmental organic chemistry and a graduate level course in solute/contaminant transport; a strong commitment to quality instruction. The following are preferred: post-doctorate experience; a record of peer-reviewed publications and research funding; teaching experience. For information about the department of Geology, refer to our Web site: [http://www.uri.edu/crd/gel\\_home](http://www.uri.edu/crd/gel_home). Interested candidates should submit a curriculum vitae, a statement of research and teaching interests, and the names of three referees by 12/31/97\* to: Anne Veeger, Search Committee Chair, (Log # 191164), UNIVERSITY OF RHODE ISLAND, P.O. Box G, Kingston, RI 02881. The University of Rhode Island is an AA/EEO employer and is committed to increasing the diversity of its faculty, staff and students. Persons from under-represented groups are encouraged to apply. \* or until position is filled.



#### VICTOR E. MONNETT PROFESSOR OF ENERGY RESOURCES SCHOOL OF GEOLOGY AND GEOPHYSICS COLLEGE OF GEOSCIENCES UNIVERSITY OF OKLAHOMA

The University of Oklahoma invites applications and nominations for the Victor E. Monnett Professor of Energy Resources. The Professorship was funded by alumni in honor of Dr. V. E. Monnett who was director of the School of Geology and Geophysics for 30 years. The Monnett Professorship provides a key element of the School's teaching and research program.

This is an endowed senior position in the general area of energy resources, with tenure and at the rank of full professor, in the **School of Geology and Geophysics in the College of Geosciences**. The primary area of expertise sought is in structural geology, particularly in those aspects relevant to the oil and gas industry. The University is seeking a highly distinguished individual with vision, commitment, and leadership abilities to establish a program of interdisciplinary teaching, research, and service. The successful candidate is expected to be a great teacher, a mentor of students, an intellectual leader, and an accomplished researcher in the profession with ability to attract significant external funding.

The University of Oklahoma is a major, comprehensive, state-supported university located approximately 20 miles south of Oklahoma City in the city of Norman. The campus contains a wide range of state-of-the-art facilities supporting teaching and research in energy and the environment. The **Sarkeys Energy Center**, which houses the College of Geosciences and a portion of the **College of Engineering**, is a premier 350,000 square foot academic facility with 200 teaching and research laboratories located on the Norman Campus. It is the focus of much of the University's energy research, and the program center for key energy research growth areas of strategic importance to the University. In particular, the Center houses the internationally recognized **Rock Mechanics Institute** with which it is hoped the successful applicant will maintain a strong collaborative relationship.

Salary and benefits will be commensurate with experience and are negotiable. Starting date is negotiable. The position is available as early as 1 January 1998.

Initial screening of complete applications will begin on 1 November 1997. The search will remain open until the position is filled. Complete applications will consist of a letter of interest from the applicant, current vita/resume, and a list of references (with addresses, telephone and FAX numbers, and email addresses) that the search committee may contact. Questions or requests for additional information should be directed to Dr. John P. Castagna, Search Co-Chair, at email address [castagna@ou.edu](mailto:castagna@ou.edu) or phone (405) 325-6697. Address all applications and nominations to: Monnett Professorship Search Committee, University of Oklahoma, Sarkeys Energy Center, 100 E. Boyd Street, Room 710, Norman, Oklahoma 73019-1008

The University of Oklahoma is an Affirmative Action, Equal Opportunity Employer. Women and Minorities are Encouraged to Apply. The University of Oklahoma has a policy of being responsive to the needs of dual-career couples.



# TORONTO

## 1998 Annual Meeting

### TORONTO MINI-CALENDAR

#### 1997

**November 1**—Theme Proposal Information in November *GSA Today*. Electronic Theme/Symposia Proposal Form Available on the GSA Web Site

**December 1**—Continuing Education Proposals Due to GSA

#### 1998

**January 2**—Theme and Symposia Proposals Due to Technical Program Chair

**April 1**—Call for Papers Published and Distributed

**May 1**—Electronic Abstract Submittal Form Available on GSA Web Site

**June 1**—Registration and Lodging Information printed in June *GSA Today*

**July 13**—Abstracts Deadline

**September 13**—Preregistration and Housing Deadline

October 26–29 • Metro Toronto Convention Centre • Sheraton Centre Toronto Hotel

**General Chairs:** *Jeffrey J. Fawcett, University of Toronto, Peter von Bitter, Royal Ontario Museum*

#### Technical Program Chairs:

*Denis M. Shaw, Dept. of Geology, McMaster University, Hamilton, Ontario L8S 4M1, Canada, shawden@mcmaster.ca*

*Andrew Miall, Dept. of Geology, University of Toronto, 22 Russell St., Toronto, Ontario M5S 3B1, Canada, miall@quartz.geology.utoronto.ca*

Due date for symposia and theme proposals: **January 2, 1998**

#### Call for Field Trip Proposals:

We are interested in proposals for single-day and multi-day field trips beginning or ending in Toronto, and dealing with all aspects of the geosciences. Please contact the Field Trip Chairs listed below.

*Pierre Robin, Dept. of Geology, University of Toronto, Erindale Campus, Mississauga, Ontario L5L 1C6, Canada, probin@credit.erin.utoronto.ca*

*Henry Halls, Dept. of Geology, University of Toronto, Erindale Campus, Mississauga, Ontario L5L 1C6, Canada, hhalls@credit.erin.utoronto.ca*

#### CALL FOR

### CONTINUING EDUCATION COURSE PROPOSALS

**Due December 1, 1997**

The GSA Committee on Continuing Education invites those interested in proposing a GSA-sponsored or cosponsored course or workshop to contact GSA headquarters for proposal guidelines. Continuing Education courses may be conducted in conjunction with all GSA annual or section meetings. We are particularly interested in receiving proposals for the 1998 Toronto Annual Meeting or the 1999 Denver Annual Meeting.

**Proposals must be received by December 1, 1997.**

Selection of courses for 1998 will be made by February 1, 1998. For those planning ahead, we will also consider courses for 1999 at that time.

**For proposal guidelines or information, contact:**

Edna Collis, Continuing Education Coordinator, GSA headquarters, 1-800-472-1988, ext. 134, E-mail: [ecollis@geosociety.org](mailto:ecollis@geosociety.org).

#### Future Annual Meetings

1999—Denver, Colorado . . . . . October 25–28  
 2000—Reno, Nevada . . . . . November 13–16  
 2001—Boston Massachusetts . . . . . November 5–8  
 2002—Denver, Colorado . . . . . October 28–31

Contact us for information on any GSA meeting.  
 We'll be glad to respond to your requests.

E-Mail: [meetings@geosociety.org](mailto:meetings@geosociety.org)

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## RESEARCH



### GSA Bulletin

An authoritative science journal covering active research areas in the earth sciences. Publishes 8-12 refereed research articles each month. The Bulletin's 100+ year record of regularly publishing important research developments reflects the evolution of the modern geological sciences. Articles span terrestrial to marine and modern to ancient environments, integrating chemical, physical, and biological information to unravel Earth's processes, history, and future. The Discussion and Reply section provides for lively debate on current topics. About 1700 pages annually. Illustrations are profuse and include full-color covers and occasional large-format inserts.

MONTHLY

## TOPICAL & CONCISE



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QUARTERLY

## APPLIED SCIENCES



### Hydrogeology Journal\*

Quarterly journal of the International Association of Hydrogeologists (IAH), available to GSA members at the IAH-member price. Features peer-reviewed papers in theoretical and applied hydrogeology. Published in English, with abstracts also in French and Spanish. Describes worldwide progress in the science and provides an affordable and widely accessible forum for scientists, researchers, engineers, and practitioners. Papers integrate subsurface hydrology and geology with supporting disciplines.



### Environmental & Engineering Geoscience\*

A joint, quarterly publication of the Association of Engineering Geologists (AEG) and the Geological Society of America (GSA). Includes refereed articles on applied topics in the environmental and hydrological geosciences, and special features like the Geology of Cities series; technical notes on current topics; a comment and reply forum; memorials to geologists of note; book reviews; and biographies on well-known geologists in the applied fields. Features new theory, applications, and case histories illustrating the dynamics of the fast-growing, environmental and applied disciplines. Co-edited by AEG and GSA.

\*Members of IAH receive Hydrogeology Journal as part of their IAH dues and should not order from GSA. Members of AEG receive Environmental & Engineering Geoscience as part of their AEG dues and should not order from GSA.

### GSA Today

GSA's monthly news magazine. Features late-breaking, hot-topic science articles, a forum for discussion of current topics, legislative updates, news about the Society and the earth-science community, job opportunities, meeting announcements, and more!

### Abstracts with Programs

Published in conjunction with GSA's regular scientific meetings. Contains abstracts of all papers to be presented at the related meeting plus programs for that meeting. Essential guides for meeting attendees; a valuable summary of current science.

### GSA Journals on the World Wide Web

Each month the PUBLICATIONS section contains the tables of contents and abstracts of each article published in *GSA Bulletin* and *Geology*. Complete issues of *GSA Today* are posted for downloading and viewing. Access the GSA home page using the Universal Resource Locator: <http://www.geosociety.org> Abstracts from *Environmental and Engineering Geoscience* are listed at: <http://128.194.195.51/journal.html>

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## Positions Open

**ALBION COLLEGE** invites applications for an anticipated tenure-track position at the Assistant Professor level in Surficial Processes/Environmental Geology. Candidates should hold a Ph.D. degree and have a strong commitment to teaching and supervising student research at a liberal arts college. Duties will include teaching courses such as Geomorphology, Glacial Geology, Environmental Geology, Groundwater Geology and Physical Geology. Additionally, all college faculty are encouraged to develop freshman seminars and honors courses. Candidates should have a willingness to participate in, and possibly direct, Albion's Environmental Sciences and Environmental Studies Concentrations. Expertise with Geographic Information Systems or other appropriate computer applications is desirable, as is work experience in an environmental field. A commitment to field work in research and in courses is desirable, and there is an opportunity to participate in Albion College's nationally recognized summer field camp program in the Rocky Mountains.

Albion's geology department has 4 FTE positions, one shared, giving us five faculty. We have well-equipped facilities, including a GIS laboratory, ICP and XRF spectrometers, modern GPS equipment, a trailer-mounted power auger and well-equipped instructional labs. We have access to SEMs, HPLC/MS, atomic absorption and other equipment on campus. Albion College is a selective liberal arts college located in south-central Michigan with a student population of 1,600.

To apply, send a letter of application with a statement of teaching and research interests and philosophy, a vita, and names of three references to Dr. William S. Bartels, Chair, Department of Geological Sciences, Albion College, Albion, MI 49224; e-mail: [wbartels@albion.edu](mailto:wbartels@albion.edu). More information on the College and Department of Geological Sciences may be obtained at [www.albion.edu](http://www.albion.edu).

### IOWA STATE UNIVERSITY APPLIED GEOPHYSICS

The Department of Geological and Atmospheric Sciences, invites applications for a tenure-track position in applied geophysics at the Assistant Professor level beginning in mid-August 1998. The position is to complement existing programs in environmental geology, hydrogeology, structural geology/tectonics, economic geology, stratigraphy/sedimentation, petrology, and geochemistry. Preference will be given to individuals with a strong background in the application of one or more of the following fields: seismic methods, electromagnetics, electrical methods, ground-penetrating radar, gravity, and 3-D subsurface imaging.

The successful candidate will be expected to develop a vigorous research program, supervise graduate students, attract external funding, and to participate actively in our graduate (M.S. and Ph.D.) and undergraduate teaching programs.

Applicants should send a letter of application, a statement of research and teaching interests, curriculum vitae, transcripts, and the names, addresses, e-mail addresses, and phone and fax numbers of at least three references to: Search Committee Chair, Applied Geophysics Position, Department of Geological and Atmospheric Sciences, 253 Science I, Iowa State University, Ames, IA 50011-3212. Applicants should hold a Ph.D. in geosciences at the time of appointment. To ensure consideration, applications should be received by December 1, 1997. Information about the Geological Sciences group can be found on the World Wide Web at: <http://www.geology.iastate.edu>.

Iowa State University is an Equal Opportunity/Affirmative Action Employer and encourages applications from women, minorities, and other protected groups.

### GEOLOGIST

Assistant Professor, tenure-track position in the Department of Geology, San Jose State University; appointment to begin Fall Semester 1998. The Department is seeking a field-oriented geologist with demonstrated ability, interest, and experience in either Earth materials (petrology, mineralogy, mineral deposits) and/or environmental geochemistry. It is anticipated that the selected individual will participate in the teaching of geology summer camp on a rotating schedule. Interest in working with K-12 earth science education would be desirable. Preference will be given to those individuals with interests and abilities in two or more of these areas. The successful candidate will be expected to teach courses in his/her own area of expertise, general education science courses for the non-science major, supervise masters thesis research, and conduct her/his own research. Ph.D. degree in an appropriate geological science is required by time of appointment.

Applicants should submit a resume copy of all graduate transcripts, names, addresses, and phone numbers of three references, and a statement of professional goals to: Dr. John W. Williams, Chair of Search Committee, Department of Geology, San Jose State University, San Jose, CA 95192-0102, (408) 924-5050; fax 408-924-5053; e-mail [williams@geosun1.sjsu.edu](mailto:williams@geosun1.sjsu.edu). Web site: <http://geosun1.sjsu.edu>. All materials must be received by 14 November, 1997.

San Jose State University is an equal opportunity/affirmative action employer and is committed to increasing the diversity of its faculty.

### STRUCTURAL GEOLOGY/TECTONICS UNIVERSITY OF WISCONSIN—MADISON

The Department of Geology and Geophysics invites applications for a tenure-track faculty position at the Assistant Professor level. The deadline for applications is November 7, 1997, and the position will be available for the Fall 1998 semester. Applications are encouraged from a broad range of specialties in the areas of tectonics and structural geology. The successful applicant will be expected to develop an active, externally-funded research program, including supervising M.S. and Ph.D. students. Demonstrated ability to teach undergraduate structural geology and field methods is required. A Ph.D. is required. Applications, including a statement of research and teaching interests, curriculum vitae, contact information for at least three references, and copies of up to five publications, should be sent to: Prof. Clark Johnson, Tectonics/Structure Search Chair, Dept. of Geology and Geophysics, University of Wisconsin-Madison, 1215 W. Dayton St., Madison, WI 53706. Additional information on the department may be found at <http://www.geology.wisc.edu>. The U.W. Madison is an EO/AE and encourages women and minorities to apply. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

### BRYN MAWR COLLEGE

The Department of Geology at Bryn Mawr College invites applications for a tenure-track position at the rank of Assistant Professor, beginning September 1998. Ph.D. required. The candidate should have a specialization in structural geology or tectonics with expertise in an area such as neotectonics, remote sensing, geomorphology, or marine geology and should complement our existing strengths in paleontology, petrology/mineralogy and sedimentary geology; is expected to contribute to our Environmental Sciences Concentration and add depth to our joint graduate program with the University of Pennsylvania.

Application deadline is December 9, 1997. Send names and addresses of three professional references, statement of teaching and research interests, and a vita to Maria Luisa Crawford, Department of Geology, Bryn Mawr College, 101 N. Merion Avenue, Bryn Mawr, PA 19010-2899.

Bryn Mawr College is an Equal Opportunity Affirmative Action Employer. The College particularly wishes to encourage applications from individuals interested in joining a multicultural and international academic community. Minority candidates and women are especially encouraged to apply.

### FACULTY POSITIONS GROUND-WATER HYDROGEOLOGY AND VOLCANOLOGY

#### STATE UNIVERSITY OF NEW YORK AT BUFFALO

The Department of Geology invites applications for two tenure-track faculty positions in hydrogeology and volcanology at the Assistant Professor level starting September 1998. The successful candidates will demonstrate a potential for research which will complement our existing programs in environmental geology and volcanology. Teaching duties for the hydrogeology position will involve hydrogeology courses at the undergraduate and graduate levels. Teaching duties for the volcanology position could be in the area of undergraduate geophysics, petrology or structural geology, with research that focuses on active volcanoes. The salary and the initial University contribution to the candidates' research equipment will be very attractive. Successful candidates must have the Ph.D. degree as of the date of appointment. Apply with a statement of teaching and research goals and a curriculum vitae, including published research, grant support and names of at least three references to: Dr. John C. Fountain, Chair, Search Committee, Department of Geology, State University of New York at Buffalo, 876 Natural Sciences Complex, Buffalo, NY 14260-3050. We will begin evaluating applicants on December 20, 1997.

The State University of New York is an Equal Opportunity/Affirmative Action Employer and encourages applications from women and minorities.

### VISITING POSITION IN QUATERNARY SOILS UNIVERSITY OF IOWA

The Department of Geology, University of Iowa, seeks a Visiting Professor, who is an outstanding teacher and researcher in the area of Quaternary studies, with focus on soils and associated surficial materials. The appointment will begin in August 1998 and extend for 2 years, with the possibility of starting January 1998 for 2.5 years. Teaching responsibilities will involve at least four courses per year. These will include two upper-level undergraduate/graduate courses: Modern and Ancient Soils, and Glacial and Pleistocene Geology, and one of our general education courses (Earth History and Resources). Other courses would depend on the candidate's expertise and departmental needs, and may include a portion of Remote Sensing. The successful candidate should have a Ph.D. and be active in research that will complement ongoing Quaternary research and surficial-process programs in the Department. Women and minorities are encouraged to apply. Applicants should send a complete resume (including a bibliography and statement of teaching and research interests) and have three letters of recommendation sent to: Dr. Richard G. Baker, Search Committee Chair, Department of Geology, University of Iowa, Iowa City, Iowa 52242-1379 (phone: 319-335-1827; fax: 319-335-1821; e-mail [rgbaker@blue.weeg.uiowa.edu](mailto:rgbaker@blue.weeg.uiowa.edu)). Final evaluation of the applicants will begin on December 1, 1997 and continue until the position is filled. The University of Iowa is an affirmative action-equal opportunity employer.

### STRUCTURAL GEOLOGIST UNIVERSITY OF IOWA

The Department of Geology invites applications for a tenure-track position in structural geology. Field-oriented individuals with a wide range of interests in structural geology and tectonics are especially encouraged to apply. The appointment will begin in August 1998 at the Assistant Professor level. We seek an outstanding researcher and teacher who will best accommodate the diverse missions of the department. Teaching responsibilities for an academic year will include a one-semester course in structural geology at the junior-senior level and two additional classes/seminars at the undergraduate or graduate level. The successful candidate should have a Ph.D. and be active in research that will complement other research programs in the department. Women and minorities are especially encouraged to apply. Applicants should send a complete resume (including a bibliography and statement of teaching and research interests) and have at least three letters of recommendation sent to: Dr. C. T. Foster, Search Committee Chair, Department of Geology, University of Iowa, Iowa City, Iowa 52242-1379 (phone: 319-335-1818; fax: 319-335-1821). Final evaluation of the

applicants will begin on December 1, 1997 and continue until the position is filled. The University of Iowa is an affirmative action-equal opportunity employer.

#### DEPARTMENT CHAIR IN GEOLOGY

COLBY COLLEGE seeks a dynamic individual to join the Department of Geology with an appointment as either Associate or Full Professor and Chair of the Department beginning September 1, 1998.

Applicants for this position should be established scientists with a reputation for excellence in both teaching and research. Areas of expertise are open, but should complement the strengths of the two existing and continuing department members in mineralogy/petrology and economic geology and in Quaternary geology and paleogeology. The department plans to launch a search for the fourth tenure-track slot in autumn, 1998, under the leadership of the new chair.

Colby College is a highly selective, nationally ranked private, residential, undergraduate, liberal arts institution with an enrollment of approximately 1700 full-time students, of whom some 40 are declared majors within the Department of Geology. The College is located within the Maine Slate Belt of the northern Appalachians; Paleozoic sediments, metasediments and intrusives dominate the geologic record of the state, with a surficial blanket of late Quaternary glacial and postglacial sediments.

All faculty are expected to maintain active research programs and the successful candidate must be able to direct research appropriate for undergraduates; the department currently requires all majors to undertake and complete independent research as part of their course of study.

To apply, please send letter of intent and complete CV, including the names of at least three persons whom the search committee may contact as references on teaching and research; candidates will be contacted prior to writing to referees. Address applications to: Chair of Search Committee, Dept. of Geology, Colby College; 5800 Mayflower Hill; Waterville, Maine 04901-8858. The Committee will begin evaluating applicants on 17 November, 1997, and continue until the position has been filled.

Colby College is an AA/EEO employer and especially encourages applications from women and minorities. For more information on the College and Department, please visit our Web site at <http://www.colby.edu/geology/>.

#### SURFICIAL PROCESSES / INFORMATION SYSTEMS MANAGEMENT BOWLING GREEN STATE UNIVERSITY

The Department of Geology seeks to fill a tenure-track position in surficial processes and information systems management starting in August, 1998. Areas of specialization are open, but coastal geomorphology, glacial geomorphology, and pedology fit well with existing department strengths. Teaching assignments might include introductory classes, geomorphology, and a graduate-level class in the candidate's speciality. In addition, participation in the summer geology field camp course would be desirable. The successful candidate would also be expected to maintain an active research program, supervise M.S. thesis projects, and contribute to the department's program in environmental geology (GIS, remote sensing, hydrogeology, and engineering geology) and to an emerging program in information systems management. Department facilities include: remote sensing/GIS laboratory (Sun & Silicon Graphics workstations), geochemistry laboratory (AAS, SEM, XRD), sedimentology/ hydrology laboratory, mineral kinetics laboratory, geophysical equipment (magnetometer, gravity meter, resistivity, shallow seismic, GPS), optical petrology laboratory, sample preparation facilities, sediment core facility, and field vehicles.

A Ph.D. is required. Applications (including a complete resume, statement of teaching and research interests, and three original letters of recommendation) should be sent to: Chair, Surficial Processes Search Committee, Dept. of Geology, Bowling Green State University, Bowling Green, Ohio 43403. Applications must be received no later than January 1, 1998. BGSU is an AA/EEOC employer.

Applications from under-represented or protected groups are urged to apply.

#### PART-TIME MICROSCOPE SALES / SCIENTISTS

Manufacturer of a new, high-resolution optical 3D microscope seeks microscopists with discretionary time interested in supplementing income through equipment sales and application development. Ideal candidate will continue to perform research in a discipline benefiting from 3D analysis. Compensation based on ability to develop and publish new applications for technology and to assist in

sales of microscopes to other scientists. Send resume to: InGen Corporation, 235 Montgomery Street, Suite 300, San Francisco, CA 94104.

## Services & Supplies

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**ALBORAN SCIENCE PUBLISHING.** Are you teaching geologic map interpretation? Try "Structural Geology and Map Interpretation" by R. Weijermars, 1997, 320 line drawings, 83 photos, 129 exerc./sol., 378 pages (8.5 x 11", flexicover). Excellent reviews. Strongly recommended. At \$24.95 you cannot afford to miss this successful textbook/lab book. Order forms are printed in *GSA Today* (April '97, p. 11) and *AAPG Explorer* (May '97, p. 28). You can also contact us by fax (Netherlands): 31 20 3640 145, or phone: 31 20 3640 331. Order Now!

**LEATHER FIELD CASES.** Free brochure, SHERER CUST SADDLES, INC., P.O. Box 385, Dept. GN, Franktown, CO 80116.

## Opportunities for Students

**France Offers Chateaubriand Fellowships in Science and Technology.** If you are working toward your Ph.D. in science or engineering, or if you have completed it in the last three years, you may qualify for a fellowship from the French government to conduct research in France. Some of the fellowships are cosponsored by French companies. The research would be performed in a French university or in a public or private laboratory. Candidates must be accepted by a French laboratory in order to be eligible for this fellowship program.

You may use existing contacts between your laboratory and a French research institution. If you do not have such contacts, you may register on the Web (<http://www.chateaubriand.amb-wash.fr>). In this case, your file will be submitted to directors of various laboratories in France who will be able to contact you directly.

Fellowships are available for a 6 to 12 month period, with a monthly stipend of \$1800 for a doctoral fellow and \$2200 for a postdoctoral fellow. Health insurance and a round-trip ticket are also provided. Only completed applications received before December 1, 1997, will be accepted. Applicants must be U.S. citizens and registered in a university in the United States or in a U.S. national laboratory. For further information: Embassy of France Office for Science and Technology Chateaubriand Fellowship 4101 Reservoir

Road, NW Washington, DC 20007-2176 (202) 944-6261 fax: 202-944-6244 <http://www.chateaubriand.amb-wash.fr> E-mail: [chateaubriand@amb-wash.fr](mailto:chateaubriand@amb-wash.fr)

**Post-Doctoral Research Associate Positions.** The Basin Research Group in the Department of Geology at the University of Alabama invites applications for two (2) Post-Doctoral Research Associate positions to begin January 1, 1998. The term of appointment is for 2 years. The successful candidates must have a Ph.D. and familiarity with geographic information systems and standard 3-D modeling software. The first position requires demonstrated skills in sedimentary basin modeling, with an emphasis on geologic and paleohydrologic processes. The second position requires demonstrated skills in carbonate sedimentology and petrography, with an emphasis on depositional environments and diagenesis. The candidates will be part of an interdisciplinary team working on basin analysis and carbonate petroleum systems research.

Applicants should send a letter of interest, curriculum vitae and the names of three references to: Chair, Search Committee, Department of Geology, University of Alabama, Box 870338, Tuscaloosa, Alabama 35487-0338. Review of applications will begin November 1, 1997, but applications will be accepted until the position is filled.

The University of Alabama is an equal opportunity, affirmative action employer which encourages applications from underrepresented groups.

**Graduate Studies in Structural & Economic Geology. Harvard University.** The Structural & Economic Geology Program in the Dept. of Earth & Planetary Sciences, Harvard University, invites applications for graduate study (Ph.D. candidates). Research efforts will emphasize the 3D characterization of complex geologic structures for hydrocarbon exploration/ production and earthquake hazards assessment. Students will have opportunities to work with modern industry seismic reflection surveys, logs, and other geologic, remote sensing, and earthquake data. Research Assistantships are available through industry and other sources and students will have opportunities for collaboration with industry scientists including summer internships. For further information on research opportunities, contact Prof. John H. Shaw ([shaw@eps.harvard.edu](mailto:shaw@eps.harvard.edu)). To receive an application packet contact the Harvard University Graduate School of Arts and Sciences, Byerly Hall, 2nd Floor, Cambridge, MA 02138 USA, or send e-mail to [adm@hugsas.harvard.edu](mailto:adm@hugsas.harvard.edu). Include your name and address, and that you are interested in information on the Department of Earth & Planetary Sciences. Completed application for admission should be submitted before the end of December. Harvard University is an equal opportunity/affirmative action employer.

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	Percent Paid and/or Requested Circulation (c/g x 100)	93%	94%

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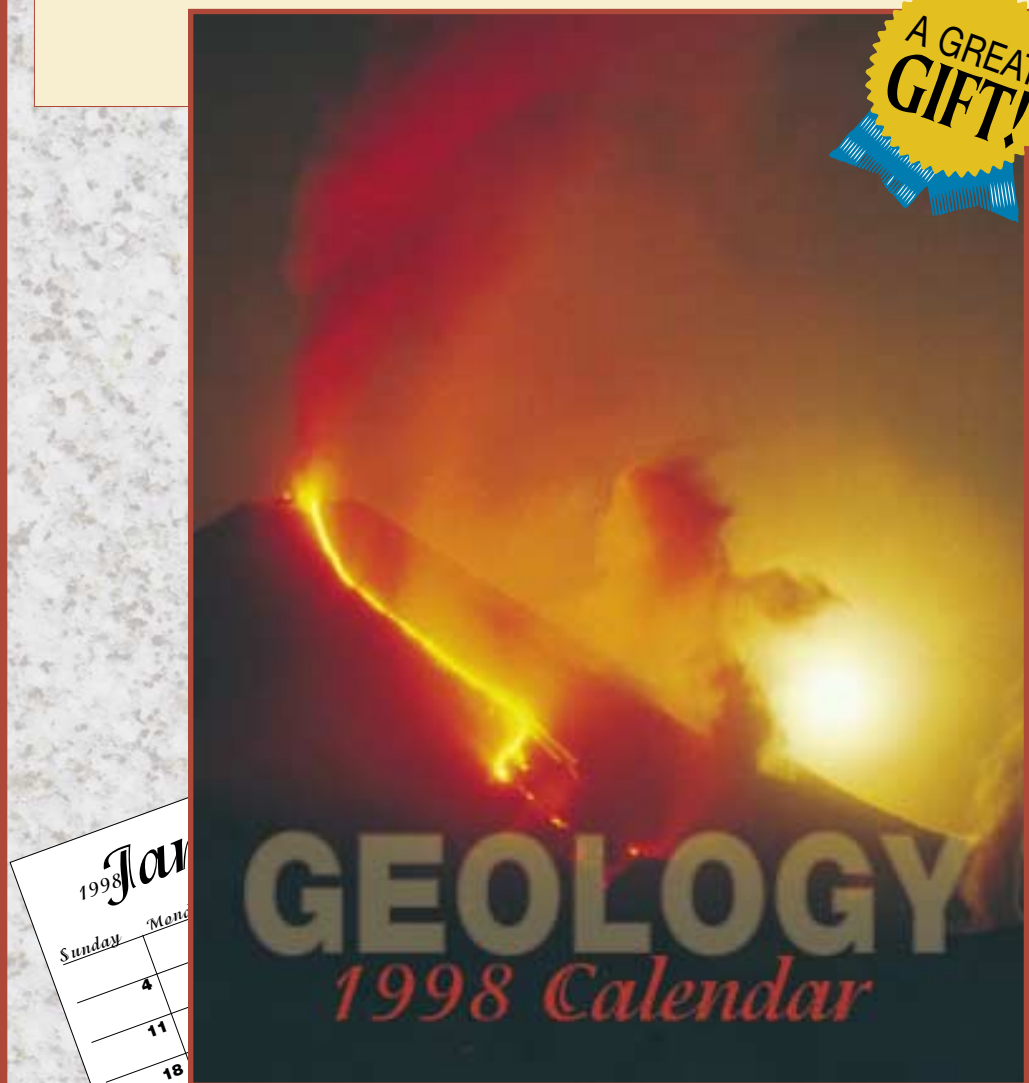


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