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GSA TODAY

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Surprise Endings to Catastrophism and Controversy on the Columbia

Joseph Thomas Pardee and the Spokane Flood Controversy

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Figure 1. Late Pleistocene strandlines of glacial Lake Missoula at Missoula, Montana. As recognized by Pardee (1910, 1942), the highest strandlines reach 1280 m. Lake Missoula was 635 m deep in the vicinity of its ice dam in northern Idaho.

ABSTRACT

Joseph Thomas Pardee (1871–1960) played a key role in the Spokane Flood controversy, in which the cataclysmic flood origins of the Channeled Scabland were intensely debated during the decades of the 1920s, 1930s, 1940s, and 1950s. Pardee first drew attention to glacial Lake Missoula in 1910. He suggested it to J Harlen Bretz as a source of the cataclysmic flooding, just prior to Bretz's famous presentation of the flood hypothesis to the January 12, 1927, meeting of the Washington Academy of Sciences. Though Pardee did not publicly advocate the cataclysmic flood hypothesis, his 1940 revelation of the evidence for rapid draining of glacial Lake Missoula, including giant current ripples and immense flood bars, proved to play a pivotal role in the eventual acceptance of the cataclysmic flooding hypothesis by the scientific community.

INTRODUCTION

The debate over the origin of the Channeled Scabland region of eastern Washington is one of the great controversies in the history of geology. The story, as generally recounted (Baker, 1978, 1981; Gould, 1980), centers on the singular role of J Harlen Bretz of the University of Chicago, but there was another major participant in that debate, Joseph Thomas Pardee.

Bretz (1978, personal communication) recalled that his interest in the scabland problem was first piqued by looking at the newly published Quincy topographic map. This map shows the great Potholes Cataract, now recognized as the product of cataclysmic flooding (Bretz et al., 1956). The year was 1910. In that same year Pardee (1910) described the geomorphological evidence for a great glacial lake occupying the intermontane basins of western Montana during the late Pleistocene. He described the prominent strandlines of the lake (Fig. 1) and the evidence for lake impoundment behind a glacial lobe in the basin of modern Lake Pend Oreille in northern Idaho. These relations were well known. Pardee (1910, p. 376) even credited T. C. Chamberlin with the discovery of the lake strandlines: "Chamberlin conceived the idea of a glacial dam and furthermore tentatively suggested that its location was in the Pend Oreille region with outflow by way of Spokane." The glacial lake was named for Missoula, Montana, where its strandlines were particularly prominent (Fig. 1).

HYPOTHESIZING THE SPOKANE FLOOD

In the summer of 1922, J Harlen Bretz began his field research with small field parties of advanced students in the Channeled Scabland. His scabland studies continued over the next seven field seasons. During those years Bretz traversed the entire region first on foot and later in his trusty Dodge 4, an early enclosed-body car. He did this with parties of students and his wife, son, daughter, and collie dog.

Bretz's first paper on the Channeled Scabland was the text of an oral

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GSA Beneficiary of the Pardee and Kelly Estates

Robert L. Fuchs
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Joseph Thomas Pardee

Mary and Ralph Kelly

Mary P. Kelly died in a Missoula, Montana, nursing home on November 16, 1994. Her last years had not been easy, in spite of the careful attention of her close friend, guardian, and attorney, Jack McInnis. Mary had broken both hips during the prior two years, and this left her bed-ridden and generally incapacitated. Additional infirmities such as pneumonia and circulatory problems, too often common afflications among the elderly, had taken their toll. However, she had plans for the future right to the end—a return to her Philipsburg, Montana, ranch, driving the two cars that she wouldn't let Jack sell, attending the GSA Cordilleran Section 1995 meeting in Fairbanks. These were ambitious plans for an 89-year-old invalid, but Mary was a strong individual and the only descendant of a unique but largely unheralded geologist, Joseph T. Pardee, who died in 1960.

The Pardee-Kelly family chronology, spanning nearly a century, includes such significant events as Joe's key role in the resolution of one of the major North American geological controversies of the twentieth century and the second largest gift ever received by GSA. Joe Pardee's career and the related chronicle of the Pardee family—Joe and his wife Ruby, Mary and her husband Ralph Kelly—are a story of lives spent out of the limelight, quietly and frugally, lives that history has now shown to have been scientifically and financially important to both geology and to GSA. The article by Vic Baker, that starts on the first page of this issue of *GSA Today,* relates the boiling controversy that for more than 40 years surrounded the Channeled Scablands, the Columbia Plateau, the Spokane (Bretz) Flood, and glacial Lake Missoula; this is the scientific side of the story. The singular financial event occurred upon Mary's death, when GSA's financial assets were enriched by the addition of the Joseph T. Pardee Memorial Fund. The income from this $2.7 million endowment is to be used by the Society "for research, study and educational advancement in the field of geology and science."

Joe Pardee was a career employee of the U.S. Geological Survey. He was appointed to the Survey in 1909 and retired in 1941. During 32 years of work, his investigations ranged from glacial deposits to gold deposits, from mine sites to dam sites. Joe Pardee spent most of his career on geology in the northwestern United States, with particular emphasis on Montana. Born in Salt Lake City in 1871, Joe grew up in a mining family. The family moved to Philipsburg, Montana, when Joe was three, and his father developed the Algonquin mine. Joe's education was at Presbyterian College in Deer Lodge, Montana, and the University of California at Berkeley. After college he opened an assay office and operated a gold and sapphire mine, but a growing interest in geology led him to the USGS. He and his wife Ruby moved to Washington in 1909, where the family lived until 1954.

The records indicate that Joe Pardee was perhaps the consummate employee—accurate, thorough, versatile, a competent professional, an effective public servant, a clear writer, and a teacher to those who followed. He was at home with both the leading geologists of his day and the ranchers and prospectors he associated with in the field. He fought red tape with a sense of humor, and his reports from the field occasionally ended with a snatch of appropriate original verse. Much of Joe Pardee's career was spent mapping in the Northwest, often accompanied

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presentation to the Geological Society of America (Bretz, 1923a). In that paper he took special care not to call upon cataclysmic origins. The paper provided a detailed description of physiographic relations in the region. He did note, however, that the indicated channel erosion required prodigious quantities of water. Referring to the three outlets at the south end of the Hartline Basin (Dry Coulee, Lenore Canyon, and Long Lake Canyon), Bretz (1923a, p. 593–594) stated, "… these are truly distributary canyons. They mark a distributive or braided course of the Spokane glacial flood over a basalt surface which possessed no adequate pre-Spokane valleys."

The idea of a truly catastrophic flood appeared in Bretz's second scabland paper (Bretz, 1923b). His interpretation of the mounded scabland gravel deposits as subfluvial bars led directly to the requirement for great water depths. This paper also included the first detailed geomorphic map of the entire Channeled Scabland, showing the overall anastomosing pattern assumed by a great flood of water.

Much of the 1920s research in the scabland region centered around Spokane, Washington, where the glacial margin was presumed to be located. Bretz named the hypothesized cataclysm the Spokane Flood because the flood source seemed to lie near that city. A year prior to Bretz's first scabland work, W. C. Alden, chief of Pleistocene geology at the U.S. Geological Survey, sent a junior Survey geologist, J. T. Pardee, to study the scabland region near Spokane. The result was a brief article (Pardee, 1922) proposing that the Cheney-Palouse scabland tract was created by glaciation of rather unusual character. Bretz visited Pardee's field locations a season or two later and found that Pardee's "glacial" deposits were actually flood bars (Bretz, 1974).

Various correspondence in the 1920s led Bretz to believe (Bretz, 1978, personal communication) that Pardee was actually considering flooding from a glacial Lake Missoula as a cause for the scabland topography. Bretz (1974) speculated that Alden dissuaded Pardee from the idea. Bretz saw a memorandum of September 25, 1922, to David White, chief geologist of the U.S. Geological Survey, in which Alden noted of Pardee's work: "… very significant phenomena were discovered in the region southwest of Spokane.… The results so far … require caution in their interpretation. The conditions warn against premature publication."

At the famous 1927 "scabland debate" at the Geological Society of Washington (Bretz, 1927) Pardee was silent on the Missoula source for the flood. Bretz believed that Pardee's superiors at the Survey, particularly Alden and Kirk Bryan, were antagonistic to the cataclysmic flood hypothesis. Did Pardee indeed first hypothesize the flooding associated with the Spokane Flood controversy? Did the critical reception accorded Bretz's hypothesis (Baker, 1978) provide a deterrent to his own theorizing?

Pardee wrote to Bretz in 1925 suggesting that Bretz consider the draining of a glacial lake as a possible source for the cataclysmic Spokane Flood. In 1926 correspondence to J. C. Merriam, Bretz wrote:

> Mr. Pardee of the Federal Survey, who has seen much of the scablands, has suggested that his glacial Lake Missoula might have afforded the water for these enormous rivers if it were suddenly drained out across the plateau. This comment indicates tha[t] his former view of scablands by land ice and concomitant subglacial drainage under ordinary climatic melting has been abandoned. Even our ultra-conservative in Pleistocene geology, Dr. Alden, wrote that the phenomena I describe certainly appear to be river work "if you could only show where all the water came from in so short a time."

PARDEE'S SCABLAND HYPOTHESIS

Brian K. McDonald, grandson of Thomas Large, a confidant of both Bretz and Pardee in the 1920s, has extensively researched correspondence relating to the origins of the cataclysmic flooding hypothesis. Thomas Large wrote prolifically on various speculations concerning scabland origins. Correspondence (researched by McDonald), in the summer of 1922 to Barton W. Evermann, contains the following passages:

> … One of Pardee's most interesting theories is that this broad belt of rough lava extending from Medical Lake and Cheney down through the state to Pasco is due to sub-glacial water erosion. Neither glacial nor river erosion will account for it as it has no gradient, while water under pressure under the ice could cut out a hole of any depth and rise again where resistance was least. I have as yet not been able to pick any flaws in the hypothesis. As yet we are very much in doubt as to the depth of the ice sheet. Some evidence which I have would indicate not over 200 feet between Cheney and Medical Lake. Objection will be made that this is not sufficient to cause ice movement over so large an area but it must be remembered that there is an average slope from here to Pasco of about 14 feet per mile.
>
> … Prof. J Harlan Bretz of U. of Chicago has been to see me twice since I wrote you. He has a group of geology students and they have gone over some of my work. He thinks that glaciation on the "prairies" may be Wisconsin but I am quite sure he does not make allowance for the aridity of this climate and its effect on slowing down weathering. Furthermore he must account for the two other glacial

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ANNOUNCEMENT

TRAVEL GRANT PROGRAM

30th IGC in Beijing, China • August 4–14, 1996

The Geological Society of America is accepting applications for the International Geological Congress (IGC) Travel Grant Program.

This program was established as a final act of the Organizing Committee for the U.S.-hosted 28th IGC held in Washington, D.C., in July 1989. Surplus funds available at the conclusion of the 28th IGC were transferred to the GSA Foundation with the stipulation that income from the fund be used to support the attendance of young geoscientists at future IGCs, until such time as the United States again hosts an IGC. Travel grants will consist of economy airfare to and from China.

To be eligible, an applicant must be a resident or citizen of the United States (includes students); must have a birth date after August 31, 1956; and must have an abstract for inclusion in the program of the 30th IGC.

Official application forms are available from the Grants Administrator, GSA Headquarters, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301. Along with the form, applicants must include a copy of the abstract that was submitted to the 30th IGC. Applications must be supported by two letters from current or recent supervisors; students may use faculty members. **Qualifying applications and letters of support must be postmarked no later than September 15, 1995.** Applicants will be notified of results early in 1996.

NOTICE OF COUNCIL MEETING

Meetings of the GSA Council are open to Fellows, Members, and Associates of the Society, who may attend as observers, except during executive sesions. Only councilors, officers, and section representatives may speak to agenda items, except by invitation of the chair. Because of space and seating limitations, notification of attendance must be received by the Executive Director prior to the meeting. The next meeting of the Council will be Tuesday afternoon, November 7, 1995, at the annual meeting in New Orleans.

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What's new on the GSA home page on the World Wide Web? If you haven't yet connected to the Web, the Universal Resource Locator (URL) is **http://www.aescon.com/geosociety/index.html.**

1995 New Orleans Annual Meeting Technical Program: NOW AVAILABLE! Go to **Meetings** and choose **1995 Annual Meeting.** This area also contains information about field trips, continuing education, exhibits, travel, lodging, and registration.

If you want to know more about the GSA Employment Service or about becoming a GSA Campus Representative, check the **Membership** section, which also has information on nominating a member to fellowship and on obtaining forms for applying to become a GSA Member or Student Associate.

See the **Geoscience Calendar** section for a listing of meetings of general geological interest.

The **Publications** section has a monthly table of contents and abstracts of articles for the *GSA Bulletin* and *Geology.* Also in this section is a guide for authors preparing manuscripts for submission to GSA publications. *GSA Today* issues are posted here for downloading and viewing.

For Congressional Contact Information, see the **Administration** section. ■

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> trains at lower levels which in no way connect with the dissected plateau prairies. He says my "out-let" by way of Mica, California Creek, and North Pine will stand. Also my marginal moraine at Pantops. Thinks he may find some evidence of ground ice on south side of the Spokane Valley above the city. May leave a student here to hunt for it. I am willing he should. He goes after Pardee hard on origin of Palouse soil and glaciation farther South-west. As Pardee is a careful man and had six weeks and a "Ford" to go over the ground while Bretz had about 10 days and only "Shank's mares" it looks like a good fight in prospect.

Confirmation that Pardee's views are accurately presented in Large's letters is provided by correspondence in 1943 between Pardee and University of Michigan professor W. H. Hobbs, who proposed (Hobbs, 1943) a glacial origin for the Channeled Scabland. Hobbs wrote to Pardee about the 1922 paper and received the following reply:

> ... The "drift" referred to in the article in Science consists of bouldery deposits which at that time (1922) I interpreted as a gravelly till transported and deposited by glaciers that extended far over the Columbia Plateau. The principal feature of the deposits that suggested glacial action is the presence of large boulders, some of them of foreign origin. From information of the region that has been made available since 1922, however, I have concluded that the deposits are more likely the work of flood waters, such as postulated by Bretz, rather than of glacial ice. That is—I do not regard them as conclusive evidence of glaciation. On the other hand the deposits are indirectly, if not directly, related to glaciation and may have been formed by streams that gouged out the channels and basins under an ice cover as you suggest.

Though Pardee may not have advocated the cataclysmic flood origin of the scablands, Bretz was not its first proponent. McMacken (1937) attributed a "Flood Theory" to a teacher at Lewis and Clark High School, Alonzo P. Troth, who apparently never published his hypothesis.

PARDEE'S REVELATION

Whatever the origins of the cataclysmic flooding hypothesis, J. T. Pardee played a major role in the resolution of the Spokane Flood controversy. His contribution came in rather dramatic fashion at a 1940 meeting of the American Association for the Advancement of Science in Seattle, Washington. Howard Meyerhoff (1978, written communication), who attended that meeting, recalls a key moment in a session organized to debate various proposed origins of the Channeled Scabland. The session, held on Tuesday afternoon, June 18, was entitled "Quaternary Geology of the Pacific." The session paper titles suggested that nonflood origins of the Channeled Scabland would be strongly advocated. A postmeeting field trip had been organized during which Richard Foster Flint of Yale University would demonstrate the evidence for a noncataclysmic origin of the Channeled Scabland. Bretz was invited to participate, but he refused, noting that all of his ideas were in print and that the field evidence would speak for itself.

Early in the session Flint gave a well-prepared synopsis of his complex arguments (Flint, 1938) of proglacial outwash stream aggradation and incision. Flint had proposed that the surface form of the scabland flood bars was that of "non-paired stream-cut terraces in various states of dissection" (Flint, 1938, p. 475). This was an idea

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PEPTALK

Barbara L. Mieras, Partners for Education Program Manager

PEP Members "Bridging the Gulf"

PEPpy greetings to all present and future members of the Partners for Education Program. Please come see us at the GSA 1995 Annual Meeting in New Orleans, where geoscience education promises to be a captivating topic. The Geology Education category received a whopping 118 abstracts, and the two educational theme sessions, Environmental Issues across the Geoscience Curriculum (T45) and Making Connections: Ties between K–12 and University Education (T46), each received more abstracts than any other theme sessions.

Whether or not you're a PEP member, please stop by our PEP-SAGE booth (#414 and 416). We'll have plenty of Partnering information for you and lots of dynamic science education resources for you to examine. We'd like to have everyone see your smiling volunteer faces, so if you're not the camera-shy sort (or even if you are), please proceed directly to the nearest mail drop and send us a picture of you (and your Partner, if possible) for display in the PEP booth.

You can also let everyone in New Orleans know you're part of the PEP team by wearing a PEP volcano sticker on your registration badge. If you don't receive your sticker before the meeting, we'll have a supply at the PEP booth. If you haven't joined PEP but would like to, we'd be glad to remedy that situation at the booth, too. Incidentally, a bright purple PEP registration flier will accompany each GSA member's 1996 dues statement, so another quick way to join PEP is to fill in the back of the flier and return it to us. If you're already a PEP member, you might want to share the flier with someone else (your Partner?) We're currently averaging one new PEP member a day. Let's keep going!

In New Orleans, we'll also be hosting a PEP reception on Tuesday, November 7, from 4:30 to 6:00 p.m. This will be a great opportunity to meet other volunteers who share in K–12 geoscience education. Watch for more details at the meeting registration and the PEP booth. Finally, don't forget to save Monday, November 6, from 4:00 to 6:00 p.m., to participate in the Earth Science Educators' Social Hour, the Rock Raffle, and the Share-A-Thon. If you have a tempting rock, mineral, or fossil sample to donate to the Rock Raffle, please call us at (800) 824-7243 for more information. Thanks! ■

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that Bretz (1923a) had introduced, but rejected after further study. Flint (1938) proposed that the normal process of channel aggradation by proglacial outwash streams was followed by dissection to leave remnants of a fill that locally resembled bar forms.

Subsequent papers at the 1940 meeting reiterated various hypotheses for the origin of the Channeled Scabland. E. T. Hodge (1940) presented his scenario involving glacial erosion in the scablands associated with complex damming and diversions by river ice. I. S. Allison (1940) presented a synopsis of Flint's fill hypothesis and contrasted it with his own ice-jam theory. In a later paper Allison (1941) pointed to key shortcomings in the Flint hypothesis.

The eighth speaker in the session was Joseph Thomas Pardee, who rose to speak on "Ripple Marks(?) in Glacial Lake Missoula." The modest title and the low-key delivery were deceiving. Pardee quietly described the "ripple marks" at Camas Prairie (Fig. 2), an intermontane basin in northwestern Montana. He described their size as "extraordinary," heights of up to 15 m and spacings of as much as 150 m (Pardee, 1940). His written discussion (Pardee, 1942) also had an understated title, "Unusual Currents in Lake Missoula." His work, dating back to before Bretz's studies, clearly demonstrated that Lake Missoula was the source of catastrophic floods through the Channeled Scabland. He noted that about 2000 km^3 of water were held in the lake. Moreover, the glacial dam impounding this lake had clearly failed suddenly, with a resultant rapid draining of the lake. Evidence for this failure included severely scoured constrictions in the lake basin, huge bars of current-transported debris (Fig. 3), and the giant current ripple marks. However, Pardee (1942) did not state the connection to the Channeled Scabland. Perhaps he generously left that point to Bretz.

In the summer of 1952, Bretz, then nearly 70 years old, returned for his last summer of fieldwork in the Channeled Scabland. The purpose was to investigate new data that had been obtained in surveys for the Bureau of Reclamation's Columbia Basin project. H. T. U. Smith accompanied him, acting in the field as "skeptic for all identifications and interpretations" (Bretz et al., 1956, p. 761). George E. Neff of the Bureau of Reclamation pointed out many new exposures of flood sediments.

Bretz returned from the 1952 field season with a wealth of new data. The U.S. Bureau of Reclamation had been especially generous in supplying maps, aerial photographs, and sedimentological information. Bretz wrote the extensive report over the next year. In that paper (Bretz et al., 1956), the most convincing evidence for cataclysmic flooding proved to be the presence of giant current ripples on bar surfaces (Fig. 4). These showed clearly that bars 30-m high were completely inundated by phenomenal flows of water. Numerous examples of giant current ripples were found on the same bars that Flint had interpreted as normal river terraces. Such features could have been produced only by the flow velocities associated with truly catastrophic discharges.

J. T. Pardee may have been wrong in his 1922 interpretation of scabland flood bars, but his 1940 description of giant current ripples proved to be the key point for convincing skeptics of the cataclysmic flood hypothesis. His first paper on glacial Lake Missoula was published in 1910, only one year after he began his 32 year career with the U.S. Geological Survey. His last paper on the subject appeared in 1942, the year after his official retirement from government service on May 30, 1941, at the age of 70. His recognition of the giant current ripples of Lake Missoula was followed by the documentation of 15 scabland ripple fields by Bretz et al. (1956) and nearly 100 by Baker (1973) and Baker and Nummedal (1978) (Fig. 4). The hydraulics of the cataclysmic flows have proven to be physically consistent with the various geomorphological field evidence (e.g., O'Connor and Baker, 1992). Unresolved issues remain as to the numbers, sizes, and timing of the late-glacial floods (Baker and Bunker, 1985; Waitt, 1985), which have now been named for Lake Missoula (Bretz, 1969), the source that was so well documented by Joseph Thomas Pardee.

Figure 2. Giant current ripples at Camas Prairie, north of Plains, Montana. The ripples are composed of foreset-bedded gravel and consist of ridges up to 15 m high, spaced as much as 200 m apart. They cover approximately 10 km^2 of northern Camas Prairie.

Figure 3. Giant flood bar at the mouth of a small tributary to the Flathead River valley near Perma, Montana. Described as "gulch fills" by Pardee (1942), the deposit is an eddy bar (Baker, 1973) formed during the rapid draining of glacial Lake Missoula. The low terrace in the foreground consists of lacustrine silt emplaced by the reformation of glacial Lake Missoula after its cataclysmic draining phase.

DISCUSSION

The Spokane Flood controversy has been cited as an illustration of the role of hypotheses in geological science. Emphasis in previous work centered on the role of the "outrageous hypothesis" (Davis, 1926) proposed by Bretz. Formal scientific publications provided the major source for description of the controversy. However, correspondence among the participants reveals a more complex and human character to the controversy. Hypotheses in geology have a profoundly human dimension. Though often associated with single individuals, usually the authors of key scientific papers, hypotheses may emerge from exchanges with colleagues over controversial explanations. The multiple working hypotheses described by Gilbert (1886) and Chamberlin (1890) are worked out among the members of a scientific community. Similarly, the eventual acceptance of a controversial explanation by that community is also a human process. The Spokane Flood controversy provides an excellent example of the social dimension to achieving reliable scientific knowledge.

Figure 4. Giant current ripples at Spirit Lake, Idaho. The partial forest cover indicates the immense scale of these bed forms.

ACKNOWLEDGMENTS

I thank Brian K. McDonald for sharing the results of his archival research into correspondence relating to the Spokane Flood controversy. Conversations with the late J Harlen Bretz provided the stimulus for my original research into the history of the controversy.

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Penrose Conference Scheduled

Tectonic Evolution of the Gulf of California and its Margins

April 16–21, 1996

A GSA Penrose Conference, "Tectonic Evolution of the Gulf of California and its Margins," will be held April 16–21, 1996, in Loreto, Baja California Sur, Mexico. Loreto, a small fishing and tourism town, with direct air service from Los Angeles, is located within the Gulf extensional province on the Gulf of California. The conveners of the conference are Paul Umhoefer, Joann Stock, and Arturo Martín.

This conference will focus on the tectonic development of the Gulf of California region during the past ~15–20 m.y. The Gulf of California is one of two examples on Earth of active oblique-rift plate boundaries. The Gulf of California, and its link to the San Andreas fault system, received much attention during the early days of plate tectonics as a demonstration of the simplicity and the kinematic consistency of the transform model. As a geologically young and currently active plate boundary, the Gulf of California has been the subject of continued investigation by many geoscientists. Because it is an active and accessible plate boundary, it is the focus of a growing community of researchers. However, this region has not received the attention it merits, particularly with respect to integration of marine- and land-based research, and the analogues it may provide to the development of other oblique continental rifts, young oceanic rift systems, and transform-type plate boundaries.

The objectives of this Penrose Conference are to assess the state of knowledge of the Gulf of California region, investigate areas and topics of greatest potential future research, and stimulate collaboration on future research projects in both earth and ocean sciences. In order to assess the tectonics of the Gulf of California and its margins, the conference will cover all aspects of the subject, including relation to the San Andreas fault, plate motions, marine geology and geophysics, seismotectonics, magmatism, structural geology, tectonic geomorphology, stratigraphy and paleontology, geodynamics and modeling of rifts, and comparison to other young rifts. The geographic range of the conference encompasses the marine realm of the Gulf of California and its mouth and the onshore margins in Jalisco, Sinaloa, and Sonora on the east, the Salton Trough in California on the north, and the eastern margin of the Baja California peninsula on the west.

The four and one-half day conference will commence with a late-afternoon summary of the southern San Andreas system and plate motions. The next day and a half will involve sessions on the deep marine areas and margins of the Gulf of California. Then we will spend a day and a half on a field trip in the Loreto area, led by Paul Umhoefer, Becky Dorsey, and Larry Mayer, during which we will examine structures, rock units, and landforms related to the formation of the Gulf of California. On the last day of the conference, we will compare the Gulf of California to other rifts and discuss experimental, analytical, and geodynamic modeling of oblique rifts.

We are especially interested in having a conference that is truly international and involves many researchers from Mexico and the United States, as well as outside North America. Our predecessors said it nicely 20 years ago, when they summarized the first Penrose Conference on the Gulf of California in the February 1975 *Geology:* "… the conference ended with discussion of where and when to hold the next Gulf of California conference. Hopefully, this would occur in Mexico, particularly in light of the need to establish better liaison with Mexican scientists." We couldn't have said it better.

The conference will be limited to about 70 participants. The conference fee has not yet been established, but we hope that it can be less than $750. The fee will include ground transportation from/to the Loreto airport, registration, food, field trip, and double-occupancy lodging. Limited support is available for some graduate students, and we are attempting to obtain partial support for Mexican geoscientists and some participants from outside North America.

Application deadline is November 1, 1995. Prospective participants should send a letter of application to Paul Umhoefer. The letter should describe briefly your research related to the objectives and plan of the conference, and your phone, fax, and E-mail address, if available. The conference is designed to involve all of the participants in either keynote presentations, short oral talks, poster presentations, or active discussion. Thus, in your letter of application, if appropriate, please indicate a title for your prospective short talk or poster. After the applications are received, formal invitations will be sent out in December 1995.

Please direct any questions to one of the conveners: ***Paul J. Umhoefer,*** Department of Geology, Box 4099, Northern Arizona University, Flagstaff, AZ 86011, (520) 523-6464, fax 520-523-9220, E-mail: pju@nauvax.ucc.nau.edu; ***Joann Stock,*** Seismological Laboratory 252-21, California Institute of Technology, Pasadena, CA 91125, (818) 395-6938, fax 818-564-0715, E-mail: jstock@seismo.gps.caltech.edu; ***Arturo Martín,*** Departamento de Geología, CICESE, P.O. Box 434843, San Diego, CA 92143-4843, (011-52 from U.S.) 617-4-45-01, ext. 2425, fax (011-52 from U.S.) 617-4-49-33, E-mail: amartin@cicese.mx. ■

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by Ruby and Mary. He provided important geological input for the siting of the Grand Coulee and Hungry Horse dams, and he played a major role in the discovery of phosphate deposits. His paper USGS Bulletin 842 (see References list) is considered to be an authoritative and thorough compilation of the ore deposits of west-central Montana. As for his role in the Channeled Scabland controversy, after gradually piecing together the evidence, gathered over a vast area and a long period of time, Joe Pardee reported his conclusions in the 1942 *GSA Bulletin* paper "Unusual Currents in Glacial Lake Missoula," and orally in 1940. These were landmark findings that brought the final piece to the Channeled Scabland puzzle and allowed resolution of the controversy.

Joe Pardee's penultimate published work was "Late Cenozoic Block Faulting in Western Montana," which appeared in the *GSA Bulletin* in 1950. This work consolidates the ideas formed during more than 40 years of field work and observation. Joe Pardee died in 1960 and left his entire estate to Ruby. When she died in 1976, the estate was valued at $1.2 million and her will established a trust for the benefit of Mary, with GSA designated as the remainder beneficiary upon Mary's death. In late 1987 Mary and her husband, Ralph Kelly, each set up charitable remainder unitrusts for their personal estates. GSA was again named as a remainder beneficiary of these unitrusts, in both cases to the extent of a 25% interest. Ralph died soon thereafter, and Mary became the sole income beneficiary of all three trusts. Upon Mary's death last year, these three interests passed to GSA, thereby creating the Joseph T. Pardee Memorial Fund.

Mary Kelly was a journalist, not a geologist, but long summers in isolated Rocky Mountain cabins and field camps with Joe and Ruby had a decided influence on her. Born in the Bitterroot Valley of western Montana, she grew up in Washington, D.C. toward the close of the era of horse-drawn carriages and gaslights. The family traveled extensively because of Joe's field work, and Mary returned to Montana to attend the University of Montana in Missoula, where she earned a degree in journalism. She worked many years for newspapers in Montana and Alaska. She and Ralph met in Great Falls, wed, and moved to Fairbanks, where they wrote and farmed. In 1946 they returned to the family homestead in Philipsburg, Montana. This ranch was their home for the rest of Ralph's life and until Mary entered the nursing home in Missoula.

In their later years the Kellys traveled extensively. Just about every trip ended with an increase in the Philipsburg rock collection. Although neither was trained as a geologist, Mary and Ralph maintained a keen interest in rocks, geology, and landforms. Mary described herself as a geologist "by infusion" as a result of those months in the field with Joe and Ruby in Montana and the Northwest. An example of her writing ability is the memorial she wrote to her father, and which was published in the GSA Bulletin (see References list).

Reflecting on the lives of Joe Pardee and Mary Kelly, it is impossible to establish a point source for the significant wealth that was accumulated over a century. We can only assume it to be a supurb manifestation of frugal, hard-working lifestyles at modest income levels combined with careful, conservative, consistent investing. The camouflage was near-perfect, for in their later years Mary and Ralph were considered by the townspeople in Philipsburg to be old and poor. True, they were old, but they were decidedly not poor. This is not to say that the Pardees and Kellys were miserly. They enjoyed life, they traveled, and Mary evolved into a supporter of every charitable cause that managed to locate her mailing address.

What is the legacy of these unsung lives that are now concluded? Through the Pardee and Kelly philanthropy, many young people will become interested in Earth and science, and many future geologists will receive direct and indirect financial support during their careers. The Pardees and the Kellys were masters at surprise, and they saved the best for last!

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FORUM

Bruce F. Molnia

Forum is a regular feature of *GSA Today* in which many sides of an issue or question of interest to the geological community are explored. Each Forum presentation consists of an informative, neutral introduction to the month's topic followed by two or more opposing views concerning the Forum topic. Selection of future Forum topics and participants is the responsibility of the Forum Editor. Suggestions for future Forum topics are welcome and should be sent to: Bruce F. Molnia, Forum Editor, U.S. Geological Survey, 917 National Center, Reston, VA 22092, (703) 648-4120, fax 703-648-4227.

Stratified Drift—Who Needs It?

"Words are the instruments of thought; they form the channel along which thought flows; they are the moulds in which thought is shaped. If we wish to think correctly it is essential that we should use the appropriate words."

—Aldous Huxley, 1936

PERSPECTIVE 1: Introduction

Bruce F. Molnia, Forum Editor

Much of our geological vocabulary and many of our fundamental precepts date back to the 18th and 19th centuries. While our technology becomes more sophisticated on a monthly or yearly basis, our vocabulary evolves very slowly, changing little, if at all, over decades or lifetimes. This month's Forum addresses the issue of the nomenclature of glacial deposits. Perspectives 2 and 3 not only deal with the historical origins of the nomenclature, but also with how communities beyond the geological sciences use and interpret our vocabulary. Although this Forum is only focused on a small component of glacial vocabulary, the message presented here is applicable to the entire cross-section of our discipline. I would like to hear about other similar situations throughout the profession.

PERSPECTIVE 2: Stratified Drift as Historical Baggage

Robert M. Thorson and Greg Brick, University of Connecticut, Storrs, CT 06269

"Stratified drift" is a famous phrase. This compound noun, this taxonomic unit, and this legal term is also an evocative pair of words that brings us back in time to when geology was a fledgling discipline, struggling against biblical orthodoxy. The phrase was coined during the "Age of Jefferson," but what should we do with it now, at the dawn of a new millennium?

In a strictly literal sense, the phrase "stratified drift" is unambiguous. It is nothing more and nothing less than layered glacial sediment. Use of the word "stratified" as an adjective is consonant with the 19th century origin of the word "drift," a noun that remains deeply rooted in our nomenclature, despite its anachronistic, Noachian overtones. This adjectival usage, however, often confuses students of glacial geology in New England, apparently because they have learned otherwise in their beginning course work. They have learned to use the term "stratified drift" not as a phrase, but as a compound noun that describes a sedimentary texture and which is the antithesis of till, an even more complicated word. Their polarized view is consonant not with the term's diluvial legacy, but with their modern educational objectives. Students really care about material properties and facies architecture because it will help them solve "environmental" problems, but they have little reason to fret about the delayed acceptance of the glacial theory in North America more than a century earlier.

Normally, we wouldn't care either, because neither of us enjoys the sophistry of semantics or the nitpicking of moribund taxonomies. But here in southern New England, where both Lyell and Agassiz debated the glacial theory before 1850 and where many of the nation's glacial geologists continue to be trained, the term has substantial economic consequences that result from its material contrast with till.

The distinction between till and stratified drift is not as clear-cut as a solid line on the map would imply. Indeed, stratified drift is commonly layered, but it doesn't have to be, especially in the gravel fraction. Many of our local till localities contain stratified intervals, particularly those with basal meltout facies and remobilized, secondary tills. Furthermore, mappable units of well-stratified eolian sand are not considered stratified drift, whereas unstratified cover sands are, by inclusion, considered stratified drift, regardless of their thickness. In spite of these obvious inconsistencies, most geologists know their glacial sediments reasonably well, understand what "stratified drift" means, and are familiar with the artificiality of discrete map units. The problem, however, resides not with those we train, but with those we do not train—the attorneys and administrators who write and enforce state statutes and who believe that stratification is the salient attribute for "environmental" mapping.

Fussing over the term "stratified drift" is thus much more than an academic exercise. Land-use regulations are based on the amount of "stratified drift" present. Flood forecasting models require the aerial extent of "stratified drift" in a watershed as input. The U.S. Department of Agriculture and the U.S. Geological Survey draw sharp boundaries between stratified drift and till. Curiously, the connotation of layering implicit in the compound noun "stratified drift" is subordinate to the connotation of texture. And ironically, statewide regulations for wellhead protection in "stratified drift" aquifers do not require that stratification, or vertical anisotropy, be taken into account.

All was fine until one day one of us (Thorsen) was asked the proverbial "good" question by a student, one motivated by curiosity but containing hints of challenge to professorial authority. "If the term is so bad," she said "why do you still use it so much?" Fumbling for an answer, because he had never really thought about it, Thorsen replied weakly: "Because it's in Flint's Bible, and because we live in the "Land of Steady Habits" (an unofficial state motto, describing the traditionally conservative Puritan world of Connecticut). Since that day, on which Thorsen was accused of merely recapitulating what he had learned, it was clear that this Perspective needed to be written.

Richard Foster Flint, affectionately dubbed the "Pope of the Pleistocene," promulgated the term in his 1971 canonical work "Glacial and Quater-

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Getting Rid of Garbage: A Room Problem for the 21st Century

Jill S. Schneiderman, GSA Congressional Science Fellow

In the early 1900s, Ascutney Mountain was Reginald Daly's muse in his search for an answer to the 20th century "room problem" of the emplacement mechanism for granites in Earth's crust. Now we confront a room problem of a different sort: where shall we put the wastes generated by massive consumption? Disposal of municipal solid waste, the garbage we produce in our daily activities, was cited among the largest environmental concerns of at least 60% of the countries submitting national reports to the United Nations in preparation for the 1992 Earth Summit in Brazil. The United States, Australia, New Zealand, France, and Canada top the list of nations that generate the most municipal solid waste per capita. According to the U.S. Environmental Protection Agency, the average U.S. resident produces more than 0.75 tons of trash each year. Despite attempts to curtail it, waste production has steadily increased; in 1960, each American produced 2.7 pounds of waste per day, compared to 4 pounds in 1988 and 4.4 pounds in 1993. We dispose of most of the 200 million tons of municipal waste produced by people in the United States by burying it in landfills. Given that geologists no longer subscribe to the expanding Earth hypothesis, our society must pursue alternative strategies for waste disposal.

Municipal solid waste includes nonhazardous durable and nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. As reported by the EPA in 1994, paper and paperboard products constitute the biggest component of trash by weight in the United States (38%) and yard trimmings the second largest portion (16%). Glass, metals, plastics, wood, and food wastes range between 6% and 9% each by weight of total municipal solid waste generated. Rubber, leather, textiles, and small amounts of miscellaneous wastes each make up approximately 3%. Most of this waste is buried in landfills or burned in incinerators.

For the past six years, the U.S. Congress has attempted to deal with the issue of transportation and disposal of municipal solid waste. The 104th Congress has moved closer to a solution with the Senate's passage of S. 534, the "Interstate Transportation of Municipal Solid Waste Act of 1995." Congress was forced to act on this issue because the Supreme Court recently found that state laws governing the interstate transportation of trash, considered an article of commerce, violate the Commerce Clause of the U.S. Constitution. The goal of the bill is to provide authority for states and local governments to control the transportation of municipal solid waste between and within states. It attempts to resolve the tension between the needs of waste-exporting states, such as New York and New Jersey, and those of states leery of becoming the nation's dumping ground. Sparsely populated western states are especially averse to interstate waste transportation. Their sentiment was expressed on the Senate floor by Senator Tom Daschle (D—SD) and printed in the Congressional Record, "Some of these lands are fragile and are home to some of our country's greatest natural assets. In South Dakota alone, the geological wonderland of the Badlands, the expansive prairie, the majestic Black Hills are examples of areas that deserve protection from the designs of anyone who would use them for waste disposal." Though only a temporary solution, the bill is a step in the right direction because it encourages states to take responsibility for managing the waste they generate, rather than sending it elsewhere.

The bill consists of three titles: interstate waste, "flow control," and ground-water monitoring. The interstate waste title provides authority to every state to restrict out-of-state municipal waste. It allows every gover-

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nary Geology," even as he apologized for its deficiencies:

> "Geologists early subdivided drift into two supposedly distinct kinds: till or nonstratified drift, and stratified drift.... Till was soon seen to be a direct glacial deposit [because its properties] show that the selective activity of water had played a minimum part in its deposition.... In contrast stratified drift, as its name implies, is sorted according to size and weight of its component fragments, and thereby indicates that a fluid medium far less viscous than glacier ice, in other words water or air, was responsible for depositing it."

Since its publication, geology professors continue to pay homage to Flint's legacy by using his classification system. But three curious aspects of the passage quoted above suggest that we should be suspicious about following his advice. First, Flint stated that "geologists early subdivided drift into … till and … stratified drift," but he did not cite a precedent or describe who the "early geologists" were. With respect to the term "drift" there is little question. In the early 1830s, Charles Lyell, in his sweeping refutation of catastrophist opponents, first used the word to describe a mechanism (not a sediment) whereby Diluvial deposits could be explained by earthly, rather than supernatural, processes. Murchison, in 1836, and in a calculated move away from biblical constraints on our thinking, suggested that the term "Drift" be used as a noun to replace the word "Diluvium." With the exception of the capital "D" the term "drift" remains, to this day, as a useful term for describing undifferentiated glacial deposits of all ages, origins, and material properties. The term "drift," in contemporary usage, is thus a chronostratigraphic, rather than a lithostratigraphic, unit.

The 19th century use of the term "stratified drift" was part of the debate between the terrestrial glacial theory of Agassiz and the water-laid glacial theory adopted by disciples of Lyell. In those days, those scientists favoring a watery origin for glacial sediments focused attention on the conspicuously "stratified" nature of the deposits bracketing boulder clays in regions where proglacial lacustrine or marine deposits were especially prominent. Thus, the exaggerated dichotomy between "stratified drift" and "unstratified drift" is a historic holdover from the original debate on the glacial theory, a usage that carries a genetic connotation. Once Agassiz's terrestrial theory of glaciation had gained widespread acceptance, however, the attribute of sedimentary layering in classification schemes became subordinate to attributes involving geographic position and form.

A second curious feature of Flint's passage was to broaden the definition of stratified drift to include Pleistocene dunes and loess, a reversal from his earlier views. And why not? If stratification is indeed a fundamental break in the classification system, why reserve it for glaciogenic aqueous deposits when the argument for glaciogenic eolian deposits is equally compelling? To place dunes outside of the stratified taxon would be to deny the fundamental nature of this attribute. And Flint apparently did not want to step into that quagmire.

The final and most important aspect of this passage is Flint's use of the word "supposedly" to imply that the distinction between stratified and unstratified drift is more arbitrary than real, a disclaimer that he buried in the following footnote:

> "Actually, washed drift, sorted drift, or the ancient modified drift would be a better term than stratified drift because it is more comprehensive. A great deal of drift has had the fine components washed out of it by water without having been actually stratified. But it is hardly likely that any attempt to supersede the well-established term would be successful."

Results of the International Quaternary Association's (INQUA) Commission on Genesis and Lithology of Quaternary Deposits, published 13 years after Flint's death, would suggest otherwise. After wrangling with nomenclature for nearly a decade, this esteemed group finally came up with a genetic definition for the word "till," a word whose vernacular usage in Scotland—"a kind of coarse or obdurate land"—predated Lyell's use of the word "drift." According to this international jury of peers, "till is glacial sediment that has not been significantly reworked by water." Additionally, the INQUA group differentiated many kinds of tills, some of which are terrestrial but stratified, and some of which were aqueous but unstratified.

What a conundrum! Accepting both the INQUA definition for till as "unsorted by water," and Flint's de facto definition of stratified drift as "if-it-isn't-till-it-must-be-stratified-drift," forces geologists to use the word "stratified" to mean all nontill deposits, regardless of whether the till is stratified or whether the nontill is not. Either we come up with a better synonym for "stratified drift" or we abandon its use as a compound noun.

Ironically, Flint did more to promulgate the "compound noun" usage of stratified drift than anyone else, in spite of his serious reservations. His clear preferences for using the "sorted" attribute of drift, rather than the "layered" attribute of drift for classification, was, in retrospect, well conceived, and represented a reversal in his earlier thinking. In his time, and particularly in his region, where new ideas are not quickly embraced, Flint was justifiably concerned that the term "stratified drift" would not die an easy death. And he was right, for the term lives on in the Land of Steady Habits, as an archaic provincialism in the contemporary geological nomenclature.

To support this view one need only look to the citation frequency of the term in the *Bibliography of North American Geology,* compiled by the American Geological Institute. Of 64 GEOREF data base citations between January 1988 and March 1995 with the word "stratified" and the word "drift" in the title, fully one-third are from Connecticut, and nearly 90% are from the northeastern United States. On a more qualitative basis, we surveyed the views of 17 state geologists (or their designates) in glaciated states from Maine to Alaska, and we found little contemporary use for the term outside New England. Ironically, the term "stratified drift," as a textural term, is now more important in hydrogeology than in Quaternary geology, a conclusion supported by the fact that the majority of studies with the term "stratified drift" in their title (64%), also include the word "aquifer." Perhaps even more compelling evidence for our suggestion that the term "stratified drift" lives on only as an archaic provincialism is the fact that contemporary texts on glacial geology, all written outside the region, place little taxonomic value on the historic dichotomy between till and nontill.

Excluding a few hydrologists with detailed site-specific data, the bulk of the "environmental professionals" in this region treat stratified drift as a monolithic, homogeneous, isotropic material composed of sand, gravelly sand, or sandy gravel. In this context, it is virtually synonymous with the term "aquifer" if it extends below the water table and with the phrase "excessively-drained soil" if above it. Ironically, the vertical anisotropy implied by the term "stratified" has come to be used as a surrogate for any effectively homogeneous deposit lacking a silt-clay matrix. This usage continues in spite of the fact that the most highly stratified deposits, the varved clays, are often relegated to a separate category in applied studies. A final and perhaps even more impor-

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nor to freeze current garbage imports at 1993 levels, and to ban future imports to facilities that did not receive out-of-state trash in 1993, if the local community does not want to receive it. "Flow control" refers to the authority of states and local governments to direct trash to specific facilities for processing, treatment, or disposal in order to generate predictable revenue. The flow control title allows jurisdictions to continue to direct the stream of garbage until bonds from facility construction are fully paid or the facility shuts down. The third title calls for a ground-water monitoring exemption for small landfills. Landfills that would qualify for the exemption must: accept less than 20 tons of waste per day, exhibit no evidence of ground-water contamination, and serve either a community with an annual interruption of surface transportation for a period of months, or one with no practicable waste management alternative. The bill was approved by the Senate (94-6) because it struck a balance between the two sides: it allowed exporting states to ship their waste across state lines, though at reduced levels, and provided importing states a degree of control over unwanted trash.

The bill awaits approval from the House. However, prospects of finding a compromise between the Senate bill and the House version may be dim. Opposition in the House comes both from conservatives who believe that the interstate transportation and flow-control provisions undercut free-market trade and members with environmental concerns who conclude that flow control encourages incineration rather than recycling.

As it was dealt with by the Senate, the waste disposal issue appears to be solely an economic one. But it is a classic environmental debate, safety and environmental concerns on one side and economics on the other, that could benefit from a geological perspective. Landfills throughout this country have closed (900 in 1993) because the EPA has issued stringent yet reasonable rules that require liners and collection and monitoring systems to prevent leachate from contaminating ground water. Geologists know intuitively that because of the potential threat to ground water, surface water, and soil, it is appropriate to close old, unlined or leaky landfills and inappropriate to exempt even the smallest landfills from ground-water monitoring. However, what is obvious to earth scientists is not so to legislators unfamiliar with the hydrologic cycle.

The waste disposal issue is also classic in that the observation that incinerators and landfills are commonly sited in poor, often minority, communities, began the environmental justice movement. This movement seeks to rectify "environmental racism," coined and described by National Association for the Advancement of Colored People (NAACP) director Benjamin Chavis as the deliberate targeting of communities of people of color for toxic waste facilities and the official sanctioning of a life-threatening presence of poisons and pollutants in such communities. In 1982, residents of Warren County, North Carolina, the county with the highest percentage of people of color in any county in that state, tried to prevent the siting of a landfill there that would contain PCB-contaminated soil from around the state. In NAACP v. Gorsuch, county residents presented evidence that several suitable landfill sites existed in North Carolina and claimed that the choice of Warren County was based on the race of county residents. Though they lost the case, their cause marked the beginning of the environmental justice movement. Since then, other cases concerning siting of waste facilities, lead poisoning, and water contamination have been lost and won in both rural and urban areas by environmental justice activists. For example, in South Dakota in the early 1990s, Lakota people defeated a proposal from a Connecticut-based company for a 6000-acre landfill on the Rosebud Sioux Indian Reservation.

The issue of municipal solid-waste disposal is more than an economic issue. A solution to the problem will not come from trying to buy one's way into an "out of sight, out of mind" strategy. Waste producers will not be allowed to foist their trash on unwilling communities in this country or abroad. More likely, a solution will be found in narrowing the waste stream by reducing the amounts of materials we use, by reusing those materials, and by recycling our trash. Geologists can help the public conceptualize environmental problems as those that transcend geographic boundaries. We must call attention to this imperative by highlighting the impacts of waste disposal options on air, water, and soil quality. ■

Jill S. Schneiderman, 1994–1995 GSA Congressional Science Fellow, served on the staff of Senator Thomas Daschle (SD). *The one-year fellowship was supported by GSA and by the U.S. Geological Survey, Department of the Interior, under Assistance Award No. 1434-94-G-2509. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.*

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tant concern involves propping up the distinction between stratified drift and till as inherently fundamental, because doing so inhibits an objective search for hydraulically significant layering in till, the most important regional aquitard.

So what's to be done? Following Flint's reservations we suggest that the term "stratified drift" as a compound noun be given a proper taxonomic burial. Stratification—whether in tills or not—is simply one of many important material attributes. In keeping with nearly a century's worth of advice by field geologists, the reservations of Flint in 1971, and the concerns of the INQUA commission, geologists must recognize that the fundamental geotechnical dichotomy for glacial deposits is not whether they are stratified, but whether they are elutriated (washed) and fractionated (sorted) with respect to their previous bulk texture. Logically, therefore, classification schemes should be based on sorting as a matter of first principle. Fortuitously, a genetic classification based on sorting is also the one most useful for environmental applications.

Sorting, wherever it occurs, partitions the glacial material into two fractions; one that could be transported, and a residual one that could not. Glacial erratics stripped free of their matrix and/or ventifacts deflated by wind come to mind as clear examples of the could not, or residual, fraction. The could be, or transported, fraction, is, in turn, sorted along a continuum of available stream power; deposits range from coarse open-work boulder gravels of infinitely high hydraulic conductivity to distal clay-rich varves of infinitely low conductivity. The distinction between transport by fluid shear traction (bedload) and by turbulent eddies (suspended load) produces two distinct sedimentary modes on this continuum—coarse and fine—that are manifest as the glacial and periglacial deposits so familiar to us all—outwash and slackwater deposits if transported by water, and dunes and loess if transported by wind. Although pure end-member forms do exist, most glacial deposits are dominated by intergrades of fine and coarse modes, the relative proportion of which is determined by longitudinal and transverse gradients in available stream power.

These considerations suggest that the best classification of glacial deposits is one based on the three principal criteria described, arranged in series. If it's washed it's not till, but something else, yet unnamed. If it's washed but didn't move, it's a lag deposit of some sort. If it's washed and transported, then it belongs to a much larger category composed of various facies—glaciomarine, glaciofluvial, glaciolacustrine, and glacioeolian—a category that we choose also to leave unnamed. Each of the major facies could then be classified independently, based on any number of attributes such as transport processes, bulk texture, or stratigraphic position—whatever is most appropriate in any given circumstance. Each of these classifications would likely include both stratified and unstratified taxa. In other words, the attribute "stratified" is important within specific glaciogenic facies, but it is not fundamental to a coherent classification of glacial deposits. We offer this alternative classification not to establish a novel formal taxonomy (which it isn't), but to make our critique of the entrenched phrase "stratified drift" more palatable to a suspicious audience, one perhaps weary of yet another revisionist editorial.

End the ambiguity! Down with "stratified drift!" Flint was right!

GSAF UPDATE

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PERSPECTIVE 3: Stratified Drift As Practical Terminology

Scott D. Stanford, New Jersey Geological Survey, Trenton, NJ 08625-0427

Geologic information on the state and local level is used in issues such as land-use planning, geologic hazard and resource assessment, and ground-water protection. These issues typically involve citizen groups and a variety of scientific, regulatory, and legal professionals. This public setting requires a clear, simple geological vocabulary. Terms intended for nonspecialists must be easily understood and easily applied. Terms that require specialist knowledge will be used only by those specialists. Such terms are viable in a restrictive professional setting such as law or medicine, where standard, centralized criteria for admission and practice can insure that all participants have knowledge of the terminology. Geology is not such a profession. Environmental scientists, engineers, hydrologists, lawyers, planners, soil scientists, well drillers, elected officials, and citizens all participate as equals (and, in many cases, as principals) in decisions involving geologic information. In order to do our job properly as geologists we must be able to communicate clearly with nongeologists.

The term "stratified drift," despite its flaws when evaluated within the context of specialized knowledge, succeeds as a practical term in the public setting in the northeastern United States. First, the term is easily understood. Most people can readily grasp that layering and sorting in sediments is produced by the action of water. They understand that in glacial settings this layering indicates deposition by meltwater, and that nonlayered, poorly-sorted sediment (till—another good, practical term) indicates deposition by ice. Second, the term is easily applied. Layering and sorting are readily identified in exposures by non-specialists. Layering and sorting are also generally identifiable in well or boring samples by drillers, engineers, and hydrologists. Third, the term is geologically accurate and meaningful. Glacial deposits in the northeastern United States, almost everywhere outside the Lake Ontario and Lake Erie basins, consist of glaciolacustrine, glaciofluvial, or glaciomarine valley fills of stratified sand, gravel, silt, and clay separated by broad till over bedrock uplands. These deposits almost everywhere postdate, overlie, and are in sharp contact with the till. Only in a few small ice-contact deposits does the distinction between till and stratified drift become gray, and these locations, although striking at outcrop scale, are generally too small to be of significance at even 1:24,000 map scales. Fourth, the term is familiar and etymologically distinctive. Its long history of use and quaint derivation are in the tradition of other glacial geological terms, and help make the term and its meaning memorable for nonspecialists. Finally, the term "stratified drift" carries lithologic, stratigraphic, and genetic meaning, and so distinguishes sand, gravel, silt, and clay of glacial origin and age from similar marine, fluvial, or lacustrine deposits of older or younger age. This specificity is important where there are both glacial and nonglacial unconsolidated deposits of hydrologic or economic importance.

Historically, the use of "stratified drift" in regulatory and legal contexts reflects the status of glacial geologic mapping in the middle decades of the 20th century. In the northeastern United States, the early development of regulations governing water-well drilling, water allocation, and mining during this period relied on existing state geologic maps. Glacial geology, because of the fine scale, stratigraphic complexity, and patchy distribution of the deposits, could not be portrayed through the use of formations in the manner of bedrock geology. Thus, a mix of morphologic, lithologic, and chronologic criteria were used to map and classify glacial deposits. (For example, see R. D. Salisbury, 1902, The glacial geology of New Jersey: New Jersey Geological Survey Final Report, v. 5, 802 p.; J. W. Goldthwait, 1950, Surficial geology of New Hampshire: New Hampshire State Planning and Development Commission, scale 1:250,000; D. P. Stewart and P. McClintock, 1970, Surficial geologic map of Vermont: Vermont Geological Survey, scale 1:250,000; R. F. Flint, 1930, The glacial geology of Connecticut: Connecticut Geological and Natural History Survey Bulletin 47, 294 p.)

This mix had to be simplified and standardized into a lithostratigraphy parallel to that in the bedrock to be usable to the nonspecialist, particularly at the 1:250,000 or 1:500,000 scales typical of most state geologic maps. The distinction between stratified drift and till accomplishes this simplification.

As glacial geology matures and as more detailed mapping is completed, units based on a mix of age, landform, and material are being replaced by lithostratigraphic units. (For example, see H. B. Willman and J. C. Frye, 1970, Pleistocene stratigraphy of Illinois: Illinois State Geological Survey Bulletin 94, 204 p.; and D. M. Mickelson, L. Clayton, R. W. Baker, W. N. Mode, and A. F. Schneider, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geological and Natural History Survey Miscellaneous Paper 84-1, 99 p.)

Until this transformation is well established and understood by nonspecialists, however, "stratified drift" continues to be useful and meaningful.

The danger in a public terminology is that nonspecialists may misconstrue their use of the terminology as professional understanding of the subject. In some instances, this false sense of mastery can lead non-specialists to dismiss experts as obscurantists or pedants. This, in turn, may lead to exclusion or marginalization of the experts. It is important to avoid this fate, especially in a nonrestrictive profession like geology. The recent, and ongoing, assault on state and federal geological surveys in the United States dramatizes our precarious professional situation. Clearly, our central problem as geologists is to have our knowledge and capability appreciated and valued by the public. This requires participation and accessibility on our part. Discarding familiar, useful terms is a sure way to be marginalized. It is easier to raise the level of public discussion and understanding by starting with a common language. The complexities, exceptions, and subtleties that lie behind a concept like "stratified drift" and which are important to the proper management of the water and mineral resources in those sediments, are best brought into nonspecialist forums by starting within the conceptual (and, in this case, sometimes legal and regulatory) framework of the participants rather than questioning the value of that framework. In this way, we can avoid marginalization or exclusion and, at the same time, establish our professional expertise by gently revealing the complexity behind the terminology, and demonstrating our ability to master that complexity. ■

Geological Society of America

NEW ORLEANS
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1995 ANNUAL MEETING

New Orleans, Louisiana • November 6–9

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Join us in New Orleans

The theme for the 1995 Annual Meeting is *Bridging the Gulf*. This theme has several meanings. In particular, we will draw attention to the Gulf of Mexico—Caribbean, and the surrounding American continents, bridging the knowledge gap that exists across a region divided by political boundaries and language but sharing a common geologic framework. *Bridging the Gulf* also addresses the need to develop a closer link between technology and the science of geology and to educate the public on issues critical to the development of intelligent policies on the environment and geologic hazards. We also hope to bridge the gulf between the past and the future with both a retrospection on the past 25 years of plate tectonics and a look at the future as geology responds to society's needs. Finally, we view the city of New Orleans, the Mississippi River and its delta, and the Gulf Coast as a laboratory where the long-term effects of humans on the environment can be examined.

NEW ORLEANS: The Crescent City—New Orleans is nestled on the inside of a south-looping meander of the Mississippi River. The early city (Vieux Carré or French Quarter) was built on the Mississippi's natural levee, and then expanded up, down, and across the river, and later northward through the swamp to the south shore of Lake Pontchartrain. New Orleans is especially noted for its cuisine and music, both of which have been influenced by the French, Spanish, African, English, and Native Americans who have made the city and its surrounding waterways their home. Come this November and discover the grace and charm of America's most unusual city.

—Bill Craig

General Chairman

REGISTRATION AND HOUSING INFORMATION

June issue of *GSA Today*

PREREGISTRATION DEADLINE

September 29

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October 6

INFORMATION

(303) 447-2020, ext. 184 or 1-800-472-1988, ext.133;
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OVERVIEW OF THE 1995 GSA ANNUAL MEETING TECHNICAL PROGRAM

There will be 166 technical sessions presented during the meeting. Of these, symposia (invited papers) and theme sessions (volunteered papers submitted to a specific topic) are referred to by a number that precedes the title. All other sessions are referred to by disciplines, such as Geochemistry I, II. Sessions are oral unless poster is indicated.

Key to Organizations Sponsoring Sessions

AGI	American Geological Institute
AWG	Association for Women Geoscientists
NABGG	National Association for Black Geologists and Geophysicists
CF	Cushman Foundation
GS	Geochemical Society
GIS	Geoscience Information Society
IEE	Institute for Environmental Education
MSA	Mineralogical Society of America
NAGT	National Association of Geology Teachers
NESTA	National Earth Science Teachers Association
PS	Paleontological Society
SEG	Society of Economic Geologists
SEPM	Society of Sedimentary Geology
SGE	Sigma Gamma Epsilon
SVP	Society of Vertebrate Paleontology

Symposia

S1. GSA Keynote Symposium: The Mississippi River—Control and Consequences. 1995 GSA Annual Meeting Committee. Nov. 6, p.m.

S2. Building Bridges Over Troubled Waters: Identifying, Educating, Recruiting, and Retaining the Stakeholders in Earth Science—Environmental Justice Issues. AGI, AWG, NABGG, and GSA Committee on Minorities and Women in the Geosciences. Nov. 5, a.m. and p.m.

S3. 25+ Years of Plate Tectonics: Where Do We Go from Here? 1995 GSA Annual Meeting Committee. Nov. 8, a.m.

S4. Geology and Tectonics of the Caribbean Region. International Division and IGCP, Project 364: Caribbean Arcs and Ophiolites. Nov. 7, a.m.

S5. Products and Processes of Continental Extension. Structural Geology and Tectonics Division. Nov. 6, a.m. and p.m.

S6. Third International Symposium on the Cenozoic Tectonics and Volcanism of Mexico. 1995 GSA Annual Meeting Committee. Nov. 7, p.m. and Nov. 9, a.m.

S7. Quaternary Geologic Framework and Processes of Coastal Land Loss in Louisiana. Quaternary Geology and Geomorphology Division. Nov. 8, a.m.

S8. The Mississippi River as a Sedimentary System. Sedimentary Geology Division. Nov. 7, p.m.

S9. Hydrology of Wetlands. Hydrogeology Division and 1995 GSA Annual Meeting Committee. Nov. 8, a.m.

S10. Bredehoeft Symposium on Hydrogeology and Geologic Processes. Hydrogeology Division. Nov. 8, p.m.

S11. Coastal Settings of Peat Formation and Their Stratigraphic Record: Ecosystems, Allocycles, and Sequences. Coal Geology Division. Nov. 6, a.m.

S12. Environmental Lessons from Planetary Exploration. Planetary Geology Division. Nov. 7, a.m.

S13. Duration of Hydrothermal Events. SEG. Nov. 8, a.m.

S14. Frontiers in Geochemistry. GS. Nov. 6, p.m.

S15. Weathering Rates of Silicate Minerals. MSA. Nov. 6, a.m.

S16. The Dana Legacy, a Century Later. History of Geology Division. Nov. 7, a.m. and p.m.

S17. Recovery from Mass Extinctions. PS. Nov. 7, a.m.

S18. Variability of Isotope Compositions in Modern and Fossil Organic Matter. GS. Nov. 5, a.m. and p.m.

S19. Taphonomy of Microfossils: Paleoenvironmental Reconstruction and Environmental Assessment. CF. Nov. 6, a.m.

S20. Gulf and Atlantic Coast Vertebrate Paleontology, Including Multidisciplinary Approaches to Vertebrate Localities. SVP. Nov. 9, a.m.

S21. High-Resolution Geophysics in Cultural Resource Management. Archaeological Geology Division. Nov. 8, p.m.

S22. Annual Environmental Forum: Politics and Economics: Geological Research Bridging the Gulf. IEE and Hydrogeology Division. Nov. 5, p.m.

S23. Crossing the Bridge to the Future: Managing Geoscience Information in the Next Decade: Archiving, Access, and Outreach. GIS. Nov. 7, a.m.

S24. Scholarship in the Geosciences—Beyond Academia. Geoscience Education Division. Nov. 6, p.m.

Annual Meeting Sponsors

For the New Orleans Annual Meeting, the following exhibitors have generously donated funds to support the meeting. GSA is most appreciative of this support and thanks these companies.

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S25. Assessing Teaching and Learning. NAGT. Nov. 7, p.m.

S26. SGE Student Research. SGE. Nov. 8, p.m.

S27. Dynamics of Aqueous and Hydrocarbon Fluids in Sedimentary Basins. Nov. 5, p.m.

Theme Sessions

T1. Plate Tectonics, the Next Generation. 1995 GSA Annual Meeting Committee. Nov. 8, p.m.

T2. Geology and Tectonics of the Caribbean Region. International Division and IGCP, Project 364: Caribbean Arcs and Ophiolites. Nov. 7, p.m. (Posters)

T3. Tectonic Geomorphology and Paleoseismology in Intraplate Tectonic Settings. Nov. 9, a.m.

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continued from p. 177

T4. Proterozoic Terranes of the Americas: Bridging the Gulf and Caribbean. GS. Nov. 9, a.m.

T5. Before the Gulf—Paleozoic Tectonics of the Southern Margin of Laurentia. Nov. 9, p.m.

T6. Advances in the Geology of Mexico. Nov. 6, a.m.

T8. Subaqueous Sediment - Gravity Flow Deposition: Scaling, Processes, and Applications. Nov. 6, p.m.

T9. Recognizing the Impact of Subtle Structures on the Stratigraphic Record. Nov. 7, p.m.

T10. Recent Progress in Shale Research. Nov. 9, a.m. and p.m.

T11. Tectonic and Paleoclimatic Records from Rift Basin Sediments of East Africa and Siberia. Nov. 6, p.m.

T12. Back to the Moon. Planetary Geology Division. Nov. 8, a.m.

T14. Quaternary Geologic Framework and Processes of Coastal Land Loss. Nov. 8, p.m.

T16. Effects of Geologic Framework on Shoreface Evolution. Nov. 6, a.m.

T19. Environmental Geology: The Voice of Reason. IEE & GSA Committee on Geology and Public Policy. Nov. 7, p.m.

T22. The Watershed Approach to Water Resource Management. Hydrogeology Division. Nov. 6, a.m.

T23. Geochemistry, Hydrology, and Environmental Impacts of Brines and Saline Waters. Nov. 8, a.m.

T24. Innovative Characterization of DNAPL Impacted Aquifers. Nov. 9, a.m.

T25. The Role of Geosciences in Ecosystem Analysis. IEE. Nov. 8, a.m.

T27. Hydrochemical Interaction Between Shallow Ground Water and Surface Water in Karst Terrane. Nov. 7, a.m.

T29. Multidisciplinary Approaches to Hydrogeologic Research on Carbonate Islands. Nov. 8, p.m.

T30. Hybrid Carbonate-Siliciclastic Sedimentary Environments. Nov. 6, a.m.

T32. Halogen Hydrology. Nov. 9, p.m.

T33. Weathering Silicate Minerals. MSA. Nov. 7, a.m. and p.m.

T35. Experimental Taphonomy: Deep Sea to Terrestrial Realms. PS. Nov. 6, p.m.

T36. Impact in the Gulf: Chicxulub. Planetary Geology Division. Nov. 8, p.m.

T37. Global Catastrophes: P-E and K-T Events Compared. Nov. 9, a.m.

T39. Andes to the Amazon: Geology and Mineral Wealth of a Continent. Nov. 9, a.m. and p.m.

T40. Mineral Deposits and Geology of the Caribbean Rim. SEG. Nov. 7, p.m.

T43. Advances in Pegmatite Genesis. Nov. 9, a.m.(Oral) and p.m.(Posters)

T44. Simulation, Animation, and Data Visualization in Hydrology. Hydrogeology Division. Nov. 7, a.m.

T45. Environmental Issues Across the Geoscience Curriculum. NAGT and IEE. Nov. 8, a.m. and p.m.

T46. Making Connections: Ties Between K–12 and University Education. NAGT, NESTA, and Geoscience Education Division. Nov. 8, p.m. and Nov. 9, a.m.

The missing theme numbers received too few abstracts. The minimum number required is 16. The abstracts submitted to these themes have been absorbed into discipline sessions.

1995 Technical Program by Scientific Discipline

KEY: I, II, … X = Discipline session number in a series; P = Poster; S = Symposium;
T = Theme Session (listed under disciplines having the majority of the abstracts).

DISCIPLINE	SUN, NOV. 5 8:00 a.m.–12:00 N 1:00–5:00 p.m.		MON, NOV. 6 8:00 a.m.–12:00 N 1:00–5:00 p.m.		TUES, NOV. 7 8:00 a.m.–12:00 N 1:30–5:30 p.m.		WED, NOV. 8 8:00 a.m.–12:00 N 1:30–5:30 p.m.		THURS, NOV. 9 8:00 a.m.–12:00 N 1:00–5:00 p.m.	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
ARCHAEOLOGY					P			S21		I
COAL			S11		I		P			
COMPUTERS			P		T44	I				
ECONOMIC			I	II		T40	S13	III	T39, P	T39
EDUCATION				S24	I, P	S25	T45	S26, T45, T46	T46, II	
ENGINEERING/ ENVIRONMENTAL	S2	S2	P	S1, P	I	T19, II	T25	III	T24	T32, IV
GEOCHEMISTRY	S18	S18, S27	I	S14, II	T33	T33, III	T23, P	IV	T4	V
GEOPHYSICS/ TECTONOPHYSICS			P			I				
GEOSCIENCE INFORMATION					S23	I	P			
HISTORY			I		S12	S16	P			
HYDROGEOLOGY		S22	T22, I	II, P	T27		S9, III	S10, T29		IV
MARINE			T16			P				I
MICROPALEONTOLOGY			S19				I	P	T37	
MINERALOGY/ CRYSTALLOGRAPHY			S15						T43, I	T43, P
PALEOCEANOGRAPHY/ PALEOCLIMATOLOGY				T11	I	II	P			
PALEONTOLOGY/ PALEOBOTANY			I	T35, II	S17, III		IV	T36, V	S20, VI, P	S20, VII
PETROLEUM			P							I
PETROLOGY, EXPERIMENTAL					I					P
PETROLOGY, IGNEOUS			I	II						P
PETROLOGY, METAMORPHIC							I	II		P
PLANETARY/ REMOTE SENSING				II, P	S12	I, P	T12			
PRECAMBRIAN			P		I					
QUATERNARY/ GEOMORPHOLOGY			P		I	II	S7	T14, III	IV	V
SEDIMENTS, CARBONATE			T30		P	T9	I			II
SEDIMENTS, CLASTIC			I	T8		S8	II	III, P	T10	T5, T10
STRATIGRAPHY					P			I	II	III
STRUCTURE			I	S5, II		P	III		IV	
TECTONICS			S5, T6	I	S4	T2, II	S3, III	T1, IV	T3, P	V
VOLCANOLOGY						S6			S6	

Session Program Calendar

ENMCC = Ernest N. Morial Convention Center

SUNDAY, NOVEMBER 5, AM

Session 1, 8:00 AM, ENMCC:43
AGI, AWG, NABGG, and GSA Committee on Minorities and Women in Geosciences Symposium (S2): Building Bridges Over Troubled Waters: Identifying, Educating, Recruiting, and Retaining the Stakeholders in Earth Science—Environmental Justice Issues—Part I

Session 2, 8:00 AM, ENMCC:42
Organic Geochemistry Division of the GS Symposium (S18): Variability of Isotope Compositions in Modern and Fossil Organic Matter—Part I

SUNDAY, NOVEMBER 5, PM

Session 3, 1:00 PM, ENMCC:43
AGI, AWG, NABGG, and GSA Committee on Minorities and Women in Geosciences Symposium (S2): Building Bridges Over Troubled Waters: Identifying, Educating, Recruiting, and Retaining the Stakeholders in Earth Science—Environmental Justice Issues—Part II

Session 4, 1:00 PM, ENMCC:41
Dynamics of Aqueous and Hydrocarbon Fluids in Sedimentary Basins (S27)

Session 5, 1:00 PM, ENMCC:44
IEE and Hydrogeology Division Symposium (S22): Annual Environmental Forum: Politics and Economics: Geological Research Bridging the Gulf

Session 6, 1:30 PM, ENMCC:42
Organic Geochemistry Division of the GS Symposium (S18): Variability of Isotope Compositions in Modern and Fossil Organic Matter—Part II

MONDAY, NOVEMBER 6, AM

Session 7, 8:00 AM, ENMCC:6
CF Symposium (S19): Taphonomy of Microfossils: Paleoenvironmental Reconstruction and Environmental Assessment

Session 8, 8:00 AM, ENMCC:41
Coal Geology Division Symposium (S11): Coastal Settings of Peat Formation and Their Stratigraphic Record: Ecosystems, Allocycles, and Sequences

Session 9, 8:00 AM, ENMCC:Hall A
Environmental and Engineering Geology I (Posters)

Session 10, 8:00 AM, ENMCC:Hall A
Geophysics/Computers (Posters)

Session 11, 8:00 AM, ENMCC:26
GS—Isotope Geochemistry I

Session 12, 10:00 AM, ENMCC:38
History of Geology

Session 13, 8:00 AM, ENMCC:24
Hydrogeology I

Session 14, 8:00 AM, ENMCC:Blrm I AB
MSA Symposium (S15): Weathering Rates of Silicate Minerals

Session 15, 8:00 AM, ENMCC:39
MSA—Igneous Petrology

Session 16, 8:00 AM, ENMCC:Hall A
Petroleum Geology (Posters)

Session 17, 8:00 AM, ENMCC:Hall A
Precambrian Geology (Posters)

Session 18, 8:00 AM, ENMCC:13
PS—Paleontology I

Session 19, 8:00 AM, ENMCC:Hall A
Quaternary Geology/Geomorphology (Posters)

Session 20, 8:00 AM, ENMCC:37
Sedimentology, Clastic I: Sedimentary Petrology

Session 21, 8:00 AM, ENMCC:40
SEG—Economic Geology I

Session 22, 8:00 AM, ENMCC:10
Structural Geology and Tectonics Division Symposium (S5): Products and Processes of Continental Extension—Part I

Session 23, 8:00 AM, ENMCC:42
Structural Geology I

Session 24, 8:00 AM, ENMCC:44
T6. Advances in the Geology of Mexico

Session 25, 8:00 AM, ENMCC:43
T16. Effects of Geological Framework on Shoreface Evolution

Session 26, 8:00 AM, ENMCC:15
T22. Hydrogeology Division: The Watershed Approach to Water Resource Management

Session 27, 8:00 AM, ENMCC:36
T30. Hybrid Carbonate-Siliciclastic Sedimentary Environments

MONDAY, NOVEMBER 6, PM

Session 28, 1:00 PM, ENMCC:24
1995 GSA Annual Meeting Committee (S1): Keynote Symposium: The Mississippi River—Control and Consequences

Session 29, 1:00 PM, ENMCC:Hall A
Environmental and Engineering Geology II (Posters)

Session 30, 2:00 PM, ENMCC:41
Geoscience Education Division Symposium (S24): Scholarship in the Geosciences—Beyond Academia

Session 31, 1:00 PM, ENMCC:6
GS Symposium (S14): Frontiers in Geochemistry

Session 32, 1:00 PM, ENMCC:26
GS—Geochemistry II: Hydrogeochemistry

Session 33, 1:00 PM, ENMCC:Hall A
Hydrogeology (Posters)

Session 34, 1:00 PM, ENMCC:44
Hydrogeology II

Session 35, 1:00 PM, ENMCC:36
MSA—Igneous Petrology and Volcanology

Session 36, 1:00 PM, ENMCC:15
Planetary Geology: Radar Remote Sensing of Flood Plains, Mountain Belts, and Volcanoes

Session 37, 1:00 PM, ENMCC:13
PS—Paleontology II: Echinoderms Et Cetera

Session 38, 1:00 PM, ENMCC:Hall A
Remote Sensing (Posters)

Session 39, 1:00 PM, ENMCC:40
SEG—Economic Geology II

Session 40, 1:20 PM, ENMCC:10
Structural Geology and Tectonics Division Symposium (S5): Products and Processes of Continental Extension—Part II

Session 41, 1:00 PM, ENMCC:42
Structural Geology II: Thrusts and Folds

Session 42, 1:00 PM, ENMCC:43
Tectonics I: Latin America, Antarctica, and Thermochronology

Session 43, 1:00 PM, ENMCC:37
T8. Subaqueous Sediment-Gravity Flow Deposition: Scaling, Processes, and Applications

Session 44, 1:00 PM, ENMCC:39
T11. Tectonic and Paleoclimatic Records from Rift Basin Sediments of East Africa and Siberia

Session 45, 1:00 PM, ENMCC:38
T35. PS: Experimental Taphonomy: Deep Sea to Terrestrial Realms

TUESDAY, NOVEMBER 7, AM

Session 46, 8:00 AM, ENMCC:Hall A
Archeological Geology (Posters)

Session 47, 8:00 AM, ENMCC:6
Coal Geology: Environmental and Paleoenvironmental Perspectives

Session 48, 8:00 AM, ENMCC:26
Environmental and Engineering Geology I

Session 49, 8:00 AM, ENMCC:Hall A
Geology Education (Posters)

Session 50, 8:00 AM, ENMCC:13
Geology Education I: Potpourri

Session 51, 8:00 AM, ENMCC:15
GIS Symposium (S23): Crossing the Bridge to the Future: Managing Geoscience Information in the Next Decade: Archiving, Access, and Outreach

Session 52, 8:00 AM, ENMCC:Blrm I AB
History of Geology Division Symposium (S16): The Dana Legacy, a Century Later—Part I

Session 53, 8:00 AM, ENMCC:24
International Division and IGCP, Project 364: Caribbean Arcs and Ophiolites Symposium (S4): Geology and Tectonics of the Caribbean Region

Session 54, 8:00 AM, ENMCC:42
MSA—Experimental Petrology

Session 55, 8:00 AM, ENMCC:39
Paleoceanography I

Session 56, 8:00 AM, ENMCC:44
Planetary Geology Division Symposium (S12): Environmental Lessons from Planetary Exploration

Session 57, 8:00 AM, ENMCC:40
Precambrian Geology

Session 58, 8:00 AM, ENMCC:10
PS Symposium (S17): Recovery from Mass Extinction

Session 59, 8:00 AM, ENMCC:41
PS—Paleontology III: Paleo-eek!

Session 60, 8:00 AM, ENMCC:43
Quaternary Geology/Geomorphology I: Glaciation and Quaternary Climatic Change at Middle Latitudes

Session 61, 8:00 AM, ENMCC:Hall A
Sedimentology, Carbonates and Diagenesis (Posters)

Session 62, 8:00 AM, ENMCC:Hall A
Stratigraphy (Posters)

Session 63, 8:00 AM, ENMCC:37
T27. Hydrochemical Interaction Between Shallow Ground Water and Surface Water in Karst Terrane

Session 64, 8:00 AM, ENMCC:38
T33. MSA: Weathering Silicate Minerals—Part I

Session 65, 8:00 AM, ENMCC:36
T44. Hydrogeology Division: Simulation, Animation, and Data Visualization in Hydrology

TUESDAY, NOVEMBER 7, PM

Session 66, 1:45 PM, ENMCC:6
1995 GSA Annual Meeting Committee Symposium (S6): Third International Symposium on the Cenozoic Tectonics and Volcanism of Mexico—Part I

Session 67, 1:30 PM, ENMCC:26
Environmental and Engineering Geology II

Session 68, 1:30 PM, ENMCC:15
Geophysics/Computers

Session 69, 3:30 PM, ENMCC:37
GIS—Information Technology and Services in the Geosciences

Session 70, 1:30 PM, ENMCC:13
GS—Geochemistry III: Geochemistry of Surfaces and Interfaces

Session 71, 1:30 PM, ENMCC:Blrm I AB
History of Geology Division Symposium (S16): The Dana Legacy, a Century Later—Part II

Session 72, 1:00 PM, ENMCC:Hall A
Marine Geology (Posters)

Session 73, 1:30 PM, ENMCC:39
NAGT Symposium (S25): Assessing Teaching and Learning

Session 74, 1:30 PM, ENMCC:41
Paleoceanography/Paleoclimatology II

Session 75, 1:30 PM, ENMCC:Hall A
Planetary Geology (Posters)

Session 76, 1:30 PM, ENMCC:42
Planetary Geology: Geologic Mapping of Venus and Mars, and Studies of Meteorites

Session 77, 1:30 PM, ENMCC:43
Quaternary Geology/Geomorphology II: Polar Glaciation and Fluvial Geomorphology

Session 78, 1:30 PM, ENMCC:24
Sedimentary Geology Division Symposium (S8): The Mississippi River as a Sedimentary System

Session 79, 1:30 PM, ENMCC:Hall A
Structural Geology (Posters)

Session 80, 1:30 PM, ENMCC:10
Tectonics II: Appalachian Caledonides

Session 81, 1:30 PM, ENMCC:Hall A
T2. International Division and IGCP, Project 364: Caribbean Arcs and Ophiolites: Geology and Tectonics of the Caribbean Region (Posters)

Session 82, 1:30 PM, ENMCC:40
T9. Recognizing the Impact of Subtle Structures on the Stratigraphic Record

Session 83, 1:30 PM, ENMCC:36
T19. IEE and GSA Committee on Geology and Public Policy: Environmental Geology: The Voice of Reason

Session 84, 1:30 PM, ENMCC:38
T33. MSA: Weathering Silicate Minerals—Part II

Session 85, 2:00 PM, ENMCC:44
T40. SEG: Mineral Deposits and Geology of the Caribbean Rim

WEDNESDAY, NOVEMBER 8, AM

Session 86, 8:00 AM, ENMCC:Blrm I AB
1995 GSA Annual Meeting Committee Symposium (S3): 25+ Years of Plate Tectonics: Where Do We Go from Here?

Session 87, 8:00 AM, ENMCC:43
CF—Micropaleontology

Session 88, 8:00 AM, ENMCC:Hall A
Coal Geology (Posters)

Session 89, 8:00 AM, ENMCC:Hall A
GIS—Geoscience Information (Posters)

Session 90, 8:00 AM, ENMCC:Hall A
GS—Geochemistry (Posters)

Session 91, 8:00 AM, ENMCC:Hall A
History of Geology (Posters)

Session 92, 8:00 AM, ENMCC:26
Hydrogeology Division and 1995 Annual Meeting Committee Symposium (S9): Hydrology of Wetlands

Session 93, 8:00 AM, ENMCC:6
Hydrogeology III

Session 94, 8:00 AM, ENMCC:41
MSA—Metamorphic Petrology I

Session 95, 8:00 AM, ENMCC:Hall A
Paleoceanography/Paleoclimatology (Posters)

Session 96, 8:00 AM, ENMCC:40
PS—Paleontology IV: Proterozoic–Paleozoic Proclivities

Session 97, 8:00 AM, ENMCC:24
Quaternary Geology and Geomorphology Division and Engineering Geology Division Symposium (S7): Quaternary Geologic Framework and Processes of Coastal Land Loss in Louisiana

Session 98, 8:00 AM, ENMCC:10
Sedimentology, Carbonates I: Carbonate Diagenesis, Geochemistry, and Dolomites

Session 99, 8:00 AM, ENMCC:15
Sedimentology, Clastic II: Sedimentary Process and Lithofacies

Session 100, 8:00 AM, ENMCC:42
SEG Symposium (S13): Duration of Hydrothermal Events

Session 101, 8:00 AM, ENMCC:13
Structural Geology III: Miscellaneous

Session 102, 8:00 AM, ENMCC:39
Tectonics III: Cordilleran Tectonics

Session 103, 8:00 AM, ENMCC:37
T12. Planetary Geology Division: Back to the Moon

Session 104, 8:00 AM, ENMCC:44
T23. Geochemistry, Hydrology, and Environmental Impacts of Brines and Saline Waters

Session 105, 8:00 AM, ENMCC:36
T25. IEE: The Role of Geosciences in Ecosystem Analysis

Session 106, 8:00 AM, ENMCC:38
T45. NAGT and IEE: Environmental Issues Across the Geoscience Curriculum—Part I

WEDNESDAY, NOVEMBER 8, PM

Session 107, 1:30 PM, ENMCC:43
Archaeological Geology Division Symposium (S21): High-Resolution Geophysics in Cultural Resource Management

Session 108, 1:30 PM, ENMCC:Hall A
CF—Micropaleontology (Posters)

Session 109, 1:30 PM, ENMCC:38
Environmental and Engineering Geology III

Session 110, 1:30 PM, ENMCC:40
GS—Geochemistry IV: Aqueous and Biogeochemistry

Session 111, 1:30 PM, ENMCC:10
Hydrogeology Division Symposium (S10): Bredehoeft Symposium on Hydrogeology and Geologic Processes

Session 112, 1:30 PM, ENMCC:41
MSA—Metamorphic Petrology II

Session 113, 1:30 PM, ENMCC:36
PS—Paleontology V: Backbones and Beyond

Session 114, 1:30 PM, ENMCC:37
Quaternary Geology/Geomorphology III: Paleoenvironmental, Basins, and Dating: Middle and Southern U.S.

Session 115, 1:30 PM, ENMCC:Hall A
Sedimentology, Clastic (Posters)

Session 116, 1:30 PM, ENMCC:15
Sedimentology, Clastic III: Miscellaneous Studies

Session 117, 1:30 PM, ENMCC:Blrm I AB
SEG—Duration of Hydrothermal Events

Session 118, 1:30 PM, ENMCC:Hall A
SGE Symposium (S26): SGE Student Research (Posters)

Session 119, 1:30 PM, ENMCC:42
Stratigraphy I: Sequence Stratigraphy and Related Topics

Session 120, 1:30 PM, ENMCC:39
Tectonics IV: Himalayan Tectonics

Session 121, 1:30 PM, ENMCC:24
T1. 1995 GSA Annual Meeting Committee: Plate Tectonics, the Next Generation

Session 122, 1:30 PM, ENMCC:26
T14. Quaternary Geologic Framework and Processes of Coastal Land Loss

Session 123, 1:30 PM, ENMCC:44
T29. Hydrogeology Division: Multidisciplinary Approaches to Hydrogeologic Research on Carbonate Islands

Session 124, 1:30 PM, ENMCC:6
T36. Planetary Geology Division: Impact in the Gulf: Chicxulub

Session 125, 1:30 PM, ENMCC:Hall A
T45. NAGT and IEE: Environmental Issues Across the Geoscience Curriculum—Part II (Posters)

Session 126, 1:30 PM, ENMCC:13
T46. NAGT, NESTA, Geoscience Education

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NEW ORLEANS
BRIDGING THE GULF

IEE Media Workshop

The GSA Institute for Environmental Education will host an all-day Media Workshop on **Saturday, November 4, 1995,** (8:00 a.m.–5:00 p.m.), in conjunction with the 1995 GSA Annual Meeting in New Orleans.

The event will be led once again by the winning team of Victor Yannacone, environmental attorney, and Kevin Molloy, journalist. Many seats are already reserved; however, several will also be available for those who wish to be considered in a pool of applications, with top priority going to GEPOP (Geology and Public Outreach Program) members. If you wish to apply or would like more specific information about the workshop, please contact Monica Gowan by phone at (360) 676-8729 or E-mail at mgowan@pacificrim.net.

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Division, and GSA's SAGE Program: Making Connections: Ties Between K–12 and University Education—Part I

THURSDAY, NOVEMBER 9, AM

Session 127, 8:00 AM, ENMCC:44
1995 GSA Annual Meeting Committee Symposium (S6): Third International Symposium on the Cenozoic Tectonics and Volcanism of Mexico—Part II

Session 128, 8:00 AM, ENMCC:43
Geology Education II: Undergraduate End-of-Program Assessment

Session 129, 8:00 AM, ENMCC:42
MSA—Mineralogy
(In Memory of Henry O. A. Meyer)

Session 130, 8:00 AM, ENMCC:Hall A
PS—Paleontology (Posters)

Session 131, 8:00 AM, ENMCC:15
PS—Paleontology VI: Steeped in Stratigraphy and Faced with Facies

Session 132, 8:00 AM, ENMCC:6
Quaternary Geology/Geomorphology IV: Neotectonics

Session 133, 8:00 AM, ENMCC:Hall A
SEG—Economic Geology (Posters)

Session 134, 8:00 AM, ENMCC:36
Stratigraphy II: Miscellaneous Topics

Session 135, 8:00 AM, ENMCC:26
Structural Geology IV: Joints and Normal Faults

Session 136, 8:00 AM, ENMCC:39
SVP Symposium (S20): Gulf and Atlantic Coast Vertebrate Paleontology, Including Multidisciplinary Approaches to Vertebrate Localities

Session 137, 8:00 AM, ENMCC:Hall A
Tectonics (Posters)

Session 138, 8:00 AM, ENMCC:24
T3. Tectonic Geomorphology and Paleoseismology in Intraplate Tectonic Settings

Session 139, 8:00 AM, ENMCC:37
T4. GS: Proterozoic Terranes of the Americas: Bridging the Gulf and Caribbean

Session 140, 8:00 AM, ENMCC:41
T10. Recent Progress in Shale Research—Part I

Session 141, 8:00 AM, ENMCC:38
T24. Innovative Characterization of DNAPL Impacted Aquifers

Session 142, 8:00 AM, ENMCC:Blrm I AB
T37. Global Catastrophes: P-E and K-T Events Compared

Session 143, 8:00 AM, ENMCC:10
T39. Andes to the Amazon: Geology and Mineral Wealth of a Continent—Part I

Session 144, 10:15 AM, ENMCC:13
T43. Advances in Pegmatite Genesis

Session 145, 8:00 AM, ENMCC:40
T46. NAGT, NESTA, Geoscience Education Division, and GSA's SAGE Program: Making Connections: Ties Between K–12 and University Education—Part II

THURSDAY, NOVEMBER 9, PM

Session 146, 1:00 PM, ENMCC:40
Archeological Geology

Session 147, 1:00 PM, ENMCC:15
Environmental and Engineering Geology IV

Session 148, 1:00 PM, ENMCC:24
GS—Geochemistry V: Analytical and Sedimentary Geochemistry

Session 149, 1:00 PM, ENMCC:26
Hydrogeology IV

Session 150, 3:00 PM, ENMCC:38
Latin American Geology

Session 151, 1:00 PM, ENMCC:43
Marine Geology

Session 152, 1:00 PM, ENMCC:Hall A
MSA—Experimental Petrology (Posters)

Session 153, 1:00 PM, ENMCC:Hall A
MSA—Igneous Petrology and Volcanology (Posters)

Session 154, 1:00 PM, ENMCC:Hall A
MSA—Metamorphic Petrology (Posters)

Session 155, 1:00 PM, ENMCC:Hall A
MSA—Mineralogy (Posters)

Session 156, 1:00 PM, ENMCC:13
Petroleum Geology

Session 157, 1:00 PM, ENMCC:44
PS—Paleontology VII: Function Junction

Session 158, 1:00 PM, ENMCC:6
Quaternary Geology/Geomorphology V: Coasts and Continental Shelves

Session 159, 1:00 PM, ENMCC:36
Sedimentology, Carbonates II: Techniques, Processes, and Sequences

Session 160, 1:00 PM, ENMCC:39
SVP—Gulf and Atlantic Coast Vertebrate Paleontology, Including Multidisciplinary Approaches to Vertebrate Localities

Session 161, 1:00 PM, ENMCC:10
Tectonics V: New Zealand to the Alps

Session 162, 1:00 PM, ENMCC:42
T5. Before the Gulf—Paleozoic Tectonics of the Southern Margin of Laurentia

Session 163, 1:00 PM, ENMCC:41
T10. Recent Progress in Shale Research—Part II

Session 164, 1:00 PM, ENMCC:37
T32. Halogen Hydrology

Session 165, 1:00 PM, ENMCC:38
T39. Andes to the Amazon: Geology and Mineral Wealth of a Continent—Part II

Session 166, 1:00 PM, ENMCC:Hall A
T43. Advances in Pegmatite Genesis (Posters)

Newcomers' Session

Monday, November 6, 12:00 noon to 1:00 p.m.; Ernest N. Morial Convention Center, Room 9

New to GSA meetings? Returning for the first time in years? Feel welcome at this orientation devoted to your questions and interests. Key GSA people will be on hand to help with everything you want to know about the meeting—from which sessions and events to attend, to where to eat and what to do after hours. Members and nonmembers. Professionals, students, guests. Everyone is welcome. Bring your lunch along. Very informal.

Graduate School Information Forum

Are you planning on going to graduate school? Shortcut your search for the right graduate school by coming to the GSA Annual Meeting in New Orleans. Meet with representatives from universities across the nation without spending travel time and money to go to each school for interviews. The schools participating (at press time) are listed below.

Individual appointments are not necessary, although students are welcome to contact the schools in advance to schedule a meeting time. If you would like to receive a complete list of schools with the contact persons and telephone numbers, contact Matt Ball, GSA Meetings Department, (303) 447-2020, ext. 141, fax 303-447-0648, E-mail: mball@geosociety.org.

Ernest N. Morial Convention Center, Hall A, 9:00 a.m. to 5:00 p.m.

Participating Schools	Monday Nov. 6	Tuesday Nov. 7	Wednesday Nov. 8
Binghamton University (SUNY)	•		
Cornell University	•	•	•
East Carolina University	•	•	
Florida International University	•		
Indiana University	•	•	
Mississippi State University	•	•	•
Northeast Louisiana University	•		
Notre Dame	•	•	•
Rice University	•	•	
Rutgers State University		•	
Southern Illinois University at Carbondale	•		
Texas Tech University	•		
University of Alabama	•	•	
University of California, Riverside	•	•	
University of Houston	•	•	
University of Kentucky		•	
University of Maryland	•	•	
University of Massachusetts	•		
University of Missouri, Columbia		•	
University of North Carolina at Wilmington			•
University of North Carolina, Chapel Hill		•	
University of North Dakota	•		
University of Southern Mississippi, Geosciences	•	•	•
University of Southern Mississippi, Marine Sciences	•	•	•
University of Southwestern Louisiana	•	•	
University of Utah	•	•	
Vanderbilt University		•	
Virginia Polytechnic Institute and State University	•	•	

THIRD ANNUAL

President's Student Forum

Wednesday, November 8, 4:00 to 5:30 p.m.; Ernest N. Morial Convention Center, Room 16-18. Sponsored by *GSA Council.*

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

NEW ORLEANS
BRIDGING THE GULF

REDISCOVER YOUR GEOLOGICAL ROOTS

Celebrate the beginnings of modern geology, the 200th Anniversary of James Hutton's

Theory of the Earth (1795)

Get your Hutton Button and join five distinguished scholars in reviewing his life and accomplishments.

Sunday, November 5, from 2:00 to 5:00 p.m. in Room 37, Ernest N. Morial Convention Center.

Organized by William Brice and Robert Ginsburg for the GSA History of Geology Division.

Preliminary Announcement and Call for Papers

SOUTHEASTERN SECTION, GSA 45th Annual Meeting

Jackson, Mississippi
March 14–15, 1996

The 1996 meeting of the Southeastern Section of the Geological Society of America, in Jackson, Mississippi, will be hosted by the Mississippi Mineral Resources Institute (University, Mississippi) and the Mississippi State University Department of Geosciences.

SETTING

Jackson, Mississippi's state capital, is located in the rolling plains of central Mississippi. In March, the temperatures are cool at night but pleasingly warm during the day. It is an ideal time of year to visit Jackson's many attractions or nearby cities. Points of interest include the Mississippi Museum of Natural Science, the Mississippi Agricultural and Forestry Museum, and the Mississippi Art Museum. Historic sites associated with the Civil War and state government are plentiful. Vicksburg, Mississippi, known for its historic structures, Civil War battlefields, and more recently, its riverboat gambling, is only a 30-minute drive from Jackson. The Southeastern Section meeting will be held in the Ramada Plaza Hotel, conveniently located near Interstate 55. Interstate 20 also serves Jackson, and the beautiful Natchez Trace Parkway provides a more scenic trip into the capital city.

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 will be welcome. Poster sessions will be set up for four hours, and authors will be available for two hours to discuss their work. Abstracts not accepted for symposia (invited) or theme (volunteered) sessions will be considered for regular technical sessions.

REGISTRATION

PREREGISTRATION DEADLINE: February 6, 1996

Please preregister for lower registration fees and to assist the local committee in planning. On-site registration will also be available. A reduced registration fee will be offered to students and to precollege teachers. Field trip participants must register for the meeting.

Preregistration by mail will be handled by the GSA Meetings Department, P.O. Box 9140, Boulder, CO 80301-9140. Registration forms will appear in the December 1995 issue of *GSA Today*.

ABSTRACTS

ABSTRACT DEADLINE: November 15, 1995

Abstracts for all sessions must be submitted camera-ready on official 1996 GSA abstract forms. These forms are available from the Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301; (303) 447-2020; E-mail: ncarlson@geosociety.org.

An original and five copies of all abstracts (volunteered and invited) should be sent to Darrel Schmitz, Department of Geosciences, P.O. Box 5448, Mississippi State University, Mississippi State, MS 39762. 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, although they can be coauthors on additional volunteered abstracts. Abstracts submitted for symposia are not affected by this limitation.

SHORT COURSE

One short course has been planned, "Practical Aspects of Hydrogeology." Instructors will be Paul E. Albertson, MS, C.P.G. and David M. Patrick, Ph.D., P.E. For specific information, contact Paul Albertson, U.S. Army Corps of Engineers, Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199; (601) 634-3153.

FIELD TRIPS

For details about particular field trips, contact the field trip leaders listed. For general questions concerning field trips, contact Maureen Corcoran or Danny Harrelson, U.S. Army Corps of Engineers, Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199; (601) 634-3334; E-mail: maureen@spock.wes.army.mil.

Tentative Field Trips:

1. **Engineering Geology and Stratigraphy of Southeastern Mississippi.** David Patrick, Department of Geology, University of Southern Mississippi, P.O. Box 5044, Southern Station, Hattiesburg, MS 39406-5044; (601) 266-4526.
2. **Cretaceous Chalk with Waste Disposal Applications.** Darrel Schmitz, Department of Geosciences, P.O. Box 5448, Mississippi State University, Mississippi State, MS 39762; (601) 325-2904.
3. **Coastal Plain Stratigraphy and Fossil Collecting Localities in Central Mississippi.** David T. Dockery III, Mississippi Office of Geology, P.O. Box 20307, Jackson, MS 39289-1307; (601) 354-6328.

SYMPOSIA

Fourteen symposia are already planned for the meeting, and individuals with suggestions for additional symposia are encouraged to contact Patricia Buis, Department of Geology and Geological Engineering, University of Mississippi, University, MS 38677; (601) 232-7498. Please contact respective conveners for information about the symposia listed below.

1. **The Alleghenian Orogeny in the Southern Appalachian Hinterland.** Gregory M. Guthrie, Geological Survey of Alabama, P.O. Box O, Tuscaloosa, AL 35486; (205) 349-2852.
2. **Marine Geology.** James L. Harding, P.O. Box 879, Richmond Hill, GA 31324; (917) 727-2519.
3. **Neotectonics of the Mississippi Embayment.** Roy Van Arsdale, Department of Geological Sciences, 429 J.M. Smith Bldg., University of Memphis, Memphis, TN 38152; (901) 678-4356; E-mail: rbvanarsdale@cc.memphis.edu.
4. **Atlantic and Gulf Coastal Plain—Differences in Stratigraphy and Geologic Evolution.** Ervin G. Otvos, Gulf Coast Research Laboratory, P.O. Box 7000, Ocean Springs, MS 39564-7000; (601) 872-4200.
5. **Clays.** William R. Reynolds, Department of Geology and Geological Engineering, University of Mississippi, University, MS 38677; (601) 232-5818.
6. **Oligocene of the Eastern Gulf Coast.** Rick Fluegeman, Department of Geology, Ball State University, Muncie, IN 47306-0475.
7. **Effective Teaching at the Introductory Level.** Gail Russell, Department of Geology, University of Southern Mississippi, P.O. Box 5044, Southern Station, Hattiesburg, MS 39406-5044; (601) 266-4077; E-mail: grussel@whale.usm.edu.
8. **Applied Paleontology.** G. Lynn Wingard, U.S. Geological Survey, National Center, Mail Stop 970, Reston, VA 22092; (703) 648-5352.
9. **Alternate Strategies and Opportunities for Geology Curricula in Environmental Sciences.** P. Geoffrey Feiss, Department of Geology, CB3315 Mitchell Hall, University of North Carolina, Chapel Hill, NC 27599-3315; (919) 962-0693.
10. **The Effective Communication of Geological Data to Decision Makers and the Public.** Cragin Knox, Mississippi Office of Geology, P.O. Box 20307, Jackson, MS 39289-1307; (601) 961-5500.
11. **Gravels to Loess: Tertiary to Quaternary Depositional Systems and Paleogeography of the Southeast.** Robert Self, Department of Geology, Geography and Physics, University of Tennessee at Martin, Martin, TN 38238; (901) 587-7430.
12. **Sequence Stratigraphy of Carbonate-Siliciclastic Strata, Eastern Gulf Coastal Plain.** Ernest Mancini, Geological Survey of Alabama, P.O. Box O, Tuscaloosa, AL 35486; (205) 349-2852.
13. **Renegade Tectonic Models and Other Geologic Heresies.** *A Session in Honor of Lynn Glover III.* David Valentino, Department of Physical Sciences, Box 19, Concord College, Athens, WV 24712; (304) 384-5238; E-mail: valentid@math.concord.wvnet.edu; and Alexander Gates, Department of Geology, Rutgers University, Newark, NJ 07102; (201) 648-5034; E-mail: agates@andromeda.rutgers.edu.
14. **Applied Geomorphology.** Paul Albertson, U.S. Army Corps of Engineers, Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199; (601) 634-3153.

THEME SESSIONS

Several theme sessions (all papers volunteered) are already planned, as indicated below. Individuals interested in convening a theme session should contact Darrel Schmitz, Department of Geosciences, P.O. Box 5448, Mississippi State University, Mississippi State, MS 39762; (601) 325-2904.

1. **Paleontology of the Southeast U.S. (Gulf Coastal Plain).**
2. **Geographic Information Systems (Geological Applications).**
3. **Salt Domes of the Gulf Coastal Plain.**
4. **Contaminant Hydrogeology.**

POSTER SESSIONS

Four half-day poster sessions are planned; we encourage poster contributions because they permit extended discussions. Please indicate your preference for a poster session on the GSA abstract form.

The Council for Undergraduate Research and Sigma Gamma Epsilon will sponsor student poster sessions, to showcase senior theses and other undergraduate research projects. First authors must be undergraduate students and are responsible for the bulk of the research, preparation of posters, and presentation of the results.

EARTH SCIENCE EDUCATION PROGRAMS

Undergraduate students are invited to participate in a poster session sponsored by the Council for Undergraduate Research (see Poster Sessions above).

Two half-day symposia are planned for teachers in K–12 and freshman and sophomore courses (See Symposia above).

PROJECTION EQUIPMENT

All slides must be 2" × 2" and fit a standard 35-mm carousel tray. Please bring your own loaded carousel trays, if possible. Two 35-mm slide projectors and screens will be available for each oral technical session. Overhead projectors will be available only by prior arrangement.

EXHIBITS

Exhibit facilities for business, educational, and governmental institutions will be located conveniently in the Ramada Plaza Ballroom, adjacent to technical session rooms. Beverages will be provided in the exhibit area for participants, and 24-hour security will be provided in the exhibit hall. The number of booths is limited, so plan to reserve space early. Exhibits will be open all day Thursday and on Friday morning. For further information and space reservations, contact Steve Ingram, Mississippi Office of Geology, P.O. Box 20307, Jackson, MS 39289-1307; (601) 354-6328.

STUDENT TRAVEL GRANTS

Limited funds for support of travel expenses for students presenting papers at the meeting are available from the GSA Southeastern Section. For information, contact Harold Stowell, Department of Geology, University of Alabama, Tuscaloosa, AL 35486; (205) 348-5098. Travel grant requests must be postmarked no later than March 1, 1996.

ACCOMMODATIONS

A large block of rooms at the Ramada Plaza Hotel, the site of the meeting, has been reserved for attendees, at the following rates: standard double (1 person)—$72; standard double (2 persons)—$81; standard king (1 or 2 persons)—$76.50. These rates are subject to 8% tax.

SPECIAL EVENTS

In addition to the usual Jackson entertainment, several special events are planned. For many, the welcoming party is an event anticipated from year

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Southeastern *continued from p. 181*

to year, and this meeting will be no exception. Perhaps you're feeling lucky? An evening excursion to Vicksburg for riverboat gambling is planned. The featured exhibit at the Mississippi Museum of Art will be "Palaces of St. Petersburg: Russian Imperial Style." The museum has extended a special invitation to conference participants to view the exhibit, which will display the coronation throne of Nicholas II, lapis lazuli furniture from the Lyon Room, and amber objects from the "missing" Amber Room of the Catherine Palace.

OTHER INFORMATION

The Southeastern Section of the Geological Society of America maintains a World Wide Web site that can be accessed at http://www.geo.ua.edu/segsa/segsa.html. This home page contains information about the management board, meetings, and student support for travel and research.

More detailed information concerning fees and registration, hotel accommodations, field trips, and other activities will appear in the December 1995 issue of *GSA Today* and as part of the GSA Southeastern Section *Abstracts with Programs* for 1996. Preliminary questions and suggestions should be referred to the local committee co-chairmen: Darrel Schmitz, Department of Geosciences, P.O. Box 5448, Mississippi State University, Mississippi State, MS 39762; (601) 325-2904; or Charles Swann, Mississippi Mineral Resources Institute, 220 Old Chemistry Building, University, MS 38677; (601) 232-7320; E-mail: cts@mmri.olemiss.edu. ■

Preliminary Announcement and Call for Papers

NORTHEASTERN SECTION, GSA 31st Annual Meeting

Buffalo, New York
March 21–23, 1996

The Department of Geology, State University of New York (SUNY) at Buffalo together with the Buffalo Museum of Science and SUNY College at Buffalo and Fredonia will host the 1996 meeting of the Northeastern Section of the Geological Society of America at the Hyatt Regency Buffalo. Meeting in conjunction with the GSA will be the Eastern Section of SEPM, Northeastern Section of the Paleontological Society, Eastern and New England Sections of the National Association of Geology Teachers, Sigma Gamma Epsilon, and the Association for Women Geoscientists.

The Hyatt Regency Buffalo is a 16-story French Renaissance landmark with an attached contemporary glass atrium. It is located in the heart of downtown Buffalo on beautiful Lake Erie and at the head of the Niagara River. Scenic Niagara Falls and Gorge are 20 minutes away, and equally interesting drives into the Allegheny Plateau or along the New York or Canadian shores of Lakes Erie and Ontario are close by. Toronto is about two hours to the northwest. Buffalo is served by Route I-190 connecting with I-90 from the south or east and the QEW in Canada from the northwest.

CALL FOR PAPERS

Papers are invited from students and professionals for presentation in oral or poster general sessions and theme (volunteered) sessions. Presentations that may fit into one of the symposia (mostly invited papers) are also solicited. Those desiring to present a paper at a symposium are encouraged to contact the convener of the symposium and/or indicate on the submitted abstract that the abstract be considered for a particular symposium.

Oral general technical and theme sessions will include 15 minutes for presentation and 5 minutes for discussion. Two 35-mm carousel projectors and two screens will be provided for each oral session. All slides must fit into a standard carousel tray. Overhead projectors will be available on request.

Poster sessions will allow at least three hours of display time, two of them specified when authors must be present. Two 4' × 8' tackboards will be provided. Electrical outlets or furniture for poster sessions must be specifically requested.

ABSTRACTS

Abstracts must be submitted camera-ready on the official 1996 GSA abstract form in accordance with instructions on that form (e.g., about 250 words, etc.). Abstract forms are available from: Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020, or E-mail: ncarlson@geosociety.org.

Send one original and five copies of abstracts to be considered to: Charles E. Mitchell, Technical Program Chairman, Dept. of Geology, State University of New York at Buffalo, 876 Natural Sciences & Mathematics Complex, Buffalo, New York, 14260-3050. Authors of invited (symposium) papers, and those who think their paper might be suitable for inclusion in a symposium or theme session should send an extra copy of the abstract to the appropriate (first listed) contact person for that particular symposium.

Abstracts will be reviewed for content, originality, and format. Only one volunteered paper may be presented by an individual; however, a person may also be a co-author on papers presented by others. Additional papers may be presented by individuals invited for symposia.

ABSTRACTS ARE DUE BY NOVEMBER 20, 1995

SYMPOSIA

The following symposia are planned for the Buffalo meeting. Symposia will include invited papers and selected volunteer papers. Prospective authors are encouraged to contact the conveners directly. General information regarding symposia may be obtained by contacting Robert Jacobi, Symposium Coordinator, SUNY at Buffalo, Dept. of Geology, 876 NSM, Buffalo, New York 14260.

1. **Neotectonics of the Eastern and Central Great Lakes Region.** J. Wallach, Atomic Energy Control Board, Box 1046, Ottawa, Ontario K1P 5S9, Canada, (613) 995-2509.

2. **Toward a New Generation of Seismic Hazard Maps and Engineering Implications for North America.** K. Jacob, Lamont-Doherty Earth Observatory, Palisades, NY 10964, (914) 365-8440, jacob@lamont.ldgo.columbia.edu; A. Dargush, NCEER, SUNY at Buffalo, 107 Red Jacket Quad, Buffalo, NY 14261, (716) 645-3391, nceer@ubvm.cc.buffalo.edu.

3. **Subsidence and Slumping in the Northeast: Mining, Karst, Structure, Neotectonic Controls.** W. Kappel, U.S. Geological Survey, 903 Hanshaw Road, Ithaca, NY 14850-1573, (607) 266-0217, ext. 3013, wkappel@sv1snyith.er.usgs.gov; H. Miller, Rock Mechanics Group, University of Missouri—Rolla, Rolla, MO 65401, (314) 341-4314, vsnelson@umr.edu.

4. **From Sandstone to Chaos: Processes in Sedimentology.** *A symposium in honor of Gerald V. Middleton on his retirement, 1996.* R. Cheel, Dept. of Geological Sciences, Brock University, St. Catherines, Ontario L2S 3A1, Canada, (905) 688-5550, ext. 3512, rcheel@craton.geol.brocku.ca.

5. **New 1:100,000 Bedrock Geology Map of Vermont: Progress and Preliminary Maps. POSTER SESSION.** N. Ratcliffe, U.S. Geological Survey, 926 National Center, Reston, VA 22092, (703) 648-6939; Rolfe S. Stanley, Dept. of Geology, University of Vermont, Burlington, VT 05401.

6. **Taconic Convergence and Appalachian Basin History: A Case Study in the Development of a Foredeep on Continental Crust.** C. Mitchell, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3991, glgchuck@ubvms.cc.buffalo.edu.

7. **Geochemistry and Tectonics in the Northern Appalachians.** R. Coish, Dept. of Geology, Middlebury College, VT 05753, (802) 388-3711, ext. 5423, coish@middlebury.edu.

8. **Metamorphism and Tectonics in the Northern Appalachians.** R. Tracy, Dept. of Geological Sciences, 4044 Derring Hall, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, (703) 231-5980, rtracy@vtvm1.cc.vt.edu. Cees Van Staal, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A OE8, Canada, (703) 231-5980, vanstaal@cc2smtp.emr.ca.

9. **Bioevents and Sequence Stratigraphy: Paleozoic Examples from Eastern North America.** *(Sponsored by SEPM.)* C. Brett, Dept. of Geological Sciences, U. Rochester, 227 Hutchinson Hall, Rochester, NY 14624, (716) 275-2408, cebh@db1.cc.rochester.edu.

10. **Faunal Succession and Speciation: The Role of Temporal and Ecological Replacement in Species Turnover.** *(Sponsored by the Northeastern Section of the Paleontological Society.)* C. Mitchell, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3991, glgchuck@ubvms.cc.buffalo.edu.

11. **GIS, Geologic Maps, and Public Policy.** R. Fakundiny, New York State Geological Survey, NYS Museum, 3136 Cultural Education Center, Albany, NY 12230, (518) 474-5816, rfakundi@museum.nysed.gov.

12. **Hydrogeologic Aspects of Site Characterization and Remediation.** J. Fountain and C. Renshaw, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3996, fountain@acsu.buffalo.edu.

13. **Fracture and Fault Characterization: Advances in Innovative Techniques and Interpretation.** R. Jacobi and J. Fountain, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 2468, fountain@acsu.buffalo.edu.

14. **Great Lakes Geological and Environmental Issues.** *(Sponsored by the GSA Institute for Environmental Education.)* J. Singer, Dept. of Earth Sciences and Science Education, SUNY College at Buffalo, 1300 Elmwood Ave., Buffalo, NY 14222, (716) 878-4724, singerjk@snybufaa.cs.snybuf.edu.

15. **Early Through Middle Wisconsin Glacial Records in the Great Lakes–Eastern North America Region.** R. Young, Dept. of Geological Sciences, SUNY College at Geneseo, Geneseo, NY 14454, (716) 245-5296, young@uno.cc.geneseo.edu. P. Calkin, Dept. Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3985, glgparkr@ubvms.cc.buffalo.edu.

THEME SESSIONS

The 1996 GSA Northeastern Section meeting committee invites papers related to the following broad themes of current interest. Theme sessions are similar to symposia in their focus on

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specific topics, but each is an open forum where the papers are volunteered. Prospective authors are encouraged to contact the appropriate session conveners directly. The following theme sessions have been proposed and will be held under these titles if enough relevant papers are submitted. If insufficient papers are received, submitted papers will be considered for regular technical oral or poster sessions.

1. **Glacial Meltwater: Subglacial, Ice Marginal, and Glacial Lakes.** P. Karrow, Dept. of Earth Sciences and Quaternary Sciences Institute, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada, (519) 885-1211, ext. 3731, pfkarrow@sciborg.uwaterloo.ca; P. Calkin, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3985, glgparkr@ubvms.cc.buffalo.edu.

2. **Appalachian and Michigan Basin Black Shales.** J. Over, Dept. of Geological Sciences, SUNY College at Geneseo, Geneseo, NY 14454, (716) 245-5294, over@uno.cc.geneseo.edu.

3. **Undergraduate Research. POSTER SESSION** *(Sponsored by the Geology Division, Council on Undergraduate Research.)* Student(s) must be listed as the author and have been the major preparer of the poster. Topics may vary over a broad spectrum (e.g., see GSA abstract form), but must be the result of the student's own participation in undergraduate research programs. Lawrence L. Malinconico, Dept. of Geology, Lafayette College, Easton, PA 18042, (610) 250-5193, malincol@lafayette.edu. Robert M. Cassie, Dept. of Earth Sciences, SUNY College at Brockport, Brockport, NY 14420-2936, (716) 395-5716, rcassie@weather.brockport.edu.

K–12 TEACHER EVENTS

A half-day program (7 a.m. to 12 noon) is planned for K–12 teachers and student teachers. This will begin with a breakfast meeting followed by workshops for K–6 and 7–12 groups. The workshop may include invited speakers, group activities, and sharing of teaching methods in poster or oral format. The program is sponsored by the GSA Education Committee.

STUDENT AWARDS AND TRAVEL ASSISTANCE

Awards will be given for the best oral paper and best poster session presented by students. Although the faculty mentor may appear as the junior author, a major part of the paper or poster session must represent work by the single student author. NOTE: *Papers submitted for this award should be so designated at the bottom of the abstract form.*

The Northeastern Section of GSA will award travel grants to students who give papers (oral or poster) of which he or she is the presenter and author or co-author at the meeting. In addition, the Northeastern Section will award student research grants to graduate and undergraduate students in 1996. Applications for travel assistance and guidelines for student research grants may be obtained from Kenneth N. Weaver, Secretary-Treasurer, Northeastern Section, GSA, c/o Maryland Geological Survey, 2300 St. Paul Street, Baltimore, MD 21281-5210, phone (410) 554-5532, fax 410-554-5502.

SHORT COURSES

Two short courses (indicated below) will be offered, one on Wednesday, before the meeting and one on Saturday afternoon, after the meeting. Preregistration is required for both of these courses. For further information on the content of these courses, you may want to contact the appropriate leaders. However, for more details, we suggest that you contact Marcus Bursik, Short Course Coordinator, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 6100, mib@pico.geology.buffalo.edu.

1. **Practical Remote Sensing for Geology.** Jim Ellis, Chevron Overseas. Wednesday, March 20. This one-day course includes: (1) an overview of fundamentals, (2) evaluation of satellite and airborne sensors, (3) acquisition and integration of images, digital elevation models, and maps, (4) image-processing techniques, and (5) interpretation of images for geology, logistics, and environmental features. Jim Ellis, Supervisor, Remote Sensing Services, Chevron Overseas Petroleum, P.O. Box 5046, San Ramon, CA, 94583, (510) 842-3030, jael@chevron.comm.

2. **Contaminant Hydrogeology in Fractured Bedrock.** Bernard Keuper, Dept. of Civil Engineering, Queens University; Kent Novakowski, National Water Research Institute, Burlington, Ontario; Carl Renshaw and Robert Jacobi, Dept. of Geology, SUNY at Buffalo. Saturday afternoon, March 23. Basic principles and current research in the flow of water and DNAPL in fractured bedrock, with an emphasis on implications for remediation, will be presented. The relation of fracture systems to regional structure and innovative methods of characterization of fractured systems will also be discussed. Contact John Fountain, Dept. of Geology, SUNY at Buffalo, Buffalo, NY, 14260; (716) 645-6800, ext. 3996, fountain@acsu.buffalo.edu.

FIELD TRIPS

A field trip, **Stratigraphy and Quaternary Geology of the Niagara Falls and Gorge,** is planned for Saturday afternoon, March 23. The trip will depart from and return to the Hyatt Regency Hotel. Leaders: Carlton Brett, Dept. of Geological Sciences, Hutchinson Hall, University of Rochester, Rochester, NY 14624, (716) 275-2408, cebh@db1.cc.rochester.edu; and Parker Calkin, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3985, glgparkr@ubvms.cc.buffalo.edu.

An SEPM-sponsored field trip for students only, **Environmental Geology of Buffalo and Environs**, is also planned for Saturday afternoon, March 23. The trip will depart from and return to the Hyatt Regency Hotel. Environmental issues in the context of surficial sedimentary deposits and sedimentary bedrock will be examined. Leaders: Kelly C. Cloyd, NYS Dept. of Environmental Conservation, Region 8 Office, Avon, NY 14414; and Robert V. Demicco, Dept. of Geological Sciences and Environmental Studies, SUNY at Binghamton, Binghamton, NY 13902-6000, demicco@bingsuns.cc.binghamton.edu.

EXHIBITS

Exhibit space will be available in the same hall as the poster sessions at the Hyatt Regency. Refreshments will be continuously available for exhibit visitors. Booths (8' × 10'), framed by pipe and drape and containing table and chairs, will be available for exhibitors during the entire meeting—8:00 a.m., Thursday, March 21, to noon, Saturday, March 23. Reduced rates are available for educational or nonprofit groups. For further information and space reservations, contact Rossman Giese, Exhibits Coordinator, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3008, glgclay@ubvms.cc.buffalo.edu.

SPECIAL EVENTS

Meetings and/or Luncheons

- Paleontological Society, NE Section.
- National Association of Geology Teachers, Eastern and New England Section.
- SEPM, Eastern Section.
- Undergraduate Student Luncheon Meeting.
- Sigma Gamma Epsilon.
- GSA Northeastern Section Management Board.

Receptions and More

- Welcoming reception, 6:30–10:00 p.m., Wednesday, March 20.
- GSA Northeastern Section Reception and Banquet, Thursday, March 21.
- Buffalo Museum of Science Reception and Light Dinner, Friday, March 22.
- National Center for Earthquake Engineering Research—Open House.
- 5 km Fun Run, 6:00–7:30 a.m., Friday, March 22.

GUEST ACTIVITIES

The Buffalo area offers a wide range of activities that may be of interest to guests, including Niagara Falls and associated attractions. For example, within the city is the internationally known Albright-Knox Art Gallery, the Naval and Servicemen's Park, and the Buffalo Museum of Science. Short drives allow access to old Erie Canal sights, or the shores of Lakes Erie and Ontario in New York or Ontario, or Letchworth Gorge. Information will be available at the Hyatt Regency to assist with sightseeing plans.

HOUSING

A large block of rooms has been reserved for meeting participants at the Hyatt Regency Buffalo, the convention site. It is a short shuttle ride from the airport and has easy access by road. For conference planning and to ensure very attractive guaranteed room rates, it is important that you reserve your room *before February 20, 1996.*

REGISTRATION

To obtain low registration fees and to assist the local committee planning, please preregister. Special low fees will be available for students and K–12 schoolteachers. One-day registration fees will also be available. Registration will be handled by the SUNY at Buffalo Office of Conference and Special Events. Registration forms will appear in the December 1995 issue of *GSA Today.*

PREREGISTRATION DEADLINE: FEBRUARY 26, 1996

DETAILED INFORMATION

Complete information concerning registration, accommodations, and activities will appear in the December 1995 issue of *GSA Today* and as part of the *Abstracts with Programs* for 1996 mailed in late February 1996. Requests for additional information or suggestions should be communicated to the general co-chair, Parker E. Calkin, Dept. of Geology, SUNY at Buffalo, 876 NSM, Buffalo, NY 14260, (716) 645-6800, ext. 3985, fax 716-645-3999, or *preferably by E-mail:* glgparkr@ubvms.cc.buffalo.edu ■

GSA Research Grants Awarded

June Forstrom, Research Grants Administrator

The GSA Committee on Research Grants met in Boulder, Colorado, on April 14–15, 1995, and awarded $319,512 to 218 student applicants, and $16,000 for the Gladys W. Cole and W. Storrs Cole Awards to two postdoctoral applicants. Committee members for 1995 are Peter C. Patton (chairman), Mary L. Droser, James P. Hibbard, Noel C. Krothe, Susan A. Longacre, Sheila J. Seaman, and Thomas O. Wright (National Science Foundation conferee).

COLE AWARDS FOR POSTDOCTORAL RESEARCH

The Gladys W. Cole Memorial Research Award for 1995 was awarded to Robert S. Anderson, University of California, Santa Cruz, to support his project "Validation of a New Cosmogenic Radionuclide Dating Strategy on the Wind River Terraces, Wyoming." This award is restricted to support research for the investigation of the geomorphology of semi-arid and arid terrains in the United States and Mexico.

The W. Storrs Cole Memorial Research Award, which is restricted to support research in invertebrate micropaleontology, was presented this year to Barun Kumar Sen Gupta, Louisiana State University, Baton Rouge, for his project "Anoxia-Tolerant Foraminifera of Hydrocarbon-Vent Habitats, Gulf of Mexico."

Eligibility for both Cole awards is restricted to GSA Members and Fellows between 30 and 65 years of age.

STUDENT AWARDS

This year, proposals were received from 579 students of which 218 (38%) were awarded grants. Of these recipients, 99 were master's candidates, 118 were doctoral candidates, and one was a postdoctoral candidate. Proposal requests totaled $1,072,636 for an average of $1853. The average award was $1466.

The committee determined that an additional 96 proposals were worthy of support, which would have required an additional $120,000. Committee members said that they hope to see the research grants funds grow, so that more of the qualified proposals can be supported in the future.

Twenty-two alternate candidates were selected by the committee in the event that some of the grantees return all or part of their grants because they

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CALENDAR

Only new or changed information is now being published in *GSA Today*. A complete listing can be found in the **Geoscience Calendar** section on the Internet: **http://www.aescon.com/geosociety/index.html.**

1995 Meetings

October

October 13–15, **National Association of Geology Teachers Far Western Section Fall Meeting,** Stockton, California. Information: Eugene F. Pearson, Dept. of Geology and Geography, University of the Pacific, 3601 Pacific Avenue, Stockton, CA 95211, (209) 946-2482, fax 209-946-2406, E-mail: epearson@uop.edu.

October 23–26, **Contaminated Soils 10th Annual Conference,** Amherst, Massachusetts. Information: Linda S. Rosen, Northeast Center, Morrill N344, University of Massachusetts, Box 35730, Amherst, MA 01003-5730.

November

November 6–9, **International Gas Research Conference,** Cannes, France. Information: 1995 IGRC, c/o Gas Research Institute, 8600 West Bryn Mawr Ave., Chicago, IL 60631-3562, (312) 399-8300, fax 312-399-8170, E-mail: ddolenc@gri.org.

November 10–11, **Prehistoric Journey: A symposium on the Evolution and Ecology of Life on Earth,** Denver, Colorado. Information: Denver Museum of Natural History, 2001 Colorado Blvd., Denver, CO 80205, 800-925-2250 (outside Denver), 303-322-7009 (Denver metro area), E-mail: paleo@dmnh.org.

1996 Meetings

March

March 6–7, **Biogeography and Geological Evolution of Southeast Asia,** London, UK. Information: Robert Hall, SE Asia Research Group, Dept. of Geology, Royal Holloway, University of London, Egham, Surrey TW20 0EX, UK; phone 44-1784-443592, fax 44-1784-471780, E-mail: cameron@gl.rhbnc.ac.uk.

March 26–27, **Platform Carbonates in the Southern Midcontinent,** Norman, Oklahoma. Information: Kenneth S. Johnson, Oklahoma Geological Survey, University of Oklahoma, 100 East Boyd St., Room N-131, Norman, OK 73019, (405) 325-3031, fax 405-325-7069.

April

April 12–14, **National Fossil Exposition XVII,** Macomb, Illinois. Information: Gilbert Norris, 2623 34th Ave. Court, Rock Island, IL 61201, (309) 786-6505.

April 28–May 1, **Symposium on the application of Geophysics to Engineering and Environmental Problems (SAGEEP),** Keystone Resort, Colorado. Information: EEGS, Mark Cramer, P.O. Box 4475, Englewood, CO 80155, (303) 771-6101, fax 303-843-6232, E-mail: 74261.524@compuserv.com, Internet Web site: http://www.esd.ornl.gov/EEGS.

September

September 17–19, **Third International Symposium on Andean Geodynamics (ISAG 96),** St. Malo, France. Information: Denis Gapais, ISAG 96, Géosciences Rennes, Université Rennes 1, 35042 Rennes cedex, France; fax: 33-99-28-67-36, E-mail: isag96@seth.univ-rennes1.fr.

Send notices of meetings of general interest, in format above, to Editor, *GSA Today,* P.O. Box 9140, Boulder, CO 80301.

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change their research project or receive funds from another source.

The committee's budget included $125,000 from the Penrose Endowment, $100,000 from the National Science Foundation, $50,000 from the Joseph T. Pardee Memorial, $6,000 from the Second Century Fund (donations by Unocal and the Lipman Research Fund), $6000 from the Harold T. Stearns Award Fund, the Sedimentary Geology Division, and the Structural Geology and Tectonics Division; and $3349 returned too late in 1994 to be re-awarded last year. The budget also included $28,000 from the GSA Foundation, comprising $9300 from the Research Fund (including $2000 from Mobil Oil), $10,150 from GEOSTAR and Unrestricted funds, and $8550 from various restricted special funds and the Engineering Geology, Geophysics, and Hydrogeology Divisions.

The recipients of student research grants awarded by GSA Divisions and Sections will be announced in the October issue of *GSA Today.*

Outstanding Mention. The Committee on Research Grants specially recognized 22 of the proposals as being of exceptionally high merit in conception and presentation:

Vicky Andrews, University of North Dakota, "The Effects of Mass Extension on Escalation of the Naticid Gastropod Predator-Prey System at the Eocene-Oligocene Boundary"; John F. Bratton, University of California, Berkeley, "Bottom-Water Oxygenation and Biotic Recovery Following the Frasnian-Famennian Boundary Mass Extinction"; Kurt N. Constenius, University of Arizona, "Structure and Timing of the Deer Creek Detachment Fault System, Wasatch Mountains, Utah"; Tobias Fischer, Arizona State University, "Gas-Water Partitioning at Papandayan Volcano, Java, Indonesia"; Carlos Fonseca, Stanford University, "Late Cretaceous-Early Tertiary Paleoceanography and Cyclic Sedimentation along the California Margin: Evidence from the Moreno Formation"; James J. Galluzzo, Jr., Tulane University, "High-Resolution Biostratigraphy/Sequence Stratigraphy of the Lares-Montbello Limestones and their Significance to the Regional Geologic Framework and Depositional History of the North Coast Aquifer System, North-Central Puerto Rico"; John H. Harris, University of Michigan, "Quantification of Paleozoic Far-Field Deformational Patterns in the North American Interior"; Victoria C. Hover, University of Michigan, "Geochemical Constraints on Pore Fluid and Sediment Interactions During the Early Diagenesis of Smectitic Clay Minerals, Mississippi River Delta Plain and Mississippi Fan"; Kurt M. Knesel, University of California, Los Angeles "Mechanisms of Crustal Contamination: Constraints from the Kinetics of Granite Melting and Granite-Basalt Interdiffusion Experiments"; Suellen R. Leimkuehler, University of Iowa, "The Origin of Methane in Glacial Till at a Municipal Waste Sanitary Landfill"; Ning Li, University of Texas, Austin, "Genesis of the Jinding Pb-Zn-Sr Deposit, Yunnan, China—A Large Sediment-Hosted Pb-Zn Deposit Generated by Fluid Mixing in a Rift Basin?"; Vladimir Liakhovitch, Southern Methodist University, "Oxygen and Hydrogen Isotopic Variations in the Trinity Massif, Klamath Mountains, Northern California"; Michelle J. Markley, University of Minnesota, "Structural Style of the Siviez-Mischa-

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bel Nappe, Western Alps, Switzerland"; Jozsef Palfy, University of British Columbia, "Integrated Biochronology and Geochronology in a Triassic/Jurassic Boundary Section in Alaska: Implications for the Geologic Time Scale and Rates of Biotic Recovery"; Timothy Paulsen, University of Illinois, Urbana, "The Structural Geometry, Kinematics, Strain and Tectonic Significance of the Mount Raymond Thrust: A Major Transverse Zone at the Southern Margin of the Wyoming Salient, Sevier Orogenic Belt, Utah"; Heather L. Reccelli, University of Iowa, "Determination of Paleoprecipitation from Stalagmite Growth Banding in Missouri and Arkansas"; Randal C. Reed, Northern Arizona University, "Stratigraphy of the Lower (?) Devonian Water Canyon Formation, Northwestern Utah"; Lois J. Roe, University of Arizona, "At Variance with Vicariance?: An Isotopic Approach to Understanding the Historical Biology and Diversification of Snakehead Fishes"; Elizabeth B. Safran, University of Washington, "Sediment Evacuation from the North Central Andes and the Role of Storage in Mountain Range Erosion"; Lora Rachelle Stevens, University of Minnesota, "Calibration of the Oxygen-Isotopic Composition of Lacustrine Carbonates with Meteorological Records from the Upper Midwest"; Mark Wingsted, University of Massachusetts, "Nature and Timing of Tectonism in the Southwestern Picuris Range, North-Central New Mexico: Its Bearing on the Tectonic Assembly of Southwestern North America"; Aaron Yoshinobu, University of Southern California, "Mechanical Links During Pluton Emplacement: When, Why, and How Strong?"

Gretchen L. Blechschmidt Research Award. The fund established in memory of Gretchen Louise Blechschmidt is to support research for women in the geological sciences. This year's award was presented to Emmanuelle Javaux of Dalhousie University, Halifax, Nova Scotia, for her project "Recent Distribution of Benthic Foraminifera in Bermuda and Paleoecological Applications: Holocene Sea-level Changes."

John T. Dillon Alaska Research Award. John Dillon was particularly noted for his radiometric dating work in the Brooks Range, the results of which have had a major impact on the geologic understanding of this mountain range. The recipient of the award established in his memory is Jennifer Lindline of Bryn Mawr College, for "The Gravina-Nutzotin Belt, South-Southeastern Alaska: Geochemistry and Geochronology of Post–Terrane Accretion Magmatism."

Robert K. Fahnestock Award. This award is given to honor the memory of Ken Fahnestock, who was a member of the Committee on Research Grants. It is awarded to the applicant with the best proposal in sediment transport or related aspects of fluvial geomorphology. The 1995 recipient is Stephen Drew Thorne, Florida State University, Tallahassee, for "Transverse Bars: Their Origin and Influence on Flow Structure, Sediment Transport, and Channel Evolution in a Boulder-Bed Stream."

Lipman Research Award. The Lipman Research Fund is supported by gifts from the Howard and Jean Lipman Foundation to promote and support student research grants in volcanology and petrology in the western United States and Alaska. The 1995 recipient is Kelly Boland, University of Nevada, Las Vegas, for "The Petrogenesis of Andesites During Regional Crustal Extension."

Bruce L. "Biff" Reed Scholarship Award. The Reed Award was established to provide research grants to graduate students pursuing studies in the tectonic and magmatic evolution of Alaska and its mineral deposits, and also can fund other geologic work in Alaska. This year's recipient is Scott T. Dreher, Indiana University, Bloomington, for "A Petrologic Investigation of South Sister Volcano: An Assessment of Potential Differentiation Mechanisms Beneath Active Volcanoes."

Harold T. Stearns Fellowship Award. The recipients of this award, for research on aspects of the geology of the Pacific Islands and the circum-Pacific region, are: Carlos Fonseca of Stanford University, for "Late Cretaceous–Early Tertiary Paleoceanography and Cyclic Sedimentation along the California Margin: Evidence from the Moreno Formation"; and Vladimir Liakhovitch, Southern Methodist University, for "Oxygen and Hydrogen Isotopic Variations in the Trinity Massif, Klamath Mountains, Northern California."

Industrial Donations and Awards. Industrial donations this year amounted to $7000 ($2000 from Mobil Oil Corporation and $5000 from Unocal Corporation). The 1995 recipients are: Laura Ann Banfield, Rice University, for "Sedimentology and High Resolution Sequence Stratigraphy of the Late Quaternary Rio Grande Valley/Delta/Slope Fan System"; Mark Caplan, University of British Columbia, for "Depositional Factors Governing the Geochemical Characteristics of an Organic-Rich Marine Source Rock: Example from the Devonian-Carboniferous Exshaw Formation, Alberta, Canada"; Bodo Katz, University of Oklahoma, for "A Test of Sequence Stratigraphy Using Magnetostratigraphy"; Jeffrey G. Richardson, Ohio State University, for "Conodont Biostratigraphy and Facies Relations of the Middle Ordovician Trenton Limestone in Ohio and Indiana"; Bradley Ritts, Stanford University, for "Mesozoic Tectonics and Sedimentation of the Qaidam Basin, Western China: Implications for the Assembly of Western and Central China"; and Peter E. Rumelhart, University of California, Los Angeles, for "The Evolution of the Nan Shan Thrust System: Implications for the Kinematic History of the Altyn Tagh Fault System, Zinjiang Province, People's Republic of China."

Other Successful Applicants. Other applicants recommended for funding are the following:

Robert H. Abrams, Penny Alano, Douglas C. Allen, Chris Amato, Leslie Ames, Rachel Ann Ames, Robert M. Baker, Sanjay Banerjee, Scott Barboza, Rachel J. Beane, Jennifer Becker, Boyd E. Benson, Katherine J. Bergk, Mairi M. R. Best, Jennifer L. Bishop, Glenn Bixler, Nancy Rodriguez Black, Ruth Elaine Blake, Dawnika Blatter, Troy Blodgett, Robert D. Bolger, Howell

Grants *continued on p. 187*

GSA SECTION MEETINGS — 1996

Call for Papers

SOUTH-CENTRAL SECTION
March 11–12, 1996
University of Texas, Austin, Texas

Abstract Deadline:
November 20, 1995

Submit completed abstracts to:
William F. Mullican, Bureau of Economic Geology, University of Texas, University Station Box X, Austin, TX 78712, (512) 471-1534, mullicanb@begv.beg.utexas.edu

SOUTHEASTERN SECTION
March 14–15, 1996
Ramada Plaza Hotel, Jackson, Mississippi

Abstract Deadline:
November 15, 1995

Submit completed abstracts to:
Darrel Schmitz, Department of Geosciences, Mississippi State University, P.O. Box 5448, Misssissippi State, MS 39762, (601) 325-2904

NORTHEASTERN SECTION
March 21–23, 1996
Hyatt Regency, Buffalo, New York

Abstract Deadline:
November 20, 1995

Submit completed abstracts to:
Charles E. Mitchell, Department of Geology, SUNY at Buffalo, 876 Natural Science and Mathematics Complex, Buffalo, NY 14260-3050, (716) 645-6800, glgchuck@ubvms.cc.buffalo.edu

ROCKY MOUNTAIN SECTION
April 18–19, 1996
Rapid City Civic Center,
Rapid City, South Dakota

Abstract Deadline:
January 5, 1996

Submit completed abstracts to:
Alvis L. Lisenbee, Department of Geology and Geological Engineering, South Dakota School of Mines and Technology, 501 East St. Joseph St., Rapid City, SD 57701-3995, (605) 394-2463

CORDILLERAN SECTION
April 22–24, 1996
Red Lion Hotel at Lloyd Center,
Portland, Oregon

Abstract Deadline:
December 28, 1995

Submit completed abstracts to:
Richard Thoms, Department of Geology, Portland State University
P.O. Box 751, Portland, OR 97207-0751, (503) 725-3379

NORTH-CENTRAL SECTION
May 2–3, 1996
Iowa State University, Ames, Iowa

Abstract Deadline:
January 17, 1996

Submit completed abstracts to:
Kenneth E. Windom, Department of Geological and Atmospheric Sciences, Iowa State University, 253 Science I Building, Ames, IA 50011-3210, (515) 294-2430, kewindom@iastate.edu

1996 ABSTRACT FORM REQUEST

To: GSA Abstracts Coordinator, P.O. Box 9140, Boulder, CO 80301-9140
or E-mail: ncarlson@geosociety.org

Please send _____ copies of the 1996 GSA abstract form. I understand that the same form may be used for all 1996 GSA meetings — (the six Section Meetings and the Annual Meeting).

Name _____

Address _____

_____

City _____ State_____ ZIP _____

1995 GSA PENROSE CONFERENCES

August
August 22–27, **Fault-related Folding,** Banff, Alberta, Canada. Information: David Anastasio, Department of Earth and Environmental Sciences, Lehigh University, Bethlehem, PA 18015-3188, (610) 758-5117, fax 610-758-3677, E-mail: dja2@lehigh.edu.

August 31–September 4, **Fine-grained Fault Rocks,** Leavenworth, Washington. Information: Jerry F. Magloughlin, Department of Geological Sciences, 1006 C.C. Little Building, University of Michigan, Ann Arbor, MI 48109-1063, (313) 747-0664, fax 313-763-4690, E-mail: jerry.magloughlin@um.cc.umich.edu.

September
September 28–October 3, **Tectonic Development of the Canada Basin and Surrounding Regions,** Banff, Alberta, Canada. Information: Lawrence A. Lawver, Institute for Geophysics, University of Texas at Austin, 8701 N. MoPac Expressway, Austin, TX 78759-8397, (512) 471-0433, fax 512-471-0433, E-mail: larry@utig.ig.utexas.edu.

October
October 6–11, **Mesozoic Evolution of the Cordilleran Continental Margin in Central and Southern California,** Tehachapi, California. Information: Andrew Barth, Department of Geology, Indiana/Purdue University, Indianapolis, IN 46202-5132, (317) 274-1243, E-mail: ibsz100@indyvax.iupui.edu.

October 14–20, **The Argentine Precordillera: A Laurentian Terrane?,** San Juan, Argentina. Information: Ian W. D. Dalziel, Institute for Geophysics, University of Texas at Austin, 8701 N. Mopac Expy., Austin, TX 78759-8397, (512) 471-0341, fax 512-471-8844, E-mail: ian@utig.ig.utexas.edu.

GSA ANNUAL MEETINGS

1995

New Orleans, Louisiana
November 6–9
Ernest N. Morial Convention Center,
Hyatt Regency New Orleans

Preregistration Deadline: ***September 29***
Technical Program Schedule: ***See pages 177–180***

REGISTRATION AND HOUSING MATERIALS APPEAR IN JUNE *GSA TODAY*

REGISTER TODAY!

1996

Denver, Colorado• October 28–31
Colorado Convention Center
Marriott City Center

General Chairs:
Gregory S. Holden and Kenneth E. Kolm, Colorado School of Mines

Technical Program Chairs:
John D. Humphrey and John E. Warme, Colorado School of Mines

CALL FOR FIELD TRIP PROPOSALS:
Please contact the Field Trip Chairs listed below.
Charles L. Pillmore, Ren A. Thompson
U.S. Geological Survey, MS 913, P.O. Box 25046
Denver Federal Center, Denver, CO 80225
phones: Charles L. Pillmore, (303) 236-1240;
Ren A. Thompson (303) 236-0929

EARTH SYSTEM SUMMIT Denver

THEME FOR 1996 ANNUAL MEETING

The scientific theme for the 1996 Annual Meeting is "Earth System Summit." As with past themes, this one has several meanings. In particular, we wish to emphasize that Earth is a complete system whose processes are complexly interrelated at a variety of scales. Second, the theme emphasizes that we are all inhabitants of this complex system; our actions can have significant impact—or be impacted by—its dynamic behavior. Theme sessions and symposia will be offered on aspects of multidisciplinary integrated studies of the Earth System, with special emphasis on the Rocky Mountain, High Plains, and Western Interior regions. We are, therefore, soliciting symposia and theme topics and field-trip proposals that will integrate a variety of disciplines around a broad topic. We envision a coupling of symposia-theme sessions and field trips, in which pre- or postmeeting field trips complement technical sessions presented during the meeting. Examples of such synergy might be "The Yellowstone Volcanic System," "The Rio Grande Rift System," or "The San Luis Valley Hydrologic System."

CALL FOR
CONTINUING EDUCATION COURSE PROPOSALS
PROPOSALS DUE BY DECEMBER 1

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 1996 Denver Annual Meeting or the 1997 Salt Lake City Annual Meeting.

Proposals must be received by December 1, 1995. Selection of courses for 1996 will be made by February 1, 1996. For those planning ahead, we will also consider courses for 1997 at that time.

For proposal guidelines or information, contact:
Edna A. Collis
Continuing Education Coordinator,GSA headquarters
1-800-472-1988, ext. 134 • E-mail: ecollis@geosociety.org

FUTURE

Denver	October 28–31	1996
Salt Lake City	October 20–23	1997
Toronto	October 26–29	1998
Denver	October 25–28	1999

For general information on any meeting call the GSA Meetings Department, 1-800-472-1988 or (303) 447-2020, ext. 133; E-mail: meetings@geosociety.org

CLASSIFIED ADVERTISING

Published on the 1st of the month of issue. Ads (or cancellations) must reach the GSA Advertising office one month prior. Contact Advertising Department (303) 447-2020, 1-800-472-1988, fax 303-447-1133, or E-mail:acrawfor@geosociety.org. Please include complete address, phone number, and E-mail address with all correspondence.

Classification	Per Line for 1st month	Per line for each addt'l month (same ad)
Situations Wanted	$1.75	$1.40
Positions Open	$6.50	$5.50
Consultants	$6.50	$5.50
Services & Supplies	$6.50	$5.50
Opportunities for Students		
first 25 lines	$0.00	$2.35
additional lines	$1.35	$2.35
Code number: $2.75 extra		

Positions Open

INDIANA UNIVERSITY, BLOOMINGTON

The Department of Geological Sciences at Indiana University, Bloomington, invites applications for a tenure-track assistant professorship in geobiology starting August, 1996. Research areas of particular interest include biodiversity, global change,paleoceanography, paleoclimatology, and evolutionary history. Candidates should have demonstrable potential as an effective teacher and as a research scientist capable of developing an externally funded research program.

Applicants should submit a vita, summary of interests in research and teaching, and names and addresses (including phone, fax, and e-mail) of three referees by 15 October to the Geobiology Search Committee, Department of Geological Sciences, Indiana University, Bloomington, IN 47405-1403; (812) 855-5581; fax: 812 855-7899; e-mail: dodd@indiana.edu.

Indiana University is an equal-opportunity, affirmative-action employer. Women and minorities are encouraged to apply.

RESEARCH PROGRAMMER
UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN

The Department of Geology seeks to fill a regular full-time position of Research Programmer. The successful candidate will have the responsibility of administering the work-stations and microcomputers in the Department; assisting in the maintenance of the Geology Computing Network; and maintaining the Geology WWW site. He/she will also assist in developing teaching software for Geology courses, especially at the introductory level; developing tools for teaching and research in geosciences; assisting in the preparation of proposals to upgrade and maintain the Geology Computing Facility; and conducting training for faculty, staff, and students as needs arise.

A B.S. degree in science or engineering with experience in computer and network administration and data retrieval through the World Wide Web is required. Candidates with a background in geosciences are preferred. Preference will be given to candidates knowledgeable in the following computer languages: UNIX scripts, C++ or C, FORTRAN and HTML. Having extensive experience in using various graphic packages will be an advantage.

The appointment will be a renewable, 12-month academic professional position. The estimated starting date is October 21, 1995. Salary is commensurate with qualifications and experience.

To ensure full consideration, applicants should send a résumé and the names of three references to: Peter A. Michalove, Department of Geology, University of Illinois, 1301 West Green Street, Urbana, IL 61801; (217) 244-3190; fax 217 244-4996; e-mail: peterm@hercules.geology.uiuc.edu before September 30, 1995.

The University is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply.

THE WIENER LABORATORY
OF THE AMERICAN SCHOOL OF CLASSICAL STUDIES AT ATHENS
DIRECTOR

Applications are invited for the position of Director of The Wiener Laboratory of the American School of Classical Studies at Athens, Greece. Applicants should have an area of expertise in one of the primary areas of the Lab's research programs (geoarchaeology, human skeletal analysis, zooarchaeology) with an established publication record and demonstrated administrative and fund-raising abilities.A strong background in natural science, experience in collaborating with archaeological and Classical scholars, and a commitment to Aegean archaeology is desired. Under the supervision of the Director of the School, the Director of the Lab is responsible for developing and administering the research and workshop programs, collections, and facilities of the Lab as well as maintaining and enlarging established networks with other laboratories and institutions. He/she chairs the local administrative committee and an international science advistory committee. Salary ($30,000–$40,000) commensurate with rank and experience; housing allowance; qualified for TIAA/CREF after two years if not previously enrolled. Term: 1 July 1996 to 30 June 1999, eligibility for renewal. Deadline for applications is 15 November 1995. Applicants must include a letter concerning his/her views on the future direction of the Wiener Laboratory, a curriculum vitae, and the names of three references that may be contacted. Application materials should be sent to the search committee chair: Professor George Rapp, Jr., Director, Archaeometry Laboratory, University of Minnesota, Duluth, MN 55812, USA. Phone: (218)726-7629. Fax: 218-726-6979.

FACULTY POSITION IN
GEOLOGICAL ENGINEERING
UNIVERSITY OF WISCONSIN, MADISON

The University of Wisconsin-Madison invites applications for a tenure-track or tenured faculty position in Geological Engineering. Potential candidates will be expected to teach geological engineering courses at both graduate and undergraduate levels, develop and conduct funded graduate research, and advise students enrolled in the Geological Engineering Program. Special consideration will be given to applicants qualified to pursue research in areas that complement existing research activities (examples of complementary fields: engineering geology, geophysical engineering). Knowledge of and experience in hazardous and toxic waste management will be of particular interest. Letters of application including research and teaching interests, current vita, and names of at least three references should be sent by November 1, 1995, to Professor Bezalel Haimson, Geological Engineering Program Chair, University of Wisconsin, 1509 University Ave., Madison, WI 53706. The University of Wisconsin is an equal opportunity/ affirmative action employer. Women and minorities are encouraged to apply

UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE

The Department of Environmental Sciences invites applications for a tenure-track faculty position in the area of hydrology at the Assistant-Professor level. Candidates should have a Ph.D. in hydrology or a closely related discipline. We are seeking an individual whose research interests involve field and laboratory observation and experimentation. Candidates whose interests are strictly in theory or computation will not be considered seriously. We also value potential or demonstrated capacity in interdisciplinary research. Example areas of particular interest include, but are not limited to, catchment and wetland hydrology and hydrochemistry, soil-plant-atmosphere interactions, surface water-ground water interacitons, and contaminant hydrogeology.

Send statement of interests, vitae, and names of three references by December 15, 1995, to Professor W. F. Ruddiman, Chair, Department of Environmental Sciences, Clark Hall, University of Virginia, Charlottesville, VA 22903. Although the closing date for applications is December 15, 1995, candidates are urged to apply as early as possible so members of the Department can arrange discussions at the Fall GSA and AGU meetings when possible. The University of Virginia is an equal opportunity/affirmative action employer.

DARTMOUTH COLLEGE / ENVIRONMENTAL GEOCHEMISTRY

The Department of Earth Sciences at Dartmouth College invites applications for a new tenure-track assistant professorship in the field of environmental and/or organic geochemistry. We are particularly interested in a person who integrates organic chemistry with geological and biological processes. Specialties might include: organic geochemistry, microgeobiology, or biogeochemistry. The successful applicant will teach introductory- and advanced-level courses in earth sciences and will participate in a graduate-level interdisciplinary program in the earth and environmental sciences. Applicants should send a curriculum vitae, reprints, statement of research, and teaching interests, and a list of at least three references with addresses, phone, and Fax numbers to: Earth Sciences Search Committe, Dartmouth College, 6105 Fairchild, Hanover, NH 03755. Application Deadline is November 1, 1995. Dartmouth College is an equal opportunity/affirmative action employer.

Services & Supplies

PROMOTE YOUR PRODUCTS AND SERVICES to the leaders and decision-makers in the earth sciences community. This column is seen each month in print and on the World Wide Web!

Opportunities for Students

JOI/USSAC Ocean Drilling Fellowships. JOI/U.S. Science Advisory Committee is seeking doctoral candidates of unusual promise and ability who are enrolled in U.S. institutions to conduct research compatible with that of the Ocean Drilling Program. Both one-year and two-year fellowships are available. The award is $20,000 per year to be used for stipend, tuition, benefits, research costs and incidental travel, if any. Applicants are encouraged to propose innovative and imaginative projects. Research may be directed toward the objectives of a specific leg or to broader themes. Proposals and applications should be submitted to the JOI office according to the following schedule: Shorebased Research: 11/15/95 (regardless of DSDP or ODP leg).

For more information and to receive an application, contact: JOI/USSAC Ocean Drilling Fellowship Program, Joint Oceanographic Institutions, Inc., 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102 (Andrea Johnson; Tel: 202-232-3900, ext. 213; Internet: ajohnson@brook.edu).

Public Service Announcement

USGS STAFF AVAILABILITY

The Geologic Division of the U.S. Geological Survey is undergoing a reduction-in-force and reorganization that will release a large pool of well trained, experienced, and productive staff including geologists, geophysicists, chemists, computer staff, cartographic and graphics experts, and a variety of administrative and support staff. Released employees will be available for employment in October 1995.

Potential employers are encouraged to contact regional offices of the Geologic Division for information and resumes of available staff beginning September 1, 1995.

INQUIRIES SHOULD BE MADE THROUGH:

Assistant Chief Geologist	Assistant Chief Geologist	Assistant Chief Geologist
Eastern Region	Central Region	Western Region
U.S. Geological Survey	U.S. Geological Survey	U.S. Geological Survey
Mail Stop 953	Mail Stop 911	Mail Stop 919
Reston, VA 22091	Box 25046, Federal Center	345 Middlefield Road
703-648-6660	Denver, CO 80225	Menlo Park, CA 94025
	303-236-5438	415-329-5101

Grants *continued from p. 185*

Bosbyshell, Angele Braden, Stacy D. Brown, Volker Bruchert, Julia G. Bryce, Brian S. Carl, Benjamin Castellana, Jonathan M. Castro, Henrietta E. Cathey, Donald P. Cederquist, Reia M. Chmielowski, Catherine A. Christoffel, Alan Clague, Troy W. Clinton, Donley Saxton Collins, Claudia Ann Cook, Holly Beth Cooper, Katie A. Cumming, Daniel Curewitz, Gwen M. Daley, Christina D. Davids, Scot Gibbs Davidson, David M. Davis, Nancye H. Dawers, Suman Kumar De, Alexander L. Densmore, Daniel Deocampo, Jennifer A. Distlehorst, Susan Dougherty, Mihai N. Ducea, Katrina Jane Edwards, Sheryl Denise Ervin, John A. Feltman, Daniel L. Feuerbach, Merri Lisa Formento-Trigilio, Julie C. Francis, Baoshun Fu, Antonio F. Garcia, Carmala N. Garzione, Carrie Elizabeth Gilliam, Keith E. Goggin, Ian T. Gordon, Shulamit Gordon, Jonas P. Gournay, David Spencer Graham, Allen Gresham, Stephen W. Grimes, Kristelle R. Groves, Kristen M. Hagstrom, Christopher P. Hamilton, Daniel C. Hamilton, Michael J. Handke, Patricia E. Helland, Howard F. Heller, Cory Hoffman, Ryan T. Houser, Eric Hovanitz, Theresa L. Hoyt, Shaosong Huang, John P. Hunter, Caroline Sylvia Ingram, Jeffrey S. Jaech, James L. Jerden Jr., Mette S. Jordan, James D. Kendall, Diann S. Kiesel, Daniel Kikkert, Andre C. Klein, Deborah Lynn Klinkby, Rhonda Knupp, Tim Ku, Hans-Christian Kuechner, Matthew J. Kulow, David Charles Latterman, Kristen J. Leckrone, Richard H. Levy, Adam Light, Heather Lin, Lila Meredith Lohr, Bruce D. Malamud, Nathalie Marchildon, Andrew Lee Maxwell, Jason Mayfield, Clifford Ray McCrary III, Roberta McIntyre, Douglas E. McVey, John W. Merck Jr., Patrick J. Mickler, Daniel James Miller, David B. Mitcheltree, Camilo Montes, Sven S. Morgan, Elizabeth B. Mulligan, Denise R. Muriceak, Michael A. Murphy, Sonia Anita Nagorski, Philip S. Newhoff, Yuet-ling O'Connor, Carol Ormand, Stephen L. Palmes, Maria S. Panfil, John Panian, Laura A. Parent, Amy Elizabeth Parker, William H. Peck, Thomas Pichler, James C. Pickens, Julia Maria Pickerell, Scott H. Pike, Shari J. Preece, Jahandar Ramezani, Roland G. Ramold, Gene Rankey, Philip G. Resor, Karen J. Rittenhouse, Scott Robinson, Eileen M. Romano, Gregory T. Roselle, Jill L. Rosenberg, Kurt Jacob Rosenkrantz, David B. Saja, Matthew R. Saltzman, Mary Sanborn-Barrie, Keegan Schmidt, Alison Borden Schwab, Anne G. Sherman, Sarah Bean Sherman, Michael I. Smoliar, Linda Elisabeth Sohl, Claudia L. Stewart, Eric C. Straffin, Kelley Straub, Maureen A. Stuart, Heping Sun, Gary Tackman, Sharma Tadepalli, Vikas Tandon, Pedro Miguel Tapia, Michael P. Terry, Scott Thieben, Mary Ellen Tuccillo, Maria Uhle, Ingrid A. Ukstins, Norman G. Van Broekhoven, Jane van Heteren, Michael Vendrasco, Kurt Vollbrecht, Cong Wang, Matthew C. Warner, Andrew C. Warnock, Tim F. Wawrzyniec, Gary S. Weissman, Patricia E. Weston, Timothy S. White, Christopher Whitefield, Peter Wilf, Robert Carleton Witter, Patricia A. Wood, Adam D. Woods, Charles Young, Libo Zhang, Xi-guang Zhang, Donggao Zhao, Jonathan H. Zimmer ■

NEW ORLEANS
BRIDGING THE GULF

GSA Annual Meeting

NOVEMBER 6–9, 1995

NEW ORLEANS, LOUISIANA

Preregistration Deadline:
SEPTEMBER 29

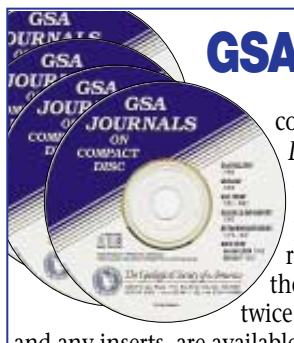
Lodging Deadline:
OCTOBER 6

See JUNE GSA Today for complete information on

- *Registration*
- *Lodging and Travel*
- *Continuing Education*
- *Field Trips*
- *Exhibits*

See pages 177–180 in this issue for

- *Technical Program Schedule*



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