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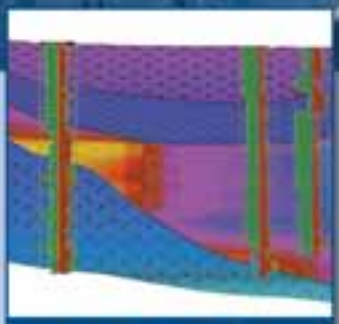

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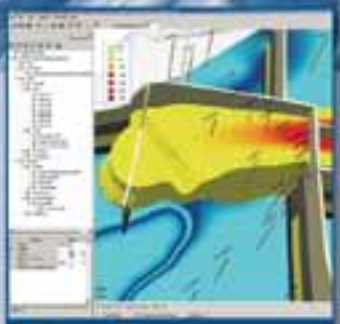

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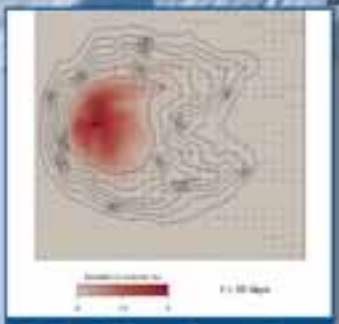

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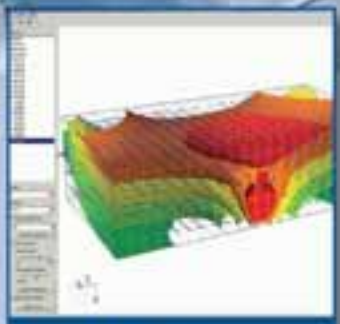

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SCIENCE ARTICLE

Cover: Earth image courtesy NASA. See "Geoinformatics: Transforming data to knowledge for geosciences", p. 4–10.

Geoinformatics: Transforming data to knowledge for geosciences

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ABSTRACT

An integrative view of Earth as a system, based on multidisciplinary data, has become one of the most compelling reasons for research and education in the geosciences. It is now necessary to establish a modern infrastructure that can support the transformation of data to knowledge. Such an information infrastructure for geosciences is contained within the emerging science of geoinformatics, which seeks to promote the utilization and integration of complex, multidisciplinary data in seeking solutions to geoscience-based societal challenges.

INTRODUCTION

Over the centuries that humankind has been studying Earth, oceans, and sky, data were gathered toward explaining the physical phenomena of our surroundings. Understanding such events as eclipses, tides, volcanism, and earthquakes was challenging because of the difficulty of organizing observations within scientific frameworks that could provide an integrative understanding of these phenomena. Pioneers of the earth sciences, such as geologists Lyell (1797–1875) and Hutton (1726–1797), made multidisciplinary observations in stratigraphy, paleontology, and petrology, stored their observations in logbooks, and visualized them through interpretive products, such as maps and cross sections. We continue to conduct our science in similar ways. We make observations on the ground and through remote sensing techniques and store the information in computers, but we still find it difficult to achieve an integrative understanding of complex natural phenomena. The ability to find, access, integrate, and properly interpret data sets has been hampered by the expanding volumes and heterogeneity of the data. With the help of computer scientists, transformative advances in the geosciences are now possible through innovative approaches to interoperability, analysis, modeling, and integration of heterogeneous databases. This geoinformatics effort would require Web-based availability of data and applications, thereby removing geographic or political boundaries. Geoinformatics will give us the ability to encompass a variety of temporal and spatial scales, integrate heterogeneous data, and visualize data and analytical results.

WHAT IS GEOINFORMATICS?

Geoinformatics is an informatics framework for the discovery of new knowledge through integration and analysis of earth-science data and applications. Fostered by support from both national and international agencies, geoinformatics has emerged to address the growing recognition that problems with significant societal implications require integrative and innovative approaches for analysis, modeling, managing, and archiving of extensive and diverse data sets. In the United States, geoinformatics emerged as an initiative within the National Science Foundation (NSF) Division of Earth Sciences and other federal agencies, such as the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA). The impetus was the wide consensus that existing information management infrastructures were inadequate to cope with the complexities of earth processes.

Foundation technologies constitute the base infrastructure required to facilitate geoinformatics. These technologies include resources for communication, storage, and computation. Consequently, geoscientists are now better equipped (e.g., high-performance computing) to efficiently address complex questions. However, the true potential of these technologies can only be realized by enhancing our data- and application-management capabilities (shown as the geoinformatics components in Fig. 1). For instance, standards are needed for the exchange and understanding of data (e.g., shared data models, markup languages, ontologies, etc.), visualization, and computation. Data analysis

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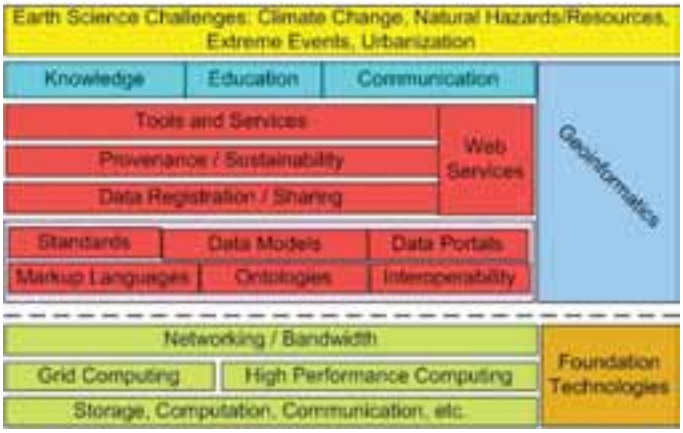

Figure 1. Representation of information technology intensive (green) and geoscience–computer science intensive (red) components for the emerging science of geoinformatics. Content adapted from Atkins et al., 2003. (See glossary, Appendix A.)

tools and services must be made Web-accessible; portals must enable easy location of registered data and services; data providers must retain ownership rights and credit through tracking of data sources and services (provenance); and, most importantly, these advances should be communicated and shared with the broader community (Simmhan et al., 2005).

Scientists facing the global challenges of climate change, natural hazards, and the discovery and management of natural resources will benefit greatly from an expanded integration of informatics into the geosciences. In this brief overview, we emphasize integration of data and services to meet such challenges. For example, management and discovery of natural resources requires many data types, such as geologic maps, geochronology, petrology, and geochemistry of fluids and solids, as well as access to ore deposit models. The ability to discover and incorporate these data into new, robust models for ore genesis would lead to an integrative view and make exploration much more efficient.

WHY DO WE NEED GEOINFORMATICS?

Communities of scientists around the world are working toward the goal of discovering new knowledge through a better understanding of the fundamental principles that underlie complex and heterogeneous data—a foundation for why the data values are what they are or an indication as to how the data would change over time through physical, chemical, and biological processes. Geoinformatics will support the next generation of knowledge discovery, markedly broaden our understanding of science and engineering, and allow us to solve challenging and complex problems previously unimagined.

There is common consensus that access to and integration of data are prerequisites for creating an information infrastructure. In addition, we argue that in order to fully exploit data in the pursuit of knowledge discovery and transformative science, new semantic models are needed to integrate scientific processes and methods within such an infrastructure. The semantic stages scientists follow on the pathway from data to knowledge and beyond involve seeking information as it relates to description, definition, or perspective (what, when, where) followed by derivation of knowledge, which comprises strategy, practice, method, or approach (how). These stages lead to new insight into fundamental principles (why).

The lack of a robust informatics infrastructure for sharing data and knowledge across all scientific disciplines has become a major hindrance to productivity, especially in multidisciplinary research (Atkins et al., 2003). Community-specific knowledge creation requires intra- and inter-community integrative capabilities. However, integrating and using data acquired by different investigators can be difficult. This is primarily because each data set uses heterogeneous schema and semantics. Such heterogeneities can be divided into three categories: syntactic, structural, and semantic (Sheth, 1998). Syntactic and structural transformation (e.g., database mediation) can be used to handle the first two kinds of heterogeneities but are not adequate for resolving semantic differences. The use of ontologies is considered a possible solution for the semantic heterogeneity problem (McGuinness, 2003).

We present two examples that demonstrate the current use of semantics for access and integration of an array of geologic data types and formats. Our purpose is to highlight the advantages of what may be considered elaborate semantics-based approaches to provide solutions for complex problems.

1. OneGeology (www.onegeology.org) is an international collaboration working to develop and serve a Web-accessible, worldwide geological map data set at a scale of 1:1,000,000. Its objective is to utilize community-endorsed standards for syntactic interoperability that enhance the use of existing data. To achieve this goal, the program has developed a data exchange model called GeoSciML (Commission for the Management and Application of Geoscience Information, 2008) that provides a controlled vocabulary within a common conceptual model. Such a model allows common description of geologic features leading to interoperability through a markup language for data interchange for the discovery and utilization of globally distributed geoscience data and information. GeoSciML is a critical first step in the use of informatics-based technologies (Simons et al., 2006).

2. Ontology-Enabled Map Integrator (OMI), developed at the San Diego Supercomputer Center (Lin and Ludäscher, 2003), utilizes ontologies for registering geologic data sets to assist in integrating and querying heterogeneous data. Although this system was implemented for integration of data associated with geologic maps, it is a geoscience breakthrough in regard to the use of ontologic capabilities for discovery and integration. Each data set is registered ("mapped") to an ontology-based association before it becomes available in a Web environment. The process of data registration semi-automatically generates mapping from data sets to existing ontologies; these mappings are then available to software applications that may be used to explore and extract information from diverse data arrays.

GEOSCIENCE-BASED SOCIETAL AND RESEARCH CHALLENGES

An Example of Cities at Risk and Volcanic Hazards

Sixty-three cities worldwide are situated near potentially active volcanoes and have populations of more than 100,000,

including two mega-cities with a combined population of more than 50 million. Thus, there is a great need to understand volcanic processes through pattern recognition and epidemiological forecasting. The need for informatics in hazard mitigation is evident in the data sets generated by disciplines represented at the International Association of Volcanology and Chemistry of the Earth's Interior's (IAVCEI) biannual conferences ("Cities on Volcanoes"). An informatics-based solution makes the integrative process across geoscience disciplines (and others) efficient, accurate, and cost-effective, thus making possible the discovery of new critical knowledge not accessible via manual analysis of data. For instance, (1) epidemiological data models enable comparisons with similar recorded events in real time, and (2) volcano visualizations and mining of data associated with volcano product characterizations facilitate efficient hypothesis formation and evaluation.

The example of cities at risk illustrates the need for integrative, multidisciplinary access to research-based data products. A host of other societally significant initiatives has similar needs; two examples are the joint USGS and Chinese Qingdao Institute for Marine Geology project on management of delta ecosystems (Delta Research and Global Observation Network) and the UK's Environment and Urban Regeneration Program for development of 3- and 4-dimensional (4-D), high-resolution shallow (first 200 m) subsurface models to aid assessment of urban risks associated with natural and anthropogenic ground instability, pollution, and flooding.

Basic research in geoscience also benefits from semantics-based geoinformatics. For example, construction of a 4-D, kinematically balanced, palinspastic restoration of a continental margin orogenic belt and foreland also requires geoinformatics-based solutions to gain a more robust understanding of geologic processes. The necessary first step in interdisciplinary integrative research is data discovery. The current method of Web-based data discovery (mainly through search engines) requires sifting through a large number of Web pages. Also, because human interaction is required, integration normally results in the "layering of data" through a GIS system to retrieve new information (e.g., Takarada et al., 2007). Alternatively, the user must create a data integration layer to capture the location, format, and structure of the underlying data leading to a logical view. This activity requires the adoption of a common data model (e.g., North American Data Model [Boisvert et al., 2003]). Such techniques are effective but laborious and not the most rational and efficient way to analyze complex information (Doan and Halevy, 2005).

The main impediment to data discovery and integration is the lack of semantics to enable machines to "understand" and "automatically" process the data that they now merely display (Cardoso and Sheth, 2006). Figure 2 shows the different types and levels of interoperability leading to integration through semantics-based techniques. For example, taxonomy can classify information hierarchically without defining the nature of connections, while a thesaurus contains associations with semantic constraints. Both levels of semantic models are for standard classification schemes in a single discipline (e.g., rock classification [one-dimensional]) and are unable to represent and interoperate across multiple dimensions and/or varied conceptual models (Obrst, 2003; McGuinness, 2003). The more

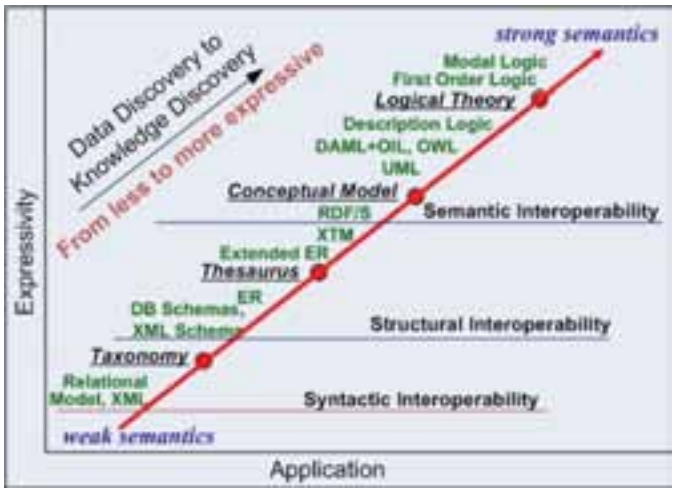

Figure 2. Multiple levels of semantics and associated interoperability capabilities (from Obrst, 2003). Increasing interoperability services requires increasing community agreement on conceptual relationships across participating geoscience disciplines. Strong semantics allow inferences from dataset contents. Terms defined in Appendix A.

expressive semantics, in the form of ontologies, are underpinned by logical theories and provide increased capabilities for deductions and inferences based on known associations and rules (Baader et al., 2004; Sinha et al., 2006). Enabling software tools and languages, such as XML (W3C, 2003), RDF (W3C, 2004a), and OWL (W3C, 2004b; McGuinness and Harmelen, 2004), allow interoperability at increasing levels of semantics (i.e., from weak to strong), resulting in a transition from data to knowledge. We endorse the definition of knowledge discovery as a nontrivial extraction of implicit, previously unknown, and potentially useful information from data (Frawley et al., 1992).

To enable strong semantic interoperability, current research emphasizes ontology-based data registration, discovery, and integration (Obrst, 2003; Noy, 2004; Raskin, 2006; Malik et al., 2007a; Fox et al., 2008). The primary purpose of ontologies (e.g., Noy and McGuinness, 2001) is to provide an organizational structure for automated data discovery and automated inferencing capabilities (Baader et al., 2004). For example, a relationship between the occurrence of ignimbrites and hazardous volcanic eruptions can be inferred by an automated reasoning system even though this fact is not contained in the database, but only if the ontologic framework effectively captures such a relationship (Fig. 3). The conceptual relationships are based on the ontologic relationships: (1) ignimbrite *is a* pyroclastic rock *is a* volcanic rock *is a* rock; (2) a hazardous eruption *is an* explosive eruption *is an* eruption; and (3) an explosive eruption *has material* pyroclastic rocks; therefore, ignimbrites are a product of hazardous volcanic eruptions.

Recognizing the significance of semantics, we see the future as a virtual environment that allows science communities to go beyond data discovery toward modeling and understanding processes through shared data and services. We recognize the need to establish a tripartite semantic infrastructure for automated discovery, analysis, utilization, and understanding of data (through both inverse and forward modeling capabilities), leading to new knowledge. This infrastructure will consist of

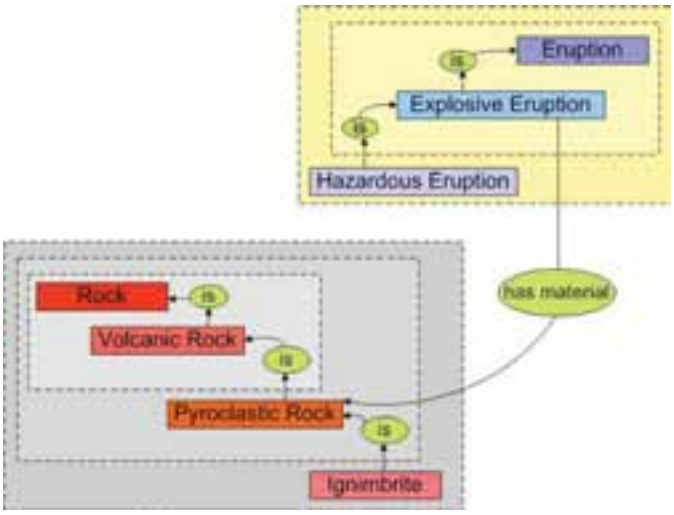

Figure 3. Graphical representation of an ontology leading to automated capability of logical deduction through defined taxonomies and inference rules.

three categories of ontologies: objects (e.g., materials), processes (e.g., chemical reactions), and services (e.g., simulation models). Objects represent our understanding of the state of a system when the data were acquired, whereas processes capture the forcings on the objects that may lead to changes in state over time (Sinha et al., 2006). Service ontologies would enable appropriate tools for computation and visualization to be discovered as Web services. Such a semantic model would provide crucial machine-interpretable information to the knowledge discovery process.

Object ontologies exist at many levels of abstraction and are often related to a tiered structure composed of upper-level, mid-level, and domain ontologies (Semy et al., 2004). Upper-level ontologies, such as Suggested Upper Merged Ontology (SUMO) (Niles and Pease, 2001) and Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE) (Masolo et al., 2003), provide a conceptual framework for developing domain ontologies, leading to interoperability, automated inference, and natural language processing. For example, a geoscience ontology being developed as a mid-level ontology (Malik et al., 2007a) could eventually contain all possible geoscience terms and their associations, similar to the well-developed semantic capabilities in bioinformatics (Stevens et al., 2004).

The use of existing ontologies (e.g., SWEET ontology library [Raskin and Pan, 2005], which contains numeric, time, and units ontologies) will accelerate the development of additional subject-specific ontologies in the geosciences (e.g., Ramachandran et al., 2006; Sinha et al., 2007; Tripathi and Babaie, 2008). Thus, we envision community-supported ontologies that would enable automated discovery, analysis, utilization, and understanding of data through both induction and deduction along the pathway from data to knowledge and ultimately to insight of scientific principles. We emphasize that through technologies such as ontology mappings (Fensel, 2004) it is possible to share ontologic frameworks within and across scientific communities, regardless of consensus level. For example, rock classification schemes used by the British Geological Survey and the Geological Survey of Canada are dissimilar, but a user can still map the concepts of one to the other based on either classification scheme.

The semantic interoperability problems of data discovery and integration are similar to those associated with the use of geoscientific services (e.g., visualization or modeling codes), which have experienced limited re-use because of differences in operating systems, formats, etc. The Web Services Initiative undertaken by the World Wide Web Consortium (W3C) is a step toward resolving the problem of service-sharing across computing environments (Alonso et al., 2003). A Web service user need not be concerned with the operating systems, development language environments, or component models used to create or access the service. Therefore, tools and services developed by geoscientists can be wrapped as Web services registered to a service and process ontologies and made accessible to the scientific community at large.

Figure 4 shows a software system architecture for organizing geoscientific data and tools through ontologies. Registration to ontologies of these data and tools as Web services would

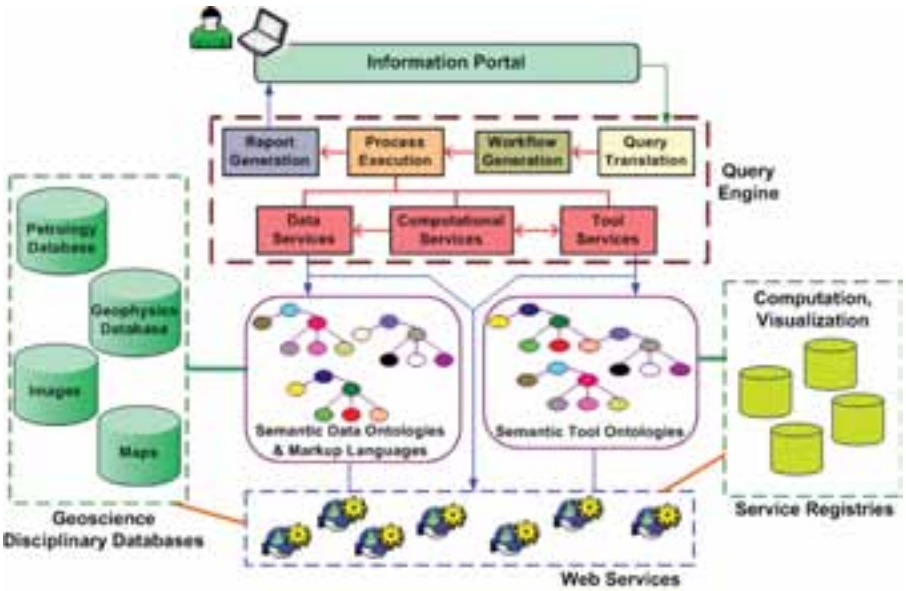

Figure 4. Schematic representation of geoinformatics components linked for efficient access to data, tools, and services for solving complex problems. A user query presented through a portal would automatically retrieve the appropriate tool defined as a Web service (registered to semantic tool ontology), which in turn would identify the required data set (registered to a data ontology), facilitating integration of heterogeneous and distributed data resources.

enable them to be automatically selected to answer geoscience queries. For example, the problem of integrating heterogeneous volcanic and atmospheric chemical-compound data used to assess the atmospheric effects of volcanic eruptions can be accomplished through semantically enabled registration and integration engines (Malik et al., 2007b; Rezgui et al., 2007; Fox et al., 2008). A simple query, such as "Find A-type plutons in Virginia and identify the correlation between these plutons and their gravity properties," requires Web-based access to distributed data resources (geochemical, gravity, and map databases, as well as computational and visualization tools) (Rezgui et al., 2007). Clearly, continued participation by geoscientists in ontology development and engineering and registration of data and tools will enable the community to move ahead into the emerging world of the Semantic Web.

THE FUTURE: THE SEMANTIC WEB AND DATA WITH NO BORDERS

The emerging Semantic Web is an extension of the existing Web, in which all information is given a well-defined meaning (Berners-Lee et al., 2001). The ultimate goal of the Semantic Web is to transform the present-day Web into a medium through which data and applications can be automatically understood and processed without geographical or organizational boundaries. The Semantic Web allows understanding, sharing, and invocation of data and services by automated tools associated with ontologies (Alonso-Jiménez et al., 2006), and it is already in use within the corporate world (Oracle, 2010; W3C, 2009a, 2009b). Other advantages of Semantic Web technologies for the geosciences include (1) facilitated knowledge management (capturing, extracting, processing, and storing knowledge) (Alonso et al., 2003); (2) integration across heterogeneous domains through ontologies (Fox et al., 2008); (3) the ability to handle non-text items, such as images and multimedia (Schreiber et al., 2001); (4) efficient information filtering (sending selective data to the right clients); (5) machine understanding (the ability to take humans out of the "integration loop"); (6) the formation of virtual communities (Reitsma and Albrecht, 2005); (7) legacy capture for long-term archiving; (8) serendipity (finding unexpected collaborators); and (9) Web-based education (Ramamurthy, 2006).

Capabilities based on semantic integration of data, services, and processes will become the new paradigm in scientific endeavors and will provide a significant boost to the visibility of geoscience research and education in a competitive world. Significant industry and government funding will be necessary for geoinformatics to grow to the level enjoyed by its sister program in bioinformatics (e.g., Mohan-Ram, 2000; Tracor Systems Technologies, 1998). We also support the establishment of a consortium to provide an organizational platform for promoting long-term management of data and resources. Researchers in bioinformatics have already recognized the need to establish economically viable models for the long-term survival of public data on the Web (Ellis and Kalumbi, 1998); geoscientists can utilize the voice of the consortium to provide stability for existing data, because those data represent the fundamental infrastructure for future geoscience research and its applications.

SUMMARY

Earth has a complex record of the dynamic interaction among plates, materials, and life that provides clues to the physical and chemical evolution of continents, oceans, atmosphere, and life forms. Extremely heterogeneous data from rocks that preserve ~4.5 billion years of history have been meticulously gathered through observations over the centuries, and this highlights the integration problems associated with studies of biodiversity, climate change, planetary processes, and natural hazards and resources. The vision of geoinformatics is to create a fully integrated geosciences information network with free access to earth-science data, tools, and services. Research in all categories of geoinformatics will support the emerging challenges posed by the building of knowledge societies:

> First, to narrow the digital divide that accentuates disparities in development, excluding entire groups and countries from the benefits of information and knowledge; second, to guarantee the free flow of, and equitable access to, data, information, best practices and knowledge in the information society; and third to build international consensus on newly required norms and principles.
>
> (UNESCO, 2003, preface)

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APPENDIX A

Glossary of Selected Terms

Conceptual model—uses a comprehensive idea that brings diverse elements into a basic relationship.

Data—values derived from scientific experiments and factual information, especially information organized for analysis.

Database—a structured collection of data managed to meet the needs of a community of users. The structure is achieved by organizing the data according to a database model.

Data model—an abstract model that describes how data are represented and used.

Description logics—a family of knowledge-representation languages that can be used to represent the terminological knowledge of an application domain in a structured and formally well-understood way.

Foundation technologies—technological resources for creation, communication, storage, and interpretation of data (e.g., spreadsheets, databases, word processors, bandwidth, HPC, Internet, etc.).

Interoperability—"enables distributed heterogeneous systems to be interactive so that a meaningful exercise may be conducted" (Sedris Technologies, 2007); the ability to exchange and use information across heterogeneous data.

Integration—the process of combining data residing at different sources and providing the user with a unified view of such resources.

Integration through layering—overlay of data products as is commonly utilized in GIS methods.

Integration through semantics—a set of technologies, drawn from artificial intelligence, linguistics, and knowledge management, designed to help make sense of complex information and allow improved integration between systems.

Markup language—"a notation for identifying the components of a document to enable each component to be appropriately formatted, displayed, or used" (Glasgow Caledonian University, 2008). A markup language (e.g., XML) provides a way to combine text and extra information about that text.

Ontology—a set of knowledge terms, including the vocabulary, the semantic interconnections, and explicit rules of inference and logic for some particular topic (Gruber, 1993).

OWL—Web Ontology Language is a family of knowledge representation languages for authoring ontologies endorsed by the W3C (2004b).

Portal—Web site considered to be an entry point for discovery and access of multiple resources and other Web sites.

Provenance—tracking the source of data and services.

Registration—adding new descriptions to a repository.

Relational model for database—based on first-order predicate logic.

Schema—structure and organization of databases, including information on the type of content and relationship within the structure (also XML and RDF schemas).

Service registry—a network-accessible directory that contains information about the available services.

Standards—defined by the International Organization of Standardization (ISO) as "documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose" (BioBasics, 2007).

Semantic—the implied meaning of data. Used to define what entities mean with respect to their roles in a system (Sedris Technologies, 2007).

Semantic interoperability—refers specifically to the meanings that are embedded in this exchanged information and to the effective and consistent interpretation of these meanings.

Semantic Web—an evolving extension of the World Wide Web in which Web content can be expressed not only in natural language but also in a form that can be understood, interpreted, and used by software agents, thus permitting them to find, share, and integrate information more easily (W3C, 2009c).

Structural interoperability—incompatibilities between hardware, operating systems, etc.

Syntactic interoperability—form of interoperability concerned with the technical issues and standards involved in the effective communication, transport, storage, and representation of metadata and other types of information (UKOLN, 2006).

Taxonomy—classification scheme for terms, structured collection of terms, generally hierarchical, that is used for both classification and navigation.

UML—Unified Modeling Language is the industry-standard language for the specification, visualization, construction, and documentation of the components of software systems. UML helps to simplify the process of software design, making a model for construction with a number of different views (Object Management Group, 2010).

Web service—defined by a set of technologies that provide platform-independent protocols and standards used for exchanging data between applications. Web services are frequently just Web application programming interfaces (APIs) that can be accessed over a network, such as the Internet, and executed on a remote system hosting the requested services.

XTM—provides a model and grammar for representing the structure of information resources used to define topics, and the associations (relationships) between topics (TopicMaps.Org Authoring Group, 2001).

THE GEOLOGICAL SOCIETY OF AMERICA®

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ARCHEAN to Anthropocene
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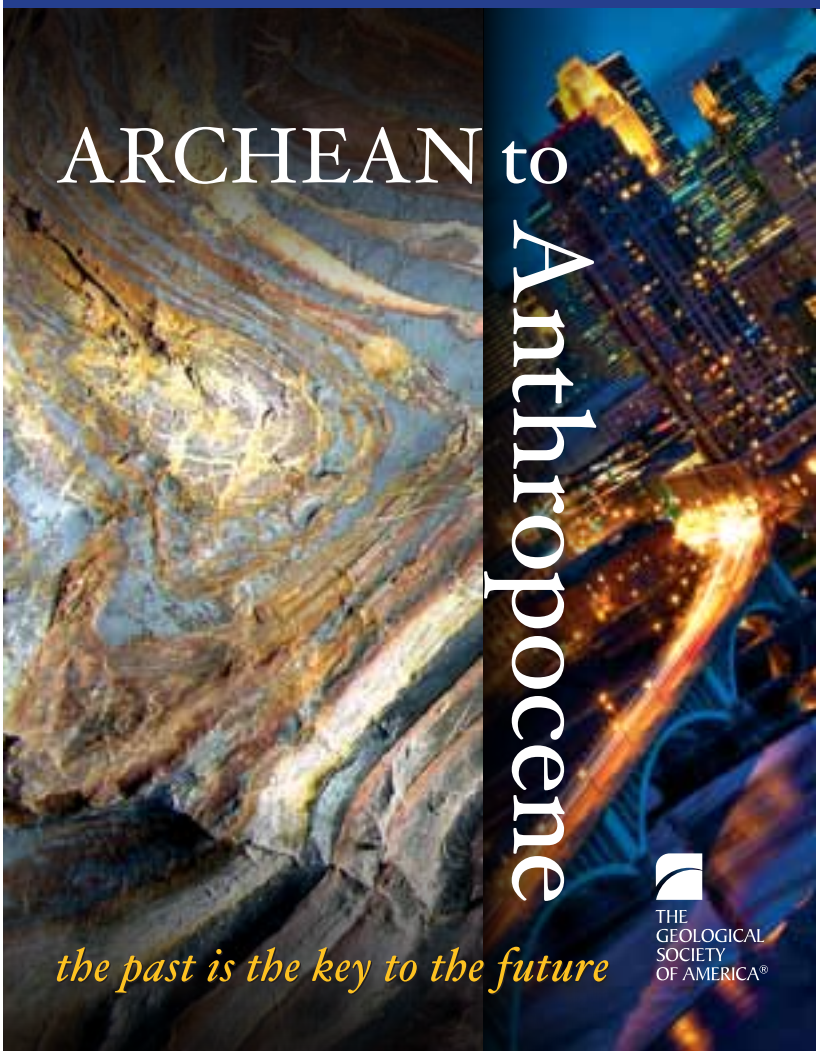

Minneapolis, Minnesota skyline at night. Photo by Greg Benz, http://carbonsilver.com/blog.

Looking forward ...

Proposal deadline: 11 January 2011

Upload your proposals via www.geosociety.org/meetings/2011/

Now is the time! Please submit your session proposal for the Annual Meeting in Minneapolis, and we will help you fill it. A highly capable and diverse local organizing committee is working hard with the GSA HQ team to make this exactly the meeting you want it to be.

Our geology is diverse. Minnesota and our neighboring states and provinces range from Phanerozoic cover to Archean shield and from the Mississippi drainage to the Hudson Bay watershed, all within the limit of continental glaciation.

The field trips will be varied. We will have a remarkable array of interesting, exciting, enjoyable, and carefully planned field trips, all at the peak of the fall colors in our mild early October weather.

Our theme captures this diversity—*Archean to Anthropocene; the past is the key to the future* stresses the broad research and education agenda of the GSA community as a whole, as well as the applications of our work to society.

We will be well coordinated. Prospective participants will see that your session ties in with field trips, short courses, workshops, and events to ensure that they will be able to make the most of their trip.

You haven't been here for a long time! GSA was last in Minneapolis in 1972; this will be the first annual meeting in the north-central region since St. Louis, Indianapolis, and Cincinnati in the 1980s. So you need to be here.

This meeting will go easy on you. Air connections to the middle of the continent are excellent, and the cab or light-rail ride from the airport is short.

You will love this town! The Twin Cities make up a pleasant, safe, and well-equipped community, with diverse running trails, cycling paths, arts, sports, public facilities, and restaurants; you may want to plan to spend an extra day or two here!

***And now*—Check out our poster!** We are pleased and excited to offer you yet another in a series of posters that go back to the 2005 North-Central Section meeting in Minneapolis. How many seconds will it take before you see something in that poster that you have never noticed before?

Brace yourselves—The Minneapolis meeting is going to be great. And now, folks: Get ready, get set… let's start proposing sessions!

Harvey Thorleifson,
2011 Local Committee Chair, thorleif@umn.edu

The Details

Propose a session via **www.geosociety.org/meetings/2011/** and have a real impact on the 2011 annual meeting. *You* are the key to unlocking the meeting's potential—Help us capture the diversity of geoscience and ensure that your area of expertise is represented.

Topical sessions promote the exchange of timely, state-of-the-art information with respect to a focused topic and allow scheduling of interdisciplinary talks that bear on that topic. Organizers (also called *advocates*) may invite up to three specific papers or poster presentations to ensure a successful session and are also encouraged to solicit volunteered abstracts. Once topical sessions are approved, articles in *GSA Today* will also be used to solicit volunteered abstracts. Topical sessions must receive a minimum of 12 abstracts to be part of the technical program, and all session proposals are reviewed by the Joint Technical Program Committee.

Do you have an idea for a digital poster session? Perhaps your modeling poster would be better viewed digitally? Submit a Digital Poster Topical Session proposal. An extra abstract submittal fee will apply for the use of a digital board in the poster hall area.

Pardee Keynote Symposia (made possible by a grant from the Joseph T. Pardee Memorial Fund) are special events of broad interest to the geoscience community that represent leading-edge work in a scientific discipline or a vital area of public policy. The GSA Annual Program Committee (APC) takes a proactive role in selecting topics and soliciting conveners for Pardee Keynote Symposia in order to enhance the range and significance of science at the annual meeting and to highlight topics of particular relevance to the Minneapolis meeting location. However, ideas for symposia will not be limited to those of the APC. All interested parties are encouraged to pool their resources and submit ideas related to new breakthroughs and transformative science within their geoscience subdisciplines. GSA also encourages members to work with GSA Divisions and Associated Societies to come up with suggestions for Pardee Keynote Symposia. Symposia may follow a classic format, but organizers also have the flexibility to reformat a session in a manner that works best for the topic at hand.

Minneapolis 2011 Dates & Deadlines

1 Dec. 2010: Field Trip proposals due.
11 Jan. 2011: Technical Session proposals due.
1 Feb. 2011: Short Course proposals due (also via www.geosociety.org/meetings/2011/).
April 2011: Electronic abstract form posted at www.geosociety.org. First announcement of sessions published in the April/May *GSA Today*.
June 2011: Second announcement and registration information published in the June *GSA Today*.
26 July 2011: Abstracts due by 11:59 p.m. PST.
13 Aug. 2011: Technical program schedule finalized. Accepted abstracts with links to speakers and titles will be posted at www.geosociety.org in mid-August.

2011 Meeting Organizers

Chair: Harvey Thorleifson, Minnesota Geological Survey, thorleif@umn.edu
Vice Chair: Carrie Jennings, Minnesota Geological Survey, carrie@umn.edu
Technical Program Chair: David Bush, University of West Georgia, dbush@westga.edu
Field Trip Chair: Jim Miller, University of Minnesota–Duluth, mille066@umn.edu
Sponsorship Chair: Curtis M. Hudak, Foth Infrastructure & Environment, LLC, curtis.hudak@foth.com

Photo courtesy the Meet Minneapolis Official Convention & Visitors Association.

2011 GSA DIVISION AWARDS

GSA Division: Sedimentary Geology

LAURENCE L. SLOSS AWARD FOR SEDIMENTARY GEOLOGY

Nominations due 20 February 2011

Submit (1) a cover letter describing the nominee's accomplishments in sedimentary geology and contributions to GSA and (2) a curriculum vitae via e-mail to Paul Link, secretary, Sedimentary Geology Division, linkpaul@isu.edu.

The Laurence L. Sloss Award for Sedimentary Geology is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—i.e., achievements that contribute widely to the field of sedimentary geology and service to GSA. The Sedimentary Geology Division's management board will choose the recipient from two nominees selected by the nominations committee, and the award will be presented at the 2011 GSA Annual Meeting in Minneapolis. Monies for the award are derived from the annual interest income of the Laurence L. Sloss Award for Sedimentary Geology Fund, which is administered by the GSA Foundation.

GSA Division: Coal Geology

GILBERT H. CADY AWARD

Nominations due 28 February 2011

Submit three copies of the following to Jack C. Pashin, Energy Investigations Program, Geological Survey of Alabama, P.O. Box 869999, Tuscaloosa, AL 35486-6999, USA; jpashin@gsa.state.al.us: (1) name, office or title, and affiliation of the nominee; (2) date and place of birth; (3) education, degree(s), and honors and awards; (4) major events in his or her professional career; and (5) a brief bibliography noting outstanding achievements and accomplishments that warrant nomination

The 2011 Gilbert H. Cady Award is given for outstanding contributions in the field of coal geology. The first award, established by the Division in honor of Gilbert H. Cady, was presented in 1973. The award recognizes contributions that advance the field of coal geology within and outside North America and will be presented at the Coal Geology Division Business Meeting at the 2011 GSA Annual Meeting in Minneapolis. Nominations will be evaluated by the Gilbert H. Cady Award Panel. Monies for the award are derived from the annual interest income of the Gilbert H. Cady Memorial Fund, administered by the GSA Foundation.

GSA Division: Geophysics

GEORGE P. WOOLLARD AWARD

Nominations due 15 February 2011

Submit online via link at www.gsageop.org. Nominations should include a description of the nominee's specific contributions and their scientific impact.

The George P. Woollard Award recognizes outstanding contributions to geology through the application of the principles and techniques of geophysics. The award is presented at each annual GSA meeting in conjunction with the Geophysics Division and the Structural Geology and Tectonics Division business meetings. A highlight of the presentation is the honorary George P. Woollard Technical Lecture by the recipient before the award ceremony. Award funds are administered by the GSA Foundation.

GSA Division: Geoscience Education

BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING

Nominations due 1 February 2011

Submit nominations to http://gsaged.org/biggsaward/award2010.htm. Any supplemental materials should be sent to Dean Moosavi, smoosavi@umassd.edu.

The Biggs Award recognizes innovative and effective teaching in college-level earth science. Earth-science instructors and faculty members from any academic institution engaged in undergraduate education who have been teaching full-time for 10 years or fewer are eligible (part-time teaching is not counted in this requirement). Both peer- and self-nominations will be accepted.

This award, administered by the GSA Foundation, is made possible by support from the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA's Education and Outreach Program. An additional travel reimbursement is also available to the recipient to enable him or her to attend the award presentation at the GSA Annual Meeting.

GSA Division: Quaternary Geology and Geomorphology

FAROUK EL-BAZ AWARD FOR DESERT RESEARCH

Nominations due 2 April 2011

Submit nominations, including (1) a statement of the significance of the nominee's research, (2) a curriculum vitae, (3) letters of support, and (4) copies of no more than five of the nominee's most significant publications related to desert research to Sara Rathburn, Dept. of Geosciences, Colorado State University, Fort Collins, CO, 80523-1482, USA; rathburn@cnr.colostate.edu. Please submit electronically unless hardcopy previously approved.

The Farouk El-Baz Award for Desert Research rewards excellence in desert geomorphology research worldwide. It is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership. Any scientist from any country may be nominated. Because the award recognizes research excellence, self-nomination is not permitted. Neither nominators nor nominees need be GSA Members. Monies for the award are derived from the annual interest income of the Farouk El-Baz Fund, administered by the GSA Foundation.

GSA Division: History of Geology

MARY C. RABBITT HISTORY OF GEOLOGY AWARD

Nominations due 1 February 2011

Submit nominations to Jane P. Davidson, University of Nevada, Reno, NV 89557-0001, USA; +1-775-747-2252; jdhexen@unr.edu.

The Mary C. Rabbitt History of Geology Award is presented annually to recognize an individual for exceptional scholarly contributions of fundamental importance to our understanding of the history of the geological sciences. Achievements deserving of the award include, but may not be limited to, publication of papers or books that contribute new and profound insights into the history of geology based on original research or a synthesis of existing knowledge. The award was established by the History of Geology Division in 1981 and renamed in memory of Mary C. Rabbitt in 2005. For more information, please see http://gsahist.org/HoGaward/awards.htm. Neither the nominator nor the nominee need be a member of the Division or of GSA. Monies for the award are administered by the GSA Foundation.

GSA AWARD, RECOGNITION & GRANT DEADLINES

See the October *GSA Today* (p. 12–15*), go to www.geosociety.org/awards/ or contact GSA Grants, Awards & Recognition P.O. Box 9140, 3300 Penrose Place Boulder, CO 80301-9140, USA +1-303-357-1028, awards@geosociety.org, for details.

2011 GSA Medals and Awards (due 1 Feb.): Upload your nominations for the Penrose Medal, Day Medal, Young Scientist Award (Donath Medal), GSA Public Service Award, GSA Distinguished Service Award, Bromery Award for the Minorities, and the Subaru Outstanding Woman in Science Award to www.geosociety.org/awards/nominations.htm.

AGI Medal in Memory of Ian Campbell (due 1 Feb.): Upload your nomination to www.agiweb.org/direct/awards.html.

AGI Marcus Milling Legendary Geoscientist Medal (due 1 Feb.): Upload your nomination to www.agiweb.org/direct/awards.html#legend.

GSA Fellowship (due 1 Feb.): Upload your nomination to www.geosociety.org/members/fellow.htm.

2011 Student Research Grants (due 1 Feb.): Submit your application to www.geosociety.org/grants/gradgrants.htm.

2011 Post-Doctoral Research Awards (due 1 Feb.): Submit your application for either the Gladys W. Cole Memorial Research Award or the W. Storrs Cole Memorial Research Award to www.geosociety.org/grants/postdoc.htm.

John C. Frye Environmental Geology Award (due 31 March): Send nomination packets to GSA Grants, Awards & Recognition, awards@geosociety.org.

** Find the October issue online at www.geosociety.org/gsatoday/archive/20/10/.*

NATIONAL AWARDS

Do your part…

Help the GSA External Awards Committee by making a nomination for a non-GSA award!

GSA needs your assistance and expertise in making nominations for the wide range of geoscience awards outside of the GSA awards arena. GSA is looking to promote national visibility and recognition for the earth sciences by making credible nominations for national awards. Examples of such awards are the William T. Pecora Award, the Vannevar Bush Award, the National Medal of Science, and the Alan T. Waterman Award. The GSA External Awards Committee also selects nominees for AGI Awards, including the Ian Campbell Medal, the William B. Heroy, Jr., Award, and the Marcus Milling Legendary Geoscientist Award. For details, see the "Call for Nominations for National Awards" in the October *GSA Today* (p. 15*).

Please send your complete nominations by 1 Feb. 2011 to GSA Grants, Awards & Recognition, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, awards@geosociety.org. Nominations will be forwarded to the GSA External Awards Committee. This committee consists of 12 voting members, including GSA's past presidents, the Penrose and Day Medal Award Committee Chairs, and eight Division representatives. The committee is charged with generating, receiving, and evaluating candidates for all nominations submitted by either the GSA membership at large or by committee members themselves. After reviewing all nominations, the committee will present their recommendations to GSA Council for approval and will then forward the final nominee information to the sponsoring organizations for their consideration.

Our GSA membership has a wealth of knowledge and expertise, so please join us in making a nomination of an award that you are passionate about!

* Find the October issue online at www.geosociety.org/gsatoday/archive/20/10/.

GSA Mentor Programs

STUDENTS

Interested in a Career in the Applied Geosciences?

Plan now to attend a Roy J. Shlemon Mentor Program in Applied Geoscience and/or a John Mann Mentors in Applied Hydrogeology Program at your 2011 Section Meeting to chat one-on-one with practicing geoscientists. These volunteers will answer your questions and share insights on how to get a job after graduation.

PROFESSIONALS

Interested in Mentoring Students about Applied Geoscience Careers?

Being a mentor is a rewarding experience. If you would like to serve as a mentor at one of the GSA Section Meetings, or need more information, please contact Jennifer Nocerino, jnocerino@geosociety.org.

www.geosociety.org/mentors/

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2011

NORTHEASTERN/ NORTH-CENTRAL
Joint Section Meeting
Pittsburgh, Pennsylvania, USA
20–22 March 2011
Abstract deadline:
14 December 2010

SOUTHEASTERN
Section Meeting
Wilmington, North Carolina, USA
23–25 March 2011
Abstract deadline:
14 December 2010

SOUTH-CENTRAL
Section Meeting
New Orleans, Louisiana, USA
27–29 March 2011
Abstract deadline:
18 January 2011

ROCKY MOUNTAIN/ CORDILLERAN
Joint Section Meeting
Logan, Utah, USA
18–20 May 2011
Abstract deadline:
15 February 2011

GSA Section Meeting Schedule

Penrose Conference Report

Origin and Uplift of the Sierra Nevada, California, USA

Bridgeport, California, USA
15–20 August 2010

CONVENERS

Cathy J. Busby, *Dept. of Earth Science, University of California, Santa Barbara, California 93106, USA*

Keith Putirka, *Dept. of Earth and Environmental Sciences, California State University, 2345 E. San Ramon Ave., MS/MH24, Fresno, California, 93720, USA*

The Sierra Nevada is an important natural laboratory for understanding a disparate array of geologic processes, including plate tectonics and associated range uplift, volcanic activity, changes in regional climate, and the assembly of plutons and batholiths. Data derived from these seemingly disparate research areas are wholly interrelated. For example, the paleodepths of pluton intrusion or roof pendant metamorphism inform estimates of the magnitude of Cenozoic range uplift, as do the timing and composition of Miocene and Pliocene volcanic rocks. Similarly, paleoclimate models are important for understanding rates of downcutting of the modern canyons that cross the Sierra Nevada. Successful models of uplift, climate change, downcutting history, and regional volcanism must explain or be consistent with geophysical observations of the crust and lithosphere as well as the age and composition of the basement rocks.

This Penrose Conference brought together researchers with a wide range of interests, including geophysics, active tectonics, structural geology, volcanism, geochemistry, batholith emplacement, stratigraphy and sedimentology, paleobotany, geomorphology, geochronology, and thermochronology, with the goal of defining clearer paths of research and potential avenues of collaboration. Much of the discussion focused on the Sierra Nevada, including (1) the nature and origin of bedrock geology; (2) geophysical observations of the crust and lithosphere; (3) geomorphologic, paleontologic, and isotopic data and theoretical models related to range uplift; and (4) volcanism and potential links to tectonic events. However, a large part of the discussion dealt with a much broader context, starting with the entire western United States and Mexico and its Pacific plate margin, and narrowing to the Great Basin and, in particular, transtensional rifting in the Walker Lane belt (Eastern California shear zone) and the Gulf of California. After all, the origin and uplift of the Sierra Nevada cannot be evaluated without debating models, for example, of (1) Laramide flat-slab–Shatsky conjugate subduction and the existence/nature of the "Nevadaplano"; (2) Paleogene slab rollback, ignimbrite flare-up, and burning of the lithospheric landbridge across what is now the Great Basin; and (3) the relative importance of edge-driven (San Andreas) versus bottom-driven (mantle flow) controls on extension, transtension, and vertical motions.

The importance of the Sierra Nevada–Walker Lane region cannot be overemphasized for understanding the processes involved in the rupturing of continental lithosphere. This is a classic plate tectonic region, from which many important concepts have developed and been exported to other parts of the world. Furthermore, the region is important for geothermal and mineral resources and has a population living on active faults (e.g., Reno–Carson City population corridor, as well as newly discovered faults in the very popular North Tahoe basin).

For all of these reasons and as a result of this conference, we are soliciting papers for a special *Geosphere* issue titled "Origin of the Sierra Nevada and Walker Lane" (to be guest edited by Keith Putirka and Cathy Busby; manuscript deadline: 15 Jan. 2011). To the extent that work in adjacent regions is relevant, we further welcome papers related to the evolution of Baja California, the Basin and Range, and the southern Cascades across a range of disciplines, including, but not limited to, field studies, geophysics, paleobotany, petrology, and geochemistry.

Conference Details

This Penrose Conference took place 15–20 August 2010 in Bridgeport, California (population 836, elevation 6,468 ft), USA, about 25 miles north of Mono Lake. The conference kicked off with posters and a welcome party on Sunday, included two days of field trips, and ended at 1 p.m. on Friday, in time for an optional, informal post-meeting field trip.

Nine of the 31 speakers were women, and 20 out of the 68 participants were "youngsters" (under the age of 40 years), including 12 students and four postdoctoral researchers. Convener Keith Putirka compiled an abstract volume, which he distributed to the participants both digitally and in print. The captive audience was never a thirsty one, thanks to the organizing efforts of student participant Chad Carlson, under the mentorship of John Wakabayshi, and this facilitated many hours of spirited debates over posters, extending until midnight on most evenings. The 37 poster presenters each gave a 3-minute "pitch" to the group (with summary slide) on the first day, and we scheduled 15 minutes of discussion for every 25-minute talk, as well as interspersed group discussion sessions. These group discussions mainly focused on (1) regional and Sierran geophysics, Sierran tectonics, and regional magmatism; (2) the Walker Lane–Eastern California Shear Zone–Northern Basin and Range: Future work with GeoPRISMS?;

Participants at Mono Lake; photo by Robert Hildebrand.

and (3) erosion, the sedimentary record, active tectonics, and landscape evolution.

Field Trips

Convener Cathy Busby compiled and edited a 68-page informal field guide, using text, figures, and references made by the following trip leaders: Graham Andrews, Cathy Busby, Chad Carlson, Jeanette Hagan, Christopher Henry, Angela Jayko, David John, Bruce Pauly, Christopher Pluhar, Keith Putirka, and David Wagner.

On Tuesday, the group hiked the Sierra Nevada crest at Sonora Pass, examining the ca. 10.5 Ma landslide and "andesite flood lava" fill of the newly recognized Sierra Crest graben (Busby, Hagan, Wagner, and Andrews), and the group was introduced to the magnetostratigraphy and chemistry of these distinctive lava flows (Pluhar and Putirka). In the early afternoon, Henry led us to a Sierran paleochannel filled with Oligocene ignimbrites erupted in central Nevada for discussions of paleolandscapes and the nature of the "Nevadaplano." At the end of the day, we examined Sierran range-front faults and discussed their controls on ca. 11–9 Ma high-K arc volcanism within a pullapart basin that shows paleomagnetic evidence for dextral vertical axis rotations (Busby, Putirka, Pluhar, and Hagan). This indicates that transtensional rifting was in full swing in this region by 11 Ma.

On Thursday, Pluhar and Carlson showed us the distinctive eruptive products of the Little Walker caldera and demonstrated further paleomagnetic evidence of dextral block rotations of these widespread strata within the Walker Lane belt. Most of the afternoon, led by John, was spent in the large, long-lived Miocene magmatic center of the famous Bodie and Aurora gold and silver mining district. The day ended with views and discussions of the Mono Basin–Long Valley areas, including volcanism, structure, landscapes, and climate change (Jayko and Pauly).

Presentations

Space does not permit a summary of all of the talks and posters, and we expect that many of the results presented at the meeting will appear in the special issue of *Geosphere*. Instead, we highlight some of the controversies and questions raised.

The legacy of subduction was debated on the big-picture scale, including the fate of the purported subducted Shatsky Rise conjugate (now below the eastern seaboard, or under Wyoming?) and the nature of the upper plate damage zone left in its wake. The nature, thickness, and evolution of the crust under the Sierra Nevada, Great Valley, and Great Basin were also debated at length. New geophysical imaging of the Cretaceous Sierra Nevada batholith suggests that a mafic residue remains only under the western foothills, and a "delamination Moho" extends as far north as Lake Tahoe (meaning that the crust rests on asthenosphere); does this indicate root removal under the entire eastern Sierra, similar to that proposed for the southern Sierra-Isabella anomaly, or did it never exist there, as suggested by xenolith studies on Cenozoic volcanic rocks? When and how did delamination (or lithosphere thinning) occur in the central and northern Sierra Nevada? Petrologic and geologic arguments were made for a wide variety of controls on Cenozoic magmatism, including "Ancestral Cascades arc" subduction, the onset of transtensional rifting, the migration of the Mendocino triple junction, and lithosphere degradation through root removal versus extension.

A series of presentations focused on the importance of Sierra Nevada microplate as a natural laboratory for collecting "real-time" data on an active rift, including GPS coverage, earthquake data, microseismicity and strain field analysis, and heat flow data. Advances in studies of active tectonics were also highlighted, including LiDAR imaging and surface dating, combined with detailed mapping and

trenching of active faults; furthermore, the rich Quaternary stratigraphic and structural record of the lacustrine rift basins was demonstrated by geophysical imaging from boats and compared with the marine record in the Gulf of California. All attendees agreed on the importance of gaining a better time-integrated view of tectonic processes along the "future plate boundary" through studies of the stratigraphic and structural architecture of Neogene basins. These basins are poorly known, perhaps in part due to inadequate funding for field-based studies relative to instrumentation-based studies, but also due to the fact that volcanic stratigraphy is a relatively new and rapidly evolving field. Knowledge of volcanic stratigraphy and structure is also important for geothermal exploration, and the role of fluids and volatiles in the development of the rift was identified as a topic deserving further investigation.

Concluding Remarks

We were very pleased with the commitment all the participants showed by arriving at the very beginning of the conference and staying until the very last hour, especially because this was a conference nearly everyone drove to, so "playing hooky" would have been easy. We felt the discussions were very lively and highly inclusive; we believe that a spirit of collaboration was fostered by the meeting. Everyone agreed that the time is ripe to mount a large, multi-investigator collaboration across a wide range of disciplines in order to understand this developing plate margin and its larger context. Several of us are now involved in exploring this possibility under the umbrella of the U.S. National Science Foundation MARGINS/GeoPRISMS Rift Initiation and Evolution initiative.

Participants: Colin Amos, Graham Andrews, George Bergantz, Glen Biasi, Elwood Brooks, Cathy Busby, Lesley Butcher, Dante Canil, Wenrong Cao, Chad Carlson, Patricia Cashman, Elizabeth Cassel, Robinson Cecil, Alan Chapman, Diane Clemens-Knott, Joseph Colgan, Michael Cosca, Brian Cousens, Diane Erwin, James Faulds, Jay Goldfarb, Bernard Guest, Jeanette Hagan, William Hammond, Christopher Henry, Robert Hildebrand, Nicholas Hinz, William Hirt, Ann Hislop, Eugene Humphreys, Raymond Ingersoll, Angela Jayko, David John, Craig Jones, Christopher Kemp, Graham Kent, Lenny Kouwenberg, John Lee, John Louie, Elizabeth Lovelock, Stephen Martel, Devin McPhillips, Valbone Memeti, Elizabeth Miller, Eldridge Moores, Elisabeth Nadin, Ian Norton, Bruce Pauly, Bill Peppin, Fred Phillips, Christopher Pluhar, Keith Putirka, Paul Riley, Charles Rogers, Jason Saleeby, Zorka Saleeby, Brandon Schmandt, Christopher Slack, Kenneth Smith, Greg Stock, Arthur Sylvester, James Trexler, Nicholas Van Buer, David Wagner, John Wakabayashi, Brian Wernicke, George Zandt.

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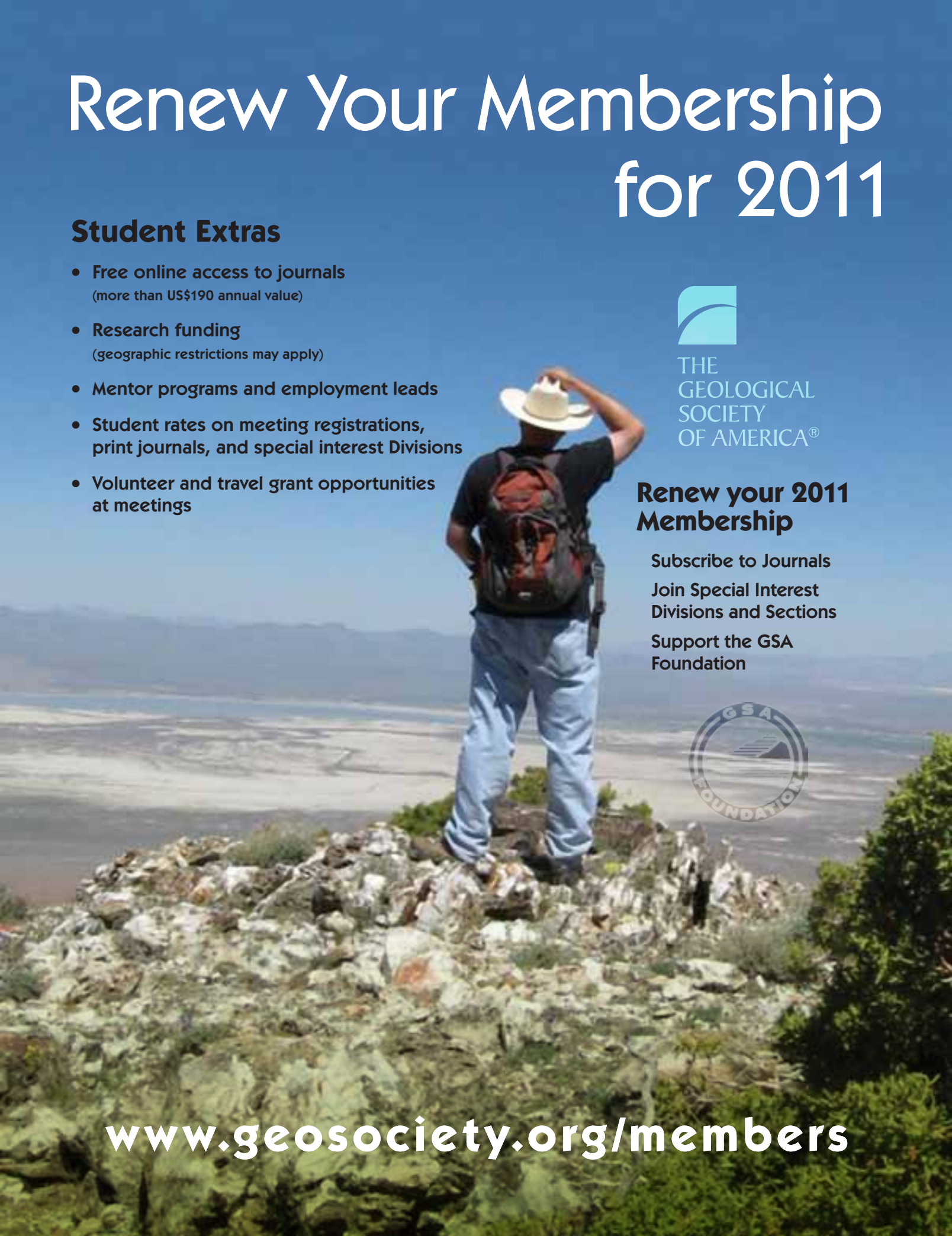

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THE GEOLOGICAL SOCIETY OF AMERICA®

SOUTH-CENTRAL

45th Annual Meeting

New Orleans, Louisiana, USA

27–29 March 2011

Aerial moonwalk over New Orleans; photo by Richard Nowitz courtesy New Orleans Convention and Visitors Bureau.

CALL FOR PAPERS

Abstract Deadline: 18 January 2011

Please submit your abstract online at www.geosociety.org/sections/sc/2011mtg. An abstract submission fee of US$10 for students and US$15 for all others will be charged. If you cannot submit the abstract online, please contact Nancy Wright, +1-303-357-1061, nwright@geosociety.org.

Symposia

S1. **The Deepwater Horizon/Macondo Well Oil Spill One Year Later: What Has Been Learned?**

Three sessions will involve research about the Deepwater Horizon Oil Spill. We seek abstracts addressing initial research into the fate of oil spilled into the Gulf of Mexico along three different fronts: the marine environment (session S1A), coastal environments (session S1B), and the biosphere (session S1C).

S1A. **Deepwater Horizon Oil Spill: The Fate of Oil in Gulf of Mexico Waters and Beyond.**

S1B. **Deepwater Horizon Oil Spill: Tracing the Landed Oil and Its Effects on the Gulf Coast.** Brad Rosenheim, Tulane Univ.; David B. Finkelstein, Univ. of Tennessee; Arndt Schimmelmann, Indiana Univ.

S1C. **Deepwater Horizon Oil Spill: Biotic Responses to the Oil Spill Incident—Microbes to Macrobiota.** Annette S. Engel, Louisiana State Univ.–Baton Rouge; Laurie C. Anderson, Louisiana State Univ.–Baton Rouge.

S2. **Our Dynamic Coasts: Erosional, Depositional, and Societal Response to Coastal Phenomena.**

This session highlights research into dynamic coastal processes, including controls on deposition and erosion (session S2A), geologic records of change (session S2B), and societal response to change and threats (session S2C).

S2A. **Our Dynamic Coasts: Past, Present, and Future Impact of Severe Storms, Accelerated Sea-Level Rise, and Variations in Sediment Supply.** John B. Anderson, Rice Univ.; Antonio B. Rodriguez, Univ. of North Carolina.

S2B. **Our Dynamic Coasts: Monitoring Coastal Evolution and Deformation Processes.** Alex Braun, The Univ. of Texas at Dallas; Craig Glennie, Univ. of Houston; John Barras, USGS.

S2C. **Our Dynamic Coasts: Delta Plain Management—What Are We Learning From the Geological Record?** Zhixiong Shen, Tulane Univ.; Juan L. Gonzalez, The Univ. of Texas–Pan American.

Theme Sessions

T1. **Lithospheric Evolution of Southern Laurentia and the Gulf of Mexico.** Elizabeth Anthony, The Univ. of Texas at El Paso; Jay Pulliam, Baylor Univ.

T2. **Deltaic Sedimentation, Modern Systems, Outcrop Analogs and Extension into the Subsurface.** Janok Bhattacharya, Univ. of Houston; M. Royhan Gani, Univ. of New Orleans.

T3. **More than Meets the Eye: Geology and Geochemistry of Dark Shales of the Southern Midcontinent.** Anna Cruse, Oklahoma State Univ.; James O. Puckette, Oklahoma State Univ.

T4. **Wetland Interfaces.** Gregg R. Davidson, Univ. of Mississippi; Zoe J. Hughes, Boston Univ.

T5. **Quaternary Faulting along the Northern Gulf of Mexico Margin.** Nance H. Dawers, Tulane Univ.; Nicole M. Gasparini, Tulane Univ.

T6. **Paleozoic Paleontology in Southern Central North America.** Rebecca L. Freeman, Tulane Univ.; Ronald L. Parsley, Tulane Univ.

T7. **Transport and Sediment Dynamics in Lowland Rivers.** Ioannis Georgiou, Univ. of New Orleans; Mead Allison, The Univ. of Texas at Austin.

T8. **Gulf Coastal Plain Groundwater Systems.** Jeffrey S. Hanor, Louisiana State Univ.–Baton Rouge; Stephanie E. Welch, Southeastern Louisiana Univ.

T9. **Nanogeosciences in Mudrocks and Shale-Gas Strata.** Farzam Javadpour, Jackson School of Geosciences, The Univ. of Texas at Austin.

T10. **Creating Geoscience Opportunities for High School Students.** Diane F. Maygarden, Univ. of New Orleans; Ivan P. Gill, Univ. of New Orleans; Jeff Agnew, Tulane Univ.

T11. **Vertebrate Paleontology and Paleoecology of the Central Gulf Coast.** Judith A. Schiebout, Louisiana State Univ.–Baton Rouge; Michael J. Williams, URS Corporation.

T12. **Undergraduate Geoscience Education: Strategies Old and New.** Jay Simms, Univ. of Arkansas at Little Rock; Dean Moosavi, Univ. of Minnesota; Jeffrey Sigler, Tulane Univ.

T13. **Living on the Edge: Hurricanes and the Dynamic Geology of New Orleans.** Steve Nelson, Tulane Univ.; Michael Miner, Univ. of New Orleans.

T14. **Undergraduate Research (Posters).**

LOCATION & HOUSING

A block of rooms has been reserved at the meeting venue, the Chateau Bourbon Hotel, 800 Iberville Street, New Orleans, Louisiana, USA; www.chateaubourbonneworleans.com. This Wyndham Historic Hotel is in the French Quarter adjacent to Bourbon Street, 16 miles from Louis Armstrong New Orleans International Airport. Reservations can be made by calling +1-888-404-6875 and referencing "GSA SC Section." Room rates are US$109 plus 13% tax and a US$1 occupancy tax.

FIELD TRIPS

We are planning a field trip to examine the impacts of Hurricane Katrina, plus other trips around the delta plain. Anyone interested in proposing a trip should contact field trip chair Alex Kolker, akolker@lumcon.edu.

CONTACT INFORMATION

Detailed information for this meeting is online at www.geosociety.org/Sections/sc/2011mtg/. If you have special requests or requirements, please contact the meeting chairs: Local Committee chair Mark Kulp, mkulp@uno.edu; Technical Program co-chairs Mike Miner, mminer@uno.edu, and Brad Rosenheim, brosenhe@tulane.edu.

Bourbon Street at night; photo by Richard Nowitz courtesy New Orleans Convention and Visitors Bureau.

THE GEOLOGICAL SOCIETY OF AMERICA®

JOINT MEETING

46th Annual Meeting, Northeastern Section, GSA
45th Annual Meeting, North-Central Section, GSA
Pittsburgh, Pennsylvania, USA

20–22 March 2011

Holtwood Gorge, Susquehanna River, Pennsylvania. Photo courtesy Frank J. Pazzaglia.

From Shield to Sea

Pittsburgh is a thriving city with a vibrant community, great restaurants, and many museums, and the meeting area offers a variety of geologically interesting venues: excellent examples of the Allegheny Front separating the Valley and Ridge and Appalachian Plateaus Provinces, including terminal Laurentide moraines, as well as oil, gas, coal, aggregates and a wealth of additional natural resources, overprinted with myriad geotechnical hazards.

REGISTRATION

Early registration deadline: 15 February 2011
Cancellation deadline: 22 February 2011

Please register online at **www.geosociety.org/sectdiv/NE-NC/11mtg/.** For further information, or if you have special requirements, please contact the local committee chairs: Daniel Holm (NC), dholm@kent.edu; Patrick Burkhart (NE), patrick.burkhart@sru.edu. Also check the Web site for meeting details.

REGISTRATION FEES (all fees are in U.S. dollars)

	Early		Standard	
	Full Mtg	One day	Full Mtg	One day
Professional member	$170	$115	$195	$135
Prof. member 70+	$90	$70	$120	$90
Prof. nonmember	$185	$135	$215	$165
Student member	$55	$45	$75	$65
Student nonmember	$65	$55	$85	$75
K–12	$65	$50	$75	$60
Guest or Spouse	$40	$30	$40	$30
Field Trip/Workshop only	n/a	$30	n/a	$30

ACCOMMODATIONS

Hotel registration deadline: 20 February 2011

A block of rooms has been reserved at the historic Omni William Penn Hotel, 530 William Penn Place, Pittsburgh, PA 15219, USA, at US$149/night plus US$10 each for third and fourth occupants. Call +1-800-843-6664 and request a reservation under "The Geological Society of America."

SYMPOSIA

1. **Marcellus—Exploration and Production.** William Zagorski, Range Resources, wzagorski@rangeresources.com.
2. **CO_2 Sequestration.** William Harbert, Univ. of Pittsburgh, harbert@pitt.edu.
3. **Applied Geology: Environmental, Engineering, and Hydrogeologic Applications.** *Cosponsored by GSA Engineering Geology Division.* Terry West, Purdue, trwest@purdue.edu.
4. **Devonian Climate and Paleoecology—Insight from Stratigraphic Studies.** Dave Brezinski, Carnegie Museum of Natural History, dbrezinski@dnr.state.md.us; Gordon Baird, SUNY Fredonia, gordon.baird@fredonia.edu; Jeff Over, SUNY Geneseo, over@geneseo.edu.

THEME SESSIONS

Structure/Tectonics/Petrology

14. **The Effect of Late Paleozoic Tectonics on the Devonian Shales.** *Cosponsored by Eastern Section, SEPM.* Mark Evans, Central Connecticut State Univ., evansmaa@ccsu.edu.
19. **Geophysical Exploration in the Allegheny Plateau—Insights into the Structure of the Appalachian Foreland.** Brian Lipinski, EXCO Resources, brian.lipinski@gmail.com.
30. **Syncrystallization Evolution of Granitic Magma in Orogenic Belts.** Tathagata Dasgupta, Kent State, tdasgupt@syr.edu; Scott Samson, Syracuse Univ., sdsamson@syr.edu.

32. **Structural Geology and Natural Resources in the Central and Northeastern United States.** W. Ashley Griffith, Univ. of Akron, wag8@uakron.edu; John C. Lewis, Indiana Univ. of Pennsylvania, jclewis@iup.edu.
40. **Advances in Defining Links between Deformation and Metamorphism.** Gregory Dumond, Univ. of Arkansas, gdumond@uark.edu.
41. **Devonian Orogenesis in the Appalachian-Caledonian Mountain Belt—Where, When, and What Caused It?** Sandra M. Barr, Acadia Univ., sandra.barr@acadiau.ca; Paul Karabinos, Williams College, paul.m.karabinos@williams.edu; Cees R. van Staal, Geol. Survey of Canada, cees.vanstaal@nrcan-rncan.gc.ca; Robert P. Wintsch, Indiana Univ., wintsch@indiana.edu; David P. West Jr., Middlebury College, dwest@middlebury.edu.
42. **Geophysics in the Central and Northeastern United States.** *Cosponsored by GSA Geophysics Division.* Kevin Mickus, Missouri State Univ., kevinmickus@missouristate.edu.

Stratigraphy/Sedimentology

1. **Conodont Stratigraphy.** *Cosponsored by the Pander Society.* Jeff Over, SUNY Geneseo, over@geneseo.org.
21. **Provenance of Organic Content in the Marcellus Shale.** *Cosponsored by Eastern Section, SEPM.* Christopher Laughrey, Weatherford Labs, christopherlaughrey@weatherfordlabs.com.
26. **The Origin of the Dunkard Group, the Youngest Paleozoic Strata in the Central Appalachian Basin.** Viktoras Skema, Pennsylvania Geol. Survey (retired), skema@verizon.net; Blaine Cecil, cecilblaine@gmail.com; William DiMichele, dimichel@si.edu.
39. **Sedimentary Environments of Post-Paleozoic, Pre-Glacial Strata of the Midwest-Appalachian Region.** Cosponsored by Great Lakes Section, SEPM. C. Pius Weibel, Illinois State Geol. Survey, weibel@isgs.illinois.edu.

Paleontology

2. **Mesozoic/Cenozoic Vertebrate Paleontology.** *Cosponsored by Eastern Section, SEPM.* Michael Ryan, Cleveland Museum of Natural History, mryan@cmnh.org; Matt Lamanna, Carnegie Museum of Natural History, lamannam@carnegiemnh.org.
3. **Advances in Arthropod Paleobiology.** *Cosponsored by the Pander Society.* Carrie Schweitzer, cschweit@kent.edu; Rod Feldmann, rfeldman@kent.edu, Kent State.
4. **Paleozoic Vertebrate Paleontology.** Chuck Ciampaglio, Wright State Univ.–Lake Campus, chuck.ciampaglio@wright.edu.
43. **Life's Footprint: New Frontiers in Field and Experimental Trace Fossil Research.** *Cosponsored by Eastern Section, SEPM.* Ilya Buynevich, Temple Univ., coast@temple.edu; Stephen Hasiotis, Univ. of Kansas; Jacob Benner, Tufts Univ.

Climate Change/Quaternary Studies

7. **Theory and Application in Quaternary Paleoclimate Studies.** Joe Ortiz, Kent State, jortiz@kent.edu.
8. **Into the Woods: Ecohydrology and Groundwater–Surface Water Interaction in Forested Eastern North America.** Alison Smith, Kent State, alisonjs@kent.edu; Don Palmer, dpalmer@kent.edu, Kent State.
13. **Quaternary History of the Great Lakes.** *Cosponsored by Eastern Section, SEPM.* Timothy G. Fisher, Univ. of Toledo, timothy.fisher@utoledo.edu.
23. **Lakes and Environmental Change.** Mark Abbott, Univ. of Pittsburgh, mabbott1@pitt.edu.

Applied Geology

6. **Engineering Geology/Slope Stability/Mine Subsidence.** *Cosponsored by GSA Engineering Geology Division.* Abdul Shakoor, Kent State, ashakoor@kent.edu; James Kilburn, Shaw Environmental, james.kilburn@shawgrp.com; Brian Greene, U.S. Army Corps of Engineers (retired).
18. **Marcellus—Production and Disposal of Produced Water.** Roman Kyshakevych, Allegheny GeoQuest, romangkk@gmail.com.
20. **Coal Ash Placement—Potential Impacts upon Surface- and Groundwater Quality.** Henry Prellwitz, slagman1@verizon.net.
22. **Urban Geochemistry.** Daniel Bain, dbain@pitt.edu; Emily Elliot, eelliot@pitt.edu, Univ. of Pittsburgh.

Geological Education

10. **Extending Geological Education beyond the Academy.** Robert Ross, Paleontological Research Inst., ross@museumoftheearth.org.
11. **Using Undergraduate Research to Help Students Engage with the World: Examples from the Field.** Tamra A. Schiappa, Slippery Rock Univ., tamra.schiappa@sru.edu.

Photo courtesy Greater Pittsburgh Chamber of Commerce.

17. **In the Field with Geoscience Education.** *Cosponsored by National Assoc. of Geoscience Teachers (NAGT).* Albert Kollar, Carnegie Museum of Natural History, kollara@carnegiemnh.org.
28. **Effective Approaches to Earth System Science Instruction and Engagement in the K–12 Classroom.** Laura Guertin, Penn State Brandywine, guertin@psu.edu; Tanya Furman, Penn State, furman@psu.edu.
33. **Undergraduate Research (Posters).** *Cosponsored by Council on Undergraduate Research–Geosciences Division.* Robert Shuster, Univ. of Nebraska–Omaha, rshuster@mail.unomaha.edu; Michele Hluchy, Alfred Univ., fhluchy@alfred.edu; Matthew Powell, Juniata College, powell@juniata.edu.
34. **Faculty and Student Perspectives on Undergraduate Research: Models, Challenges, and Best Practices.** *Cosponsored by Council on Undergraduate Research–Geosciences Division.* Meagen Pollock, College of Wooster, mpollock@wooster.edu; Prajukti (Juk) Bhattacharyya, Univ. of Wisconsin–Whitewater, bhattacj@uww.edu.
35. **Climate Change Issues in Geoscience Education.** *Cosponsored by National Assoc. of Geoscience Teachers (NAGT).* P. Allen Macfarlane, Kansas Geol. Survey, amacfarlane@topekacollegiate.org.
36. **Virtual Field Trips for K–16 Geoscience Education.** *Cosponsored by National Assoc. of Geoscience Teachers (NAGT).* P. Allen Macfarlane, Kansas Geol. Survey, amacfarlane@topekacollegiate.org; Don Duggan-Haas, Paleontological Research Inst., dugganhaas@gmail.com.
37. **Education, Environment, and Water.** Solomon Isiorho, IPFW, isiorho@ipfw.edu.
38. **Issues in Geoscience Education.** Carrie Wright, Univ. of Southern Illinois, clwright@usi.edu.

Historical and Cultural Geology

9. **Geology of the War of 1812 and Other Eighteenth- and Nineteenth-Century Wars in North America: Battles, Terrain, Monuments, and More.** Joe Hannibal, Cleveland Museum of Natural History, hannibal@cmnh.org; Kevin R. Evans, Missouri State Univ., kevinevans@missouristate.edu.
27. **Cultural Geology: Building Stones, Archaeological Materials, Terrain, and More.** Joe Hannibal, Cleveland Museum of Natural History, hannibal@cmnh.org; Tammie Gerke, Indiana Univ., tlgerke@indiana.edu.

Geological Techniques

12. **Innovative Data Management and Visualization in Applied Geology and Other Applied Topics.** *Cosponsored by Northern Ohio Geol. Society.* Matt Hammer, Sanborn, Head & Assoc., mhammer@sanbornhead.com; Rob Porges, SAIC, porgesr@saic.com.
24. **Capturing Dynamic Processes with Satellite Imaging.** Michael Ramsey, Univ. of Pittsburgh, mramsey@ pitt.edu.
44. **Employment Opportunities.** Bob Stewart, Arcadis, bob.stewart@arcadis-us.com.

FIELD TRIPS

Pre-Meeting

1. **Late Devonian Paleontology and Paleoenvironments at Red Hill and Other Fossil Sites in the Catskill Formation of North-Central Pennsylvania.** Two-day trip. Fri.–Sat., 18–19 March. Departs 8 a.m. Fri.; returns 5 p.m. Sat. Cost: US$250. Max.: 22. Ted Daeschler, Academy of Natural Sciences of Philadelphia; Walt Cressler, West Chester Univ. of Pennsylvania.
2. **Analysis of the Hinterland (Structural Geology) and Proximal (Stratigraphy) Portion of the Marcellus Basin, Appalachian Valley and Ridge.** Two-day trip. Fri.–Sat., 18–19 March. Departs 7 a.m. Fri.; returns 6 p.m. Sat. Cost: US$245. Max.: 40. Terry Engelder; Rudy Slingerland; Dan Kohl; Mike Arthur, Penn State.
3. **Appalachian Pennsylvanian Climate Events and Their Congruent Biotic Responses.** Sat., 19 March, 7:30 a.m.–5 p.m. Cost: US$110. Max.: 22. David K. Brezinski, Maryland Geol. Survey and Carnegie Museum of Natural History; Albert D. Kollar, Carnegie Museum of Natural History.
4. **Western Pennsylvania Landslides.** Sat., 19 March, 8 a.m.–5:30 p.m. Cost: US$100. Max.: 21. Richard Gray, DiGioia, Gray & Associates LLC; William R. Adams, Jr., Pennsylvania Dept. of Transportation; James Hamel, Hamel Geotechnical Consultants.
5. **Glacial Geology of Northwestern Pennsylvania.** Sat., 19 March, 7:30 a.m.–5:30 p.m. Cost: US$95. Max.: 44. Gary Fleeger, Pennsylvania Geol. Survey; John Szabo, Univ. of Akron; Eric Straffin, Edinboro Univ. of Pennsylvania; Todd Grote, Eastern Michigan Univ.
6. **History and Geology of the Allegheny Portage Railroad, Blair and Cambria Counties, Pennsylvania.** Sat., 19 March, 7:30 a.m.–6:30 p.m. Cost: US$85. Max.: 50. John A. Harper, Pennsylvania Geol. Survey.
7. **From Fort Pitt to the Golden Triangle: Geological and Historical Aspects of Downtown Pittsburgh and its Environs.** Sat., 19 March, 9 a.m.–5 p.m. Cost: US$20. Max.: 24. Joe Hannibal, Cleveland Museum of Natural History; Andrew Gaerte, Fort Pitt Museum.

During the Meeting

8. **Building Pittsburgh—A Walking Tour of Pittsburgh's Building Stones.** Mon., 21 March, 1 p.m.–4 p.m. Cost: US$20. Max.: 24. Judy Neelan, Pennsylvania Dept. of Environmental Protection; C.H. Shultz, Slippery Rock Univ. (emeritus).

Post-Meeting

9. **The Old, the Crude, and the Muddy: Oil History in Western Pennsylvania.** Wed., 23 March, 7:30 a.m.–5:30 p.m. Cost: US$95. Max.: 45. Kristin Carter, Pennsylvania Geol. Survey; Kathy J. Flaherty, ABARTA Oil & Gas Company.
10. **Early Industrial Geology of Eastern Ohio and Western Pennsylvania: Grist Mills, Iron Furnaces, and Outcrops.** Wed., 23 March, 8 a.m.–6:30 p.m. Cost: US$65. Max.: 9. Joe Hannibal, Cleveland Museum of

Natural History; Tammie L. Gerke, Glenn A. Black Laboratory of Archaeology, Indiana Univ.; Harry M. Edenborn, National Energy Technology Lab; Mary K. McGuire, Univ. of Pittsburgh.

11. **Building Pittsburgh—A Walking Tour of Pittsburgh's Building Stones.** Wed., 23 March, 1 p.m.–4 p.m. Cost: US$20. Max.: 24. Judy Neelan, Pennsylvania Dept. of Environmental Protection; C.H. Shultz, Slippery Rock Univ., emeritus.

WORKSHOPS

1. **Geology of National Parks Modules in the "Spreadsheets across the Curriculum" Library.** 1–5 p.m., Sat., 19 March. US$15. Max.: 24. Len Vacher,vacher@usf.edu; Judy McIlrath, jmcilrath@usf.edu; Tom Juster, juster@usf.edu, Univ. of South Florida.
2. **Creating Original Geoscience Content in Google Earth.** 8 a.m.–5 p.m., Sat., 19 March, US$45 (does not include lunch). Max.: 24. Steve Whitmeyer, James Madison Univ., whitmesj@jmu.edu; Declan De Paor, Old Dominion Univ., ddepaor@odu.edu.
3. **Classroom Strategies that Improve Learning and Engage Students.** 1–5 p.m., Sat., 19 March. US$25. Max.: 25. David Steer, Univ. of Akron, steer@uakron.edu.
4. **Climate Change: Causes, Consequences, and Adaptations.** 1:30–5:30 p.m., Sat., 19 March. US$25. Max.: 24. P. Allen Macfarlane, Kansas Geol. Survey, amacfarlane@topekacollegiate.org.
5. **Near-Surface Geophysics for Non-Geophysicists.** 9 a.m.–5 p.m., Sat., 19 March. US$45 (does not include lunch). Max.: 35. Gregory Baker, Univ. of Tennessee, gbaker@tennessee.edu.

OPPORTUNITIES FOR STUDENTS

Mentor Programs

Cosponsored by the GSA Foundation. Learn more at www.geosociety.org/mentors/.

Roy J. Shlemon Mentor Program in Applied Geoscience

Sun., 20 March, noon–1:30 p.m. or Mon., 21 March, noon–1:30 p.m. FREE lunch and discussion of career opportunities & challenges with professionals from multiple disciplines.

John Mann Mentors in Applied Hydrogeology Program

Tues, 22 March, noon–1:30 p.m. FREE lunch and discussion of career opportunities in applied hydrogeology or hydrology with working professionals.

Travel Grants

Deadline to apply: 15 February 2011

GSA student members enrolled in Northeastern or North-Central Section schools who are presenting oral or poster papers can apply for a travel grant after registering for the meeting. Check your Section Web site for more information.

Volunteering

The Joint Sections offer free registration in return for ~7 hours of work at the meeting. Contact volunteer coordinator Tamra Schiappa, tamra.schiappa@sru.edu, for more information.

Donna L. Russell, *Director of Operations*

GeoCorps America™ — Geoscientists Working for Public Land Management and Protection

A Geological Society of America Education & Outreach Program

GSA places all levels of geoscientists—university students, professionals & retirees—in short-term positions working on U.S. National Parks, National Forests, and Bureau of Land Management (BLM) lands through the GeoCorps™ America Program. National Park, Forest, and BLM managers select projects in research, resource management, resource protection, education, and interpretation that require geoscience expertise. GSA then actively recruits applicants for these positions through the Society's 22,000+ members and helps to place the most qualified applicants where needed. Selected participants receive a US$2,750 stipend and housing (or a housing allowance), paid through GSA.

Who Benefits?

The need for geoscience expertise on America's public lands is great. Geoscience is often not adequately addressed in visitor education, resource management, site protection, geologic hazards mitigation, and research. For example, the National Park Service manages 80.7 million acres of land but only permanently employs 25 geologists. The National Park Service has over 1,000 interpreters on staff in the park system; however, only a handful of these interpreters have a background in geology. The U.S. Forest Service manages 192 million acres of land and only has 175 geoscientists on staff nationwide.

Since GSA's GeoCorps program began in 1997, more than 600 GeoCorps participants have been put to work supporting 113 National Parks, National Monuments, National Forests, and BLM lands with their geoscience know-how.

GeoCorps participants also greatly benefit by being provided a "real life" on-the-ground work or research experience to help enhance their careers. Participants work side-by-side with Park Service, Forest Service, and BLM field staff and receive invaluable training and work experience on active public land projects.

GeoCorps Project Examples

- Excavating and preparing fossil specimens
- Developing and presenting geology educational tours to Park visitors
- Stream and erosion surveys for watershed assessments
- Glacial movement monitoring
- Paleontology research and database development
- Glacial lakes water quality monitoring
- Mapping soil and groundwater contamination

Make a Difference…

You can help make this an even greater success by supporting the GeoCorps™ America fund. For more information, go to http://rock.geosociety.org/g_corps/ or contact Donna Russell, +1-303-357-1054, drussell@geosociety.com. Donate directly via the dropdown menu at www.gsafweb.org/makeadonation.html.

Most memorable early geologic experience:

An overnight hike to the Phantom Ranch in the Grand Canyon with major Professor Stanley Beus of Northern Arizona University.

—Paul M. Crosby

Positions Open

GEOSCIENCE EDUCATION
GEORGIA STATE UNIVERSITY

The Dept. of Geosciences anticipates hiring for a tenure-track faculty member at the Assistant Professor level pending budgetary approval, whose professional development is in the area of geoscience education. The area of research in geoscience education is open. We seek a colleague who will develop a vigorous research program in an area of geoscience education resulting in publications and extramural support and will develop a strong record of instruction at the graduate and the undergraduate level. Some preference will be given to candidates with post-doctoral research in geoscience education and whose research and experience in geoscience education complements ongoing departmental research and instruction activities. Ph.D. in relevant discipline required. Further information about the Geosciences Dept. can be read at www.cas.gsu.edu/geosciences/index.html. To ensure full consideration, applicants need to send by 15 Jan. 2011 an application stating their geoscience education research and instructional interests and goals, CV, and the names of at least three references to Dr. Daniel M. Deocampo, deocampo@gsu.edu, Chair, Geoscience Education Search Committee, Dept. of Geosciences, Georgia State University, Atlanta, GA 30302-4105. The position will start fall 2011. This position is open until filled. An offer of employment will be conditional upon background verification. Georgia State University is a Research University of the University System of Georgia and is an EEO/AA employer.

NON-TENURE TRACK FULL-TIME LECTURER
GEORGIA STATE UNIVERSITY

The Dept. of Geosciences anticipates hiring non-tenure track full-time lecturer pending budgetary approval to teach Introductory courses in geoscience (Weather and Climate, Intro. to Landforms, Intro. Geology I, Intro. Geology II). Preference is given to those candidates with appropriate teaching experience and scholarly preparation. A Ph.D by Aug. 2011 is required. Send Application letter, CV, copies graduate transcripts, and a brief description of instructional interests to Dr. Crawford Elliott, Dept. of Geosciences, Georgia State University, P.O. Box 4105, Atlanta, GA 30302-4105. Review of applications will begin immediately and continue until the positions are filled. An offer of employment will be conditional upon background verification. Georgia State University is a Research University of the University System of Georgia and is an EEO/AA employer.

FACULTY POSITION IN PLANETARY SCIENCES
PURDUE UNIVERSITY

Purdue University is building a strong new effort in Planetary Sciences. Jay Melosh has joined the Purdue Faculty and, together with Andy Freed, Marc Caffee, Brenda Bowen, and David Minton, has a mandate to expand Planetary Sciences by adding an additional faculty member this year. We seek a broadly based individual for a tenure-track position at the Assistant professor level.

The successful candidate will be an outstanding researcher with potential for excellence in teaching at both the graduate and undergraduate levels. We seek someone who will complement our existing strengths in modeling and isotopic cosmochemistry. In harmony with Purdue's traditional emphasis on science, mathematics and engineering we seek a quantitatively focused researcher with an interest in planetary surface processes. The Dept. of Earth and Atmospheric sciences presently has outstanding programs in geodynamics, isotope geochemistry, terrestrial climate and extreme weather systems.

Applicants must have a Ph.D. in field related to Planetary Science. Salary and benefits are highly competitive. The appointment will begin Aug. 2011. Candidates are expected to develop a vigorous research program, obtain external funding, supervise graduate students, and teach undergraduate and graduate courses. Interested candidates should submit their curriculum vitae, publication list, and brief descriptions of their planned research program and teaching philosophy to planetarysearch@purdue.edu. Names and contact information for at least three referees must be included in the application. Information on the EAS department can be found at www.purdue.edu/eas/. Applications completed by 15 Jan. 2011 will be given full consideration, although the search will continue until the position is filled.

Purdue University is an Equal Opportunity/Equal Access/Affirmative Action employer fully committed to achieving a diverse workforce.

TENURE-TRACK FACULTY POSITION
HYDROGEOLOGY, NORTHERN ILLINOIS UNIV.

The Dept. of Geology and Environmental Geosciences at Northern Illinois University invites applications for an anticipated tenure-track position at the rank of Assistant Professor to begin Aug. 2011. We seek a candidate with research and teaching interests in applied physical hydrogeology and preferably expertise in using groundwater modeling and field methods to characterize aquifers and flow systems. Possible areas of research could include numerical modeling of subsurface flow, flow in fractured media and karst, groundwater–surface water interactions, contaminant transport, aquifer studies, etc. We expect the successful candidate to establish a strong externally funded research program, to supervise student research at undergraduate, M.S., and Ph.D. level, and to teach at all levels including assisting the summer environmental field methods camp. Departmental facilities include a truck-mounted Geoprobe™ 6600, field hydrogeological equipment, surface and borehole geophysical instruments, and extensive geochemical/analytical facilities. The department currently has 13 faculty members whose broad research interests are described on our website, www.niu.edu/geology; potential for collaboration exists with areas including role of fluids in formation of ore deposits and hydrocarbon accumulations, energy resources, hydro-geophysics, groundwater geochemistry and geomicrobiology, climate change and glacial studies, as well as with a new interdisciplinary Institute for the Study for the Environment, Sustainability and Energy, www.niu.edu/ese. A Ph.D. in the geosciences or a related field is required at the time of appointment. Applicants must submit a letter of application, CV, statements of teaching and research interests, and list of at least three references to Philip J. Carpenter, Hydrogeology Search Chair, Dept. of Geology and Environmental Geosciences, Northern Illinois University, DeKalb, IL 60115. Send electronic applications to pjcarpenter@niu.edu. Complete applications must be received by 10 Jan. 2011. NIU is an AA/EEO Institution that values diversity in its faculty, staff, and students; we strongly encourage applications from diverse candidates including women and minorities.

TENURE-TRACK FACULTY POSITION
STABLE ISOTOPE GEOCHEMISTRY
NORTHERN ILLINOIS UNIVERSITY

The Dept. of Geology and Environmental Geosciences at Northern Illinois University invites applications for an anticipated tenure-track position at the Assistant Professor level to begin Aug. 2011. We seek an individual whose research interests are in the broad area of stable isotope geochemistry. We expect the successful applicant to establish a vigorous and innovative externally funded research program that integrates with one or more of our existing strengths in geochemistry, environmental geology, mineralogy/petrology, paleoclimatology, paleontology, sedimentology/stratigraphy, or structural geology and tectonics. The candidate will be expected to supervise Ph.D. and M.S. students and have a commitment to excellence in teaching at both the undergraduate and graduate levels. The department's facilities include an array of analytical instruments (Element 2, MAT 253, DELTA plus, and 2100 T Mass Spectrometers, Carlo Erba NA1500 and alpha spectrometer, electron microprobe, X-ray diffractometer, LV-SEM/EDS, etc.) and field equipment (truck-mounted Geoprobe, large percussion corer, oceanographic analytical and sampling equipment, and two specialized remotely operated vehicles). Applicants who can utilize or expand existing facilities, especially our mass spectrometers, will receive special consideration. A Ph.D. in the geosciences or a related field is required at the time of appointment. The department has 13 faculty members, whose research and teaching interests are described on our website, www.niu.edu/geology/. Applicants must submit a letter of application, curriculum vitae, statements of teaching and research interests, and list of at least three references to Mark Frank, Search Committee Chair, Dept. of Geology and Environmental Geosciences, Northern Illinois University, DeKalb, IL 60115. Complete applications must be received by 10 Jan. 2011. NIU is an AA/EEO Institution that values diversity in its faculty, staff, and students; we strongly encourage applications from diverse candidates including women and minorities.

POST DOCTORAL ASSOCIATE
ENVIRONMENTAL SCIENCES
THE UNIVERSITY OF TOLEDO

This Post-Doctoral position (job 5171) will be responsible for supporting and enhancing research in the Environmental Sciences and reconstructing glacial Lake Agassiz. Position may conduct teaching for the Department Chair. Qualifications for the position include a Ph.D. in Earth Sciences and demonstrated knowledge of proglacial lakes and GIS skills. Must be able to work with and advise master's level and undergraduate students.

Applicants need to submit a two-page proposal that details a research question and the approach necessary to answer it. Possible topics include, but are not limited to (1) using LiDAR imagery of strandlines to map water planes, isobases and ice margin positions ; (2) hydrological reconstructions; and (3) ice margin retreat chronology in northern Saskatchewan. While post-doctoral support is available immediately, proposal writing is expected. Applicants will be reviewed beginning 1 Oct. and will continue until position is filled. For additional information please contact Timothy Fisher, timothy.fisher@utoledo.edu.

For more information and to apply please visit https://jobs.utoledo.edu. This position will be open until filled. UT is an EEO, AA Employer and Educator.

ASSISTANT PROFESSOR TENURE TRACK (2)
AND POST-DOCTORAL POSITIONS (2)
INSTITUTE OF GEOLOGY
NATIONAL AUTONOMOUS UNIVERSITY OF MEXICO

The Institute of Geology at UNAM offers two tenure-track assistant professor positions 05/11, and two post-doctoral positions 09/11. We seek earth scientists in metamorphic petrology, urban geology/landslide research, fluvial geomorphology, basin analysis and petroleum geology, or soil sciences/organic geochemistry. Expectations include research, teaching, student advisement, and continuing professional development.

With the highest admission standards of any university in Mexico, UNAM offers quality education, a diverse international faculty community, and high standards in research facilities. Applicants must submit a copy of Ph.D. degree, CV, two page letter describing research interest, name and e-mails of three referees. Applications or more information to dirigl@unam.mx, academicaigl@geologia.unam.mx; websites: www.geologia.unam.mx, www.unam.mx.

ASSISTANT PROFESSOR
GEOSCIENCES, SMITH COLLEGE

Smith College invites applications for a tenure-track Assistant Professor position in the Dept. of Geosciences specializing in structural geology with knowledge in the use of Geographic Information Systems (GIS). A Ph.D. in the geosciences is required. For more information and to apply, visit http://jobs.smith.edu. Review of applications will begin 30 Dec. 2010. Smith College is an equal opportunity employer encouraging excellence through diversity.

DIRECTOR, NEW MEXICO BUREAU OF
GEOLOGY & MINERAL RESOURCES
NEW MEXICO INSTITUTE OF MINING AND
TECHNOLOGY, NEW MEXICO TECH

The New Mexico Bureau of Geology and Mineral Resources is seeking a new director and state geologist. The bureau is a research and service division of the New Mexico Institute of Mining and Technology (New Mexico Tech), in Socorro, New Mexico. With close to 60 employees, the bureau serves as the state geological survey, with a long-standing reputation for excellence in research, service, and outreach. Our mission includes research on the geologic framework of the state, with an emphasis on applied geosciences and the state's geologic resources; and the gathering, preservation, and dissemination of geologic information to the geoscience community, state and federal agencies, and the general public. The director manages the administrative, personnel, and financial affairs of the bureau, including direct supervision of a significant portion of the professional staff, and must be proactive in seeking additional, external funding to support new and ongoing programs. As a division of the university, the bureau works in collaboration with other divisions of the university. The director reports directly to the university president. As state geologist, the director serves on several state advisory commissions. Requirements include a Ph.D. in the geosciences, ten years of professional experience, and five years of administrative experience. Anticipated appointment date: 1 July 2011. Salary: Negotiable. Full details of the position and information regarding application procedures may be found at www.geoinfo.nmt.edu/DirectorSearch and at www.nmt.edu/hr-jobs-at-nmt. For more information about the application process, contact JoAnn Salome in Human Resources at 575-835-5955, JSalome@admin.nmt.edu. For more information about the position itself, contact L. Greer Price, search committee chair, at 575-835-5752, gprice@gis.nmt.edu. For full consideration, application materials must be received by 1 Mar. 2011.

USGS—FIVE POSITIONS, USGS ALASKA SCIENCE CENTER, ANCHORAGE, ALASKA

The USGS Alaska Science Center will soon advertise five new permanent research geologist positions. This hiring initiative inaugurates a team approach to geologic research in Alaska. The five positions together make up a working group that will respond to the USGS' ongoing need for research in framework geology of the 49th state. Project work is expected to support a broad range of research topics related to crustal evolution and surficial processes. We expect projects will involve collaboration with researchers from other USGS offices, federal agencies, state agencies, and academia.

The five Tectonics Working Group positions are:

- Tectonics and structural geology
- Neotectonics, paleoseismology, and Quaternary geology
- Tectonics and igneous processes
- Tectonics and metamorphic processes
- Tectonics and sedimentary basin analysis

We expect applications will be open between 1 Dec. 2010 and 15 Feb. 2011 and that selection will occur during late spring of 2011. We are interested in the highest quality candidates for these positions, which will be filled at the GS-12 or GS-13 level. We have established a website specific to advertising and application information for these five positions and it will be updated as the application period approaches: http://alaska.usgs.gov/jobs/geologists.php.

Contacts are listed on the website.

We expect the individuals selected for these positions will have tremendous opportunities. The team of five will be central to the USGS framework geology program in Alaska.

USGS is an equal opportunity employer.

ASSISTANT PROFESSOR STRUCTURAL GEOLOGY AND TECTONICS UNIVERSITY OF TEXAS AT AUSTIN

The Dept. of Geological Sciences seeks candidates for a tenure-track Assistant Professor position in the broad fields of structural geology and tectonics. The successful candidate will be required to develop an internationally recognized, externally funded research program and become an integral part of undergraduate and graduate teaching and supervision, including classroom and field instruction. The area of research specialization is unrestricted, and may include diverse fields such as neotectonics, deformation timescales, integration of structural and geodetic datasets, fault or shear zone processes, mapping and field analysis, structural petrology, rheological studies, kinematic structural modeling, rock mechanics, experimental deformation, strain analysis, structural and reflection seismic interpretation, remote sensing, numerical modeling, paleoseismology, and climate-tectonic interactions. A Ph.D. is required at the time of appointment. As part of the Jackson School of Geosciences (www.jsg.utexas.edu), the department (www.geo.utexas.edu) has 50 faculty and a community of research staff with a broad range of specialization and access to an outstanding collection of research facilities and equipment.

Applicants should submit a letter of application, curriculum vitae, statements of research and teaching interests, and contact information for at least three references. Submit a compiled electronic copy to structure .search@jsg.utexas.edu or send to Structure Search Committee, Dept. of Geological Sciences, University of Texas at Austin, Austin TX 78712. Review of applications will begin 1 Dec. 2010 and continue until the position is filled.

Background check conducted on applicant selected. The University of Texas at Austin is an Affirmative Action/Equal Opportunity Employer.

VISITING ASSISTANT PROFESSOR OF GEOLOGY, ROCKY MOUNTAIN COLLEGE

The Geology Program at Rocky Mountain College invites applications for a one or two year visiting teaching faculty position at the Visiting Assistant Professor level to begin Aug. 2011. It is possible that this position may become a permanent tenure track position. Classes taught will include introductory (physical) geology, earth's materials (mineralogy), geomorphology, and a course of the successful candidate's choosing depending on expertise and fit with the current faculty. Preference will be given to candidates with a desire to teach field-based courses and demonstrated excellence as an instructor. A PhD. in geoscience is preferred for this position. The successful candidate will be expected to teach an average course load of 12 credits each semester. If interested, there would be a possibility to teach introductory physics courses.

The Geology Program at Rocky Mountain College is dynamic and growing. Current faculty have active and expanding research projects currently underway in Montana and beyond that involve undergraduate students. The geology exposed in and around Montana offers countless opportunities for field trips and research. Information about the Dept. of Geology is available at http://geology.rocky.edu.

Rocky Mountain College is a private, comprehensive, baccalaureate college in Billings, Montana, where the Northern Plains meet the Rocky Mountains, offering limitless recreational and cultural opportunities. Information about Rocky Mountain College is available at www.rocky.edu. Billings is a growing community of about 125,000 people that serves as the center of culture, commerce and health care for a multi-state region.

Questions should be directed to the chair of the search committee, Dr. Thomas Kalakay, 406-657-1101 or kalakayt@rocky.edu. Review of applications will begin 15 Jan. 2011. Applications will be accepted until the position is filled.

To apply, submit letter of interest, curriculum vitae, 3 letters of recommendation addressing the candidate's interest in and commitment to excellent teaching, a statement of teaching philosophy and the Rocky Mountain College application (go to www.rocky.edu and click on faculty & staff then employment opportunities) via email at jobs @rocky.edu or mail to Human Resources, Rocky Mountain College, 1511 Poly Drive, Billings, MT 59102. AA/EOE.

FACULTY OPENING, GEOSCIENCES RESEARCH ASSISTANT PROFESSOR UNIVERSITY OF NEVADA, RENO

The Nevada Bureau of Mines and Geology (NBMG), University of Nevada, Reno (UNR), seeks applicants for a tenure-track, Research Assistant Professor faculty position beginning on or after 1 July 2011, with skills in state-of-the-art techniques in any one of the following areas:

- Quaternary geology, geomorphology, and neotectonics (incorporating geologic mapping in applications related to hazards, engineering geology, or environmental geology);
- Hydrogeology, particularly involving modeling of fluid flow in fractured rocks utilizing information from detailed geologic mapping, geophysical observations, and drill-hole data; and
- 3D modeling that integrates geophysical and geological observations and interpretations (from a background in either structural geology or geophysics, but with a clear understanding of both).

Doctoral research must be in geology or a related geoscience field. Nevada is one of the most exciting regions in the world to do research in the geosciences. Opportunities abound for research on earthquake, flood, and ground-stability hazards; water flow in fractured rocks related to potable groundwater, geothermal systems, and mineral deposits; and detailed geologic mapping in support of fundamental understanding of Nevada's geological history and 3D framework. An additional tenure-track faculty position is open in the areas of economic geology and geothermal systems. For complete position descriptions and requirements, view the position announcements at www.nbmg.unr.edu and http://jobs.unr.edu/ or contact Geoscience Search, NBMG, Mail Stop 0178, UNR, Reno, NV 89557-0178. Applications received through http://jobs.unr.edu/ by 31 Jan. 2011 will receive full consideration. EEO/AA. Women and under-represented groups are encouraged to apply.

ASSISTANT PROFESSOR, GEOMICROBIOLOGY STATE UNIVERSITY OF NEW YORK, BINGHAMTON

Binghamton University seeks applications for a tenure-track assistant professor in the area of geomicrobiology. We seek exceptional candidates whose research is focused on microbial influences on the Earth's biosphere, atmosphere, hydrosphere and solid Earth, past and present. Areas of interest include but are not limited to microbial processes affecting cycling of elements (carbon, sulfur); long-term preservation of biomaterials and biomarkers; origin and evolution of microbial life on Earth, and extreme environments on Earth and beyond.

The successful candidate must develop and sustain an internationally recognized, externally funded research program in geomicrobiology. We also expect the candidate to develop a strong record of teaching and mentoring students and teach undergraduate and graduate courses in geobiology and other topics

in his/her area of expertise. We are seeking candidates who will strengthen existing research programs in geochemistry and Earth surface processes with the potential to interact with geologists, biologists and environmental scientists on the Binghamton University campus.

Candidates must have a Ph.D. with a focus in geomicrobiology, or a related field, at the time of appointment, and should send a letter of application, curriculum vitae, statements of research and teaching interests, and names and contact information of at least three references by email to cslavets@binghamton.edu, or by mail to Search Committee, Dept. of Geological Sciences and Environmental Studies, State University of New York at Binghamton, Binghamton, NY 13902. For further information, visit the Geological Sciences and Environmental Studies website, www.geology.binghamton.edu, or contact Professor Tim Lowenstein by email: lowenst@binghamton.edu.

Women and minorities are encouraged to apply. Binghamton University is an equal opportunity/affirmative action employer. Applications will be considered until the position is filled, but priority will be given to those received by 15 Jan. 2011.

ASSISTANT PROFESSOR OF GEOGRAPHY
REMOTE SENSING, EASTERN KENTUCKY UNIV.

The Dept. of Geography & Geology at Eastern Kentucky University invites applications for a tenure-track faculty position in Geography at the Assistant Professor level, beginning 15 Aug. 2011. We are seeking candidates with expertise in remote sensing and the applied use of remote sensing and GIS techniques. The new hire would be expected to teach courses in remote sensing and advanced remote sensing, to teach applied geotechniques courses based on her or his specialty, to participate in our general education program, share in service activities, and conduct research that could involve undergraduates. Applicants must have a strong commitment to excellence in undergraduate teaching including willingness to participate in online teaching, mentoring student research, and to developing an active program of scholarship that encourages student involvement. Eastern Kentucky University is committed to the promotion of regional stewardship and student engagement. Candidates must have a Ph.D. in geography or a related discipline by the time of appointment. To apply, candidates must submit a letter of interest, names and e-mail addresses of three professional contacts, curriculum vitae, statements of teaching and research interests, and unofficial transcripts via the EKU online employment website, jobs.eku.edu. The requisition number for this position is 0608540. Review of applications will begin on 3 Jan. 2011.

ASSISTANT PROFESSOR
UNIVERSITY OF WISCONSIN–FOX VALLEY

The University of Wisconsin Colleges Dept. of Geography and Geology seeks a broadly-trained geologist as a tenure-track Assistant Professor at the University of Wisconsin–Fox Valley (www.uwfox.uwc.edu), to begin Aug. 2011. UW-Fox is located in Menasha, WI, and is one of 13 campuses of the UW Colleges (www.uwc.edu). The UW Colleges provide a liberal arts education and emphasize excellence in teaching in a variety of formats. Teaching responsibilities will include introductory courses in physical geology, environmental geology, and soil and water resources. Doctoral degree in geology or geosciences required within one year of appointment. For more information about the position and application: www.uwc.edu/jobs/faculty/FOX-GEO-Oct10.cfm. To be assured consideration applications must be received by 7 Jan. 2011. The UW Colleges is an affirmative action/equal opportunity employer.

DEPARTMENT HEAD AND PROFESSOR
GEOLOGY AND GEOLOGICAL ENGINEERING
SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

The Dept. of Geology and Geological Engineering at the South Dakota School of Mines and Technology invites applications for a 12-month position as Department Head at the Professor level. The successful applicant should have a background in Geology or Geological Engineering, a proven record of academic or industrial leadership, and a history of successful research in a field that complements existing departmental strengths. The department head will foster growth in the areas of enrollment, research, and fundraising, strengthen industry relations, and lead faculty, staff, and the academic programs. Some teaching is expected. The department offers two undergraduate and three graduate degrees in Geology, Geological Engineering, and Paleontology, with 11 faculty, ~90 undergraduate students and 45 graduate students. A Ph.D. in Geology, Geological Engineering, or a closely related field is required.

The School of Mines is a public state university offering baccalaureate, masters, and doctoral degrees in science and engineering with a student population of approximately 2,400 traditional and non-traditional learners representing 40 states and 27 countries. The university is located at the foot of the beautiful Black Hills in Rapid City, South Dakota's second-largest city. Twenty-five miles from Mount Rushmore, Rapid City has a relatively mild climate and the Black Hills offer numerous opportunities for summer and winter outdoor experiences. For more information, go to http://visitrapidcity.com/ and www.sdsmt.edu.

The School of Mines is committed to recruiting and retaining a diverse workforce. Individuals interested in this position must apply online at http://sdmines.sdsmt.edu/sdsmt/employment/. Human Resources can provide accommodation to the on-line application process and can be reached at 605-394-1203. Review of applications will begin on 4 Jan. 2011, and will continue until the position is filled. Employment is contingent upon completion of a satisfactory background investigation.

SDSM&T is an EEO/AA/ADA employer & provider.

ASSISTANT PROFESSOR, GEOPHYSICS
SYRACUSE UNIVERSITY

The Dept. of Earth Sciences at Syracuse University seeks applicants for a tenure track position in geophysics. The successful candidate will balance an active research program with both graduate and undergraduate teaching responsibilities (General/Applied Geophysics, as well as introductory courses in Earth Sciences).

We seek a geophysicist willing to collaborate within the Dept. of Earth Sciences and across campus (e.g., L.C. Smith College of Engineering, SUNY College of Environmental Science and Forestry), and participate in emerging University-wide initiatives in Water Resources, Energy and/or Forensic Sciences. Current department resources include a LINUX computing network for processing and interpreting seismic reflection data (PROMAX, SEISWORKS software), and marine seismic imaging instruments. More information is available at http://earthsciences.syr.edu.

Applicants must attach their curriculum vitae, statement of teaching and research interests, and the names and contact information for three referees to https://www.sujobopps.com. The search will remain open until the position is filled. Review of applications will begin 1 Dec. 2010. Syracuse University is an equal opportunity employer. Minorities and women are encouraged to apply.

ASSISTANT PROFESSOR, PALEOCLIMATOLOGY
SYRACUSE UNIVERSITY

The Dept. of Earth Sciences at Syracuse University seeks applicants for a tenure-track position in paleoclimatology. The successful candidate will balance an active research program with both graduate and undergraduate teaching responsibilities (e.g., Climate Change, Paleolimnology/Paleoceanography, Isotope Geochemistry). We seek a physical scientist willing to collaborate within the Dept. of Earth Sciences and across campus (e.g., SUNY College of Environmental Science and Forestry), and participate in an emerging University-wide initiative in Clean Water. Potential fields of study might include, but are not limited to, recovering, analyzing, and integrating records of paleotemperature, ocean/atmosphere chemistry, or biogeochemical cycles. Current department resources include extensive geochemical, sedimentological, and paleobiological analytical facilities, as well as sediment sampling equipment and portable research vessels. More information is available at http://earthsciences.syr.edu.

Applicants must attach their curriculum vitae, statements of teaching and research interests, and the names and contact information for three referees to https://www.sujobopps.com. The search will remain open until the position is filled. Review of applications will begin 1 Dec. 2010. Syracuse University is an equal opportunity employer. Minorities and women are encouraged to apply.

ASSISTANT/ASSOCIATE PROFESSOR
NATURAL RESOURCE MANAGEMENT
NEW MEXICO HIGHLANDS UNIVERSITY

New Mexico Highlands University (NMHU) invites applicants for a tenure-track appointment in the Natural Resource Management Dept. We seek a dynamic teacher and broadly trained researcher with a commitment to undergraduate and graduate education. NMHU,

located in the southern Rocky Mountains, has the only bachelors-level Forestry and Environmental Geology programs in the State, offers M.S. degrees in the Natural Sciences, and is home to the Forest and Watershed Restoration Institute.

For a complete job description see www.nmhu.edu/jobs.

Responsibilities: Teach undergraduate and graduate courses related to fire ecology, remote sensing, geomorphic response to fire, surface processes, and forest management. Develop an innovative and externally funded student-involved research program that emphasizes topics such as forest health, land-surface morphology and evolution, and post-fire assessment and restoration. Contribute to Natural Resource Management outreach and recruitment efforts and other service activities.

Qualifications: Ph.D. in any natural resource management related field (e.g., Forestry, Earth/Natural Science, or closely allied field; ABD may be considered). Applicant must demonstrate (1) a record of funded research and publications commensurate with experience; and (2) ability to teach university-level courses at the undergraduate and graduate level.

To Apply: Applications include a letter of application, curriculum vita, three letters of recommendation, copies of transcripts, a statement of teaching philosophy and research interests, university employment application and names/addresses/telephone numbers of three professional references. Send all materials to New Mexico Highlands University, Human Resources, Asst./Assoc. Professor of Natural Resource Management Search, Box 9000, Las Vegas, NM 87701. Position is open until filled, yet applicants are encouraged to submit a complete application by 14 Jan. 2011 when review of the applications will begin. For more detailed information and application procedures, please contact Search Committee Chair, Michael S. Petronis, mspetro@nmhu.edu. For disabled access or services, call 505-454-3242 or TDD# 505-454-3003. EOE.

ASSISTANT PROFESSOR/FACULTY POSITIONS IN GEOSCIENCES UNIVERSIDAD DE LOS ANDES, BOGOTÁ

The Faculty of Sciences at the Universidad de los Andes is seeking applications for one or more open faculty positions in Geosciences. Research interests may be in any field of the geosciences including, but not limited to, geology, geochemistry, structural geology, geochronology, stratigraphy, mineralogy, mathematical geosciences, climatology, oceanography, etc. The successful applicant will join an earth sciences research cluster at Uniandes and become part of the Geosciences Program (Undergraduate) and future Geosciences Dept. He/She will be expected to develop and maintain an active and independent program of research and to contribute to the education and training of undergraduates and graduate students in the Geosciences Program and related departments.

A Ph.D. and commitment to excellence in independent research and teaching are required. Postdoctoral experience is preferred. Interested applicants should send a curriculum vitae, a description of research and teaching interests, and arrange to have two recommendation letters sent to Germán A. Prieto, Chairman Geosciences Program. E-mail: gprieto@uniandes.edu.co. Universidad de los Andes, Depto. de Física A.A. 4976, Bogotá DC, Colombia. Phone (57) 1 332 4500 Fax (57) 1 332 4516.

STABLE ISOTOPE GEOCHEMISTRY AND MASS SPECTROMETRY, UNIVERSITY OF PITTSBURGH

FY2011, position no.: 0003114. Academic rank: Assistant/Associate Professor Level–Tenure Stream. Specialization: Stable Isotopic geochemistry and mass spectrometry.

The Dept. of Geology and Planetary Science at the University of Pittsburgh (www.geology.pitt.edu) invites applications for a tenure-track faculty position in stable isotope geochemistry at the advanced assistant or associate professor level. The position would begin with the fall term 2011, subject to budgetary approval. We seek an outstanding individual whose research program includes a strong field component, and who has expertise in light stable isotope mass spectrometry. A Ph.D. is required at the time of appointment.

The successful candidate will be expected to develop an active, externally funded research program, including supervision of M.S. and Ph.D. students and undergraduate research projects. Teaching duties will include undergraduate and graduate courses in isotope geochemistry and related fields. We seek someone who would complement one or more of our existing programs in environmental geology, geophysics and geochemistry, hydrology, paleoclimatology, soil science, and volcanology.

Applicants should submit to the Stable Isotope Geochemistry Mass Spectrometry Search Committee, Dept. of Geology and Planetary Science, 200 SRCC, University of Pittsburgh, Pittsburgh, PA 15260, the following materials: CV (including past and current grant support); statements of research and teaching interests; copies of relevant publications; names and addresses of at least four references.

Application deadline: 15 Jan. 2011.

The University of Pittsburgh is an equal opportunity/affirmative action employer. Applications from women and members of minority groups are especially encouraged.

STRUCTURAL GEOLOGIST UNIVERSITY OF PITTSBURGH

FY2011, position no. 0002036. Academic rank: Assistant Professor Level–Tenure Stream. Specialization: Structural Geology/Tectonics.

The Dept. of Geology and Planetary Science (www.geology.pitt.edu) at the University of Pittsburgh invites applications for a tenure-track faculty position in structural geology/tectonics at the assistant professor level. The position would begin with the fall term 2011, subject to budgetary approval. We seek an outstanding individual whose research program includes strong field, laboratory component, and/or modeling components, with a particular emphasis in one or more of the following areas: structural analysis, plate tectonic interactions, planetary geodynamics, and/or volcano-tectonics. A Ph.D. is required at the time of appointment.

The successful candidate will be expected to have and/or develop an active, externally funded research program, including the supervision of M.S. and Ph.D. students and undergraduate research projects. Teaching duties will include undergraduate and graduate courses in structural geology and topics related to the individual's expertise. We seek dynamic individual who would complement one or more of our existing programs in geophysics/paleomagnetism, tectonics, planetary science, regional tectonics, volcanology, and remote sensing. Further information can be found on the department's website at www.geology.pitt.edu.

Applicants should submit to the Structural Geology Search Committee, Dept. of Geology and Planetary Science, 200 SRCC, University of Pittsburgh, Pittsburgh, PA 15260, the following materials: CV (including past and current grant support); statements of research and teaching interests; copies of relevant publications; names and addresses of at least four references.

Application deadline: 15 Jan. 2011.

The University of Pittsburgh is an equal opportunity/affirmative action employer. Applications from women and members of minority groups are especially encouraged.

THOMPSON CHAIR OF GEOLOGICAL SCIENCES DEPARTMENT OF GEOLOGICAL SCIENCES UNIVERSITY OF FLORIDA

The Dept. of Geological Sciences, University of Florida, invites applications for the Thompson Chair of Geological Sciences, an endowed position at the rank of Associate or Full Professor with tenure. The successful candidate will be expected to teach at the undergraduate and graduate levels, mentor students for M.S. and Ph.D. degrees, and conduct a dynamic, externally funded research program in an area of globally significant earth science that is relevant to geological problems within Florida and the surrounding region. Areas of expertise may include, but are not limited to basin analysis, regional tectonics, carbonate and/or siliciclastic stratigraphy and sedimentology, biostratigraphy, karst geology, hydrogeology, coastal processes, sea level change, and environmental geophysics. Ph.D. required. Salary will be competitive and commensurate with experience.

For additional information or nominations please contact Dr. Jonathan B. Martin, Thompson Chair Search Committee, Dept. of Geological Sciences, University of Florida, P.O. Box 112120, Gainesville, FL 32611-2120, jbmartin@ufl.edu. Review of applications will begin 14 Jan. 2011 and continue until the position is filled. To ensure full consideration please apply online at http://jobs.ufl.edu (requisition # 0806180). For full consideration, the application should include: (1) cover letter;

(2) curriculum vitae; (3) statement of research, teaching, vision, and goals; (4) reprints of no more than three publications; and (5) the names of three colleagues who might be contacted for letters of recommendation. The University of Florida is an Equal Opportunity Institution. If an accommodation due to a disability is needed to apply for this position, please call 352-392-2477 or the Florida Relay System at 800-955-8771 (TDD). The selection process will be conducted under the provisions of Florida's "Government in the Sunshine" and Public Records laws.

THOMPSON CHAIR OF INVERTEBRATE PALEONTOLOGY, FLORIDA MUSEUM OF NATURAL HISTORY, UNIVERSITY OF FLORIDA

The Florida Museum of Natural History, University of Florida, invites applications for the Thompson Chair of Invertebrate Paleontology to be hired at the level of Associate or Full Curator (equivalent to Associate or Full Professor) with tenure. The successful candidate will be expected to conduct a dynamic research program and develop the museum's extensive collection of primarily Cenozoic invertebrate fossils that includes five million specimens. The collection is assigned two full-time staff responsible for its operations. A substantial endowment is associated with this position.

This position requires a strong commitment to university education, field work, museum-based research, and outreach. Interactions with allied academic departments include affiliate professorship status with responsibility for supervision of graduate students and teaching two formal courses per year. Minimum qualifications: Strong externally funded research, collections experience, and tenure or at least seven years of post-Ph.D. professional experience (i.e., in academic, research, or related position[s]). The start date is open. The salary is competitive and commensurate with experience.

The search committee will begin reviewing applications on 14 Jan. 2011 and will continue to receive applications until the position (requisition # 0806086) is filled. To ensure full consideration please apply online at http://jobs.ufl.edu. The application should include: (1) cover letter; (2) curriculum vitae; (3) statement of research, collections, teaching, and outreach experience, vision, and goals; (4) reprints of no more than three publications; and (5) the names of three colleagues who might be contacted for letters of recommendation. Any questions regarding this position or nominations may be directed to the search committee chair Dr. Bruce J. MacFadden, Thompson Chair Search Committee, Florida Museum of Natural History, University of Florida, P.O. Box 117800, Gainesville, FL 32611-7800, bmacfadd@flmnh.ufl.edu.

The University of Florida is an Equal Opportunity/Affirmative Action Employer. If an accommodation due to a disability is needed to apply for this position, please call 352-392-2477 or the Florida Relay System at 800-955-8771 (TDD). The selection process will be conducted under the provisions of Florida's "Government in the Sunshine" and Public Records laws.

DIRECTOR OF PALEONTOLOGY JOHN D. COOPER ARCHAEOLOGY AND PALEONTOLOGY CURATION CENTER CALIFORNIA STATE UNIVERSITY, FULLERTON

California State University, Fullerton, invites applications for the Director of Paleontology for the newly established John D. Cooper Archaeology and Paleontology Curation Center. The successful candidate will also hold a tenure-track appointment in the Dept. of Geological Sciences. We are searching for a person with extensive experience managing and curating vertebrate fossil collections, and will make an appointment at a level commensurate with the experience of the candidate. The successful candidate's primary responsibility will be the management of the paleontology portion of the Orange County Archaeology and Paleontology Collection at the Cooper Center, including direction of a Senior Paleontology Technician, interns and volunteers. The Collection contains fossils in various stages of curation, from large jacketed specimens to fully curated fossils. The bulk of the specimens at the Cooper Center are Miocene marine animals, including numerous previously unrecognized marine mammals. The successful candidate is expected to develop an externally-funded research program focusing on specimens curated at the Cooper Center and resulting in peer-reviewed publications in refereed journals. Teaching responsibilities may include some of the following: physical geology, historical geology, paleontology, and upper-division and graduate courses in the new faculty member's area of expertise. The successful candidate will have the following credentials and capabilities: (1) a Ph.D. in Geology or a related field with emphasis in Vertebrate Paleontology; (2) experience in fossil curation and museum operations related to the accession, management and display of fossils; (3) a vigorous, research program in vertebrate paleontology that can involve undergraduate and graduate students; (4) a strong interest in teaching and achieving excellence in teaching; and (5) interest and ability to interact effectively with an ethnically and culturally diverse campus community. To apply, please send a detailed curriculum vita; a letter of application that explains how you meet the qualifications outlined above and specifically addressing your qualifications as Director of Paleontology for the Cooper Center, including a record of your past external funding; a statement of your future research plans and goals as they relate to the collections in the Cooper Center; a statement about teaching including a list of courses you would feel comfortable teaching and a statement of your teaching philosophy; and letters of recommendation from at least three references familiar with your research, curation, and teaching experience. Referees should send their letters directly to Adam Woods, Chair, Search Committee, Dept. of Geological Sciences, California State University, Fullerton, P.O. Box 6850, Fullerton, Calif. 92834-6850. Review of completed applications will begin on 10 Jan. 2011. Applications received after this date will be reviewed only if the position is not filled from the original pool of applicants. For more information, please e-mail Adam Woods, awoods@fullerton.edu, or visit http://geology.fullerton.edu.

HYDROGEOLOGY, ASSISTANT PROFESSOR SUNY CORTLAND

The Geology Dept. at the State University of New York College at Cortland has a tenure-track, assistant professor position available beginning fall 2011. The department is seeking applicants who have teaching and research interests in the field of hydrogeology. Additional expertise in areas such as low temperature geochemistry, surface water hydrology, environmental geology, or biogeochemistry is welcome and should complement existing strengths in the department. The successful applicant will be expected to (1) teach courses in hydrogeology; oceanography; environmental, physical or historical geology; and/or other courses in his or her specialty as appropriate; (2) maintain an active research program that produces peer-reviewed results and involves undergraduates; (3) contribute to departmental commitments to environmental science, undergraduate and graduate programs in adolescence education/earth science, and/or field-based courses and programs; (4) advise and mentor undergraduates; and (5) serve on department and college committees. Ph.D. in hydrogeology, geology or related field at time of appointment required. Preference will be given to applicants who have a demonstrated teaching ability and a strong commitment to research at the undergraduate level. Apply online at https://jobs.cortland.edu/applicants/Central?quickFind=52321. Review of application materials will begin 1 Dec. 2010 and will continue until the position is filled. SUNY Cortland is an AA/EEO/ADA employer. We have a strong commitment to the affirmation of diversity and have interdisciplinary degree programs in the areas of Multicultural Studies.

PETROLOGY UNIVERSITY OF WISCONSIN OSHKOSH

University of Wisconsin Oshkosh, Dept. of Geology, seeks hard rock, field-oriented geologist for full-time, tenure-track assistant or associate professor position starting 1 Sept. 2011. Specialty area should complement existing faculty expertise. Ph.D. required; prior college/university teaching experience preferred. Successful candidate is expected to develop a vigorous research program, which includes publishing peer-reviewed papers. Teaching responsibilities include introductory courses, lithology, economic geology, geochemistry, field trips, and advising majors. Submit letter of application, concise statement of teaching and research interests and experience, curriculum vitae, and undergraduate and graduate transcripts (original or photocopy) by 31 Dec. 2010 to Dr. William Mode, Chair, Dept. of Geology, University of Wisconsin Oshkosh, Oshkosh, WI 54901. Have three current letters of reference sent directly to the department by that date. For additional information see www.uwosh.edu/departments/geology/. Employment requires criminal background check. AA/EOE

PALEONTOLOGY/STRATIGRAPHY
UNIVERSITY OF WISCONSIN OSHKOSH

University of Wisconsin Oshkosh, Dept. of Geology, seeks field-oriented geologist for full-time, tenure-track assistant professor position starting 1 Sept. 2011. Specialty area should complement existing faculty expertise. Ph.D. required; prior college/university teaching experience preferred. Successful candidate is expected to develop a vigorous research program, which includes publishing peer-reviewed papers. Teaching responsibilities include historical geology, paleontology, stratigraphy, field trips and advising majors. Submit letter of application, concise statement of teaching and research interests and experience, curriculum vitae, and undergraduate and graduate transcripts (original or photocopy) by 31 Dec. 2010 to Dr. William Mode, Chair, Dept. of Geology, University of Wisconsin Oshkosh, Oshkosh, WI 54901. Have three current letters of reference sent directly to the department by that date. For additional information see www.uwosh.edu/departments/geology/. Employment requires criminal background check. AA/EOE.

LOW TEMPERATURE GEOCHEMIST
SAM HOUSTON STATE UNIVERSITY

The Geology Program of the Dept. of Geography and Geology at Sam Houston State University wishes to appoint at the Assistant Professor level a Low-Temperature Geochemist with research interests in the broad field of either Aqueous Geochemistry (surface or groundwater) or Petroleum Geochemistry. The candidate will already hold the Ph.D. and will be in process of developing a strong research program with the likelihood of external funding. Primary teaching responsibilities will include an upper level course in Geochemistry to be taught each year; an upper level course related to the candidate's research field to be taught alternate years; plus coverage of sections of an introductory level Geological/Environmental Hazards course designed to attract majors. It would be particularly advantageous if the candidate could offer a general survey course in Hydrology (surface and groundwater) that includes modeling.

At the present time, Geology and Geography form a combined department with separate degree programs. The Geology curriculum is deliberately generalist but rigorous and we have success in placing our graduates in entry level positions in both environmental and petroleum-related fields, as well as in good graduate programs. It is probable that in the relatively near future Geology will become an independent department and will begin the process of building a focused graduate program of its own. We seek a geologist who would enjoy full participation from the start of this building process. This includes making funds available to the successful candidate to design and equip a research lab that will support the candidate's research agenda.

The start date for this position will be August 2011. A letter of interest, vita, e-mail addresses of referees and a statement of research interests should be e-mailed or mailed to Dr. Chris Baldwin, baldwin@shsu.edu, Dept. of Geography and Geology, Sam Houston State University, Box 2148, Huntsville, TX 77341-2148.

In addition, candidates should apply online at https://shsu.peopleadmin.com/.

Sam Houston State University is an Equal Employment Opportunity/Affirmative Action Plan Employer and Smoke/Drug-Free Workplace and a Member of The Texas State University System

ASISTANT/ASSOCIATE PROFESSOR
SEISMIC EXPLORATION, UNIVERSITY OF UTAH

The Dept. of Geology and Geophysics at the University of Utah seeks applicants for a tenure track position at the Associate or Assistant Professor level in Seismic Exploration.

Priority will be given to candidates whose research has a focus on seismic imaging including but not limited to processing and interpretation of seismic array data, reflection seismology, inversion, and integrated interpretation with other geophysical data. Preference will be given to a candidate with a strong background in quantitative sciences and with experience in solving practical geological/geophysical problems. The successful candidate should have a proven ability or potential to attract external funds and to build a vibrant research program involving graduate students and post docs. Applicants must hold a Ph.D. in geophysics, or a closely related discipline.

Applicants should e-mail an application letter describing research, teaching, and career interests, a curriculum vitae, and the names and contact information for three referees, all in PDF format to searchcommitteeseism-expl@lists.utah.edu. Review of applicants will begin 1 Jan. 2011 and continue until the position is filled.

The University of Utah is fully committed to affirmative action and to its policies of nondiscrimination and equal opportunity in all programs, activities, and employment. Employment decisions are made without regard to race, color, national origin, sex, age, status as a person with a disability, religion, sexual orientation, gender identity or expression, and status as a protected veteran. The University seeks to provide equal access for people with disabilities. Reasonable prior notice is needed to arrange accommodations. Evidence of practices not consistent with these policies should be reported to Director, Office of Equal Opportunity and Affirmative Action, 801-581-8365 (V/TDD).

The University of Utah values candidates who have experience working in settings with students from diverse backgrounds, and possess a [strong or demonstrated] commitment to improving access to higher education for historically underrepresented students.

Opportunities for Students

UCLA Ion Microprobe Student Workshop (22–25 Feb. 2011). The UCLA SIMS laboratory hosts a four-day workshop on ion microprobe applications in earth sciences. The workshop emphasizes microanalytical geochronology and stable isotope geochemistry with large radius magnetic sector SIMS. Arrival and departure dates are 21 and 26 Feb., respectively. NSF's Instrumentation and Facilities program will sponsor travel, accommodation costs, and course materials for domestic participants. Graduate students and advanced undergrads (with recommendation letter of an academic supervisor) can apply via http://sims.ess.ucla.edu/STUDENTWORKSHOP.php. Applications will be accepted up to 01/04/11.

MS in Geological Sciences, Central Washington University, in the foothills of the Cascades, has an MS program that focuses on solid Earth dynamics, environmental geology, and geologic hazards. Exciting projects are available in tectonics, seismology, geodesy, geomorphology, hydrogeology, environmental geochemistry, climate variability, volcanology, petrology, and earth-science education. The department is well-equipped with computational and geochemistry laboratories. Teaching and research assistantships are available. Application deadline: 2/1/2011. See www.geology.cwu.edu or e-mail grad@geology.cwu.edu for more information. CWU is an AA/EEO/Title IX Institution. TDD 509-963-2143.

Graduate Student Opportunities at Case Western Reserve University. Students with backgrounds in geology, physics, chemistry, biology, engineering and related fields are encouraged to apply for our Ph.D. and MS programs in Earth, environmental and planetary sciences. Areas of active research in the department include surface processes, sediment transport, carbon sequestration, aqueous geochemistry, planetary geology and geophysics, and high-pressure mineral physics and geochemistry. For more information, see http://geology.case.edu or write to geo-gradinfo@case.edu. Financial assistance is available. Application deadline: 15 Jan. 2011.

Fellowship Opportunities

TURNER POSTDOCTORAL FELLOWSHIP
UNIVERSITY OF MICHIGAN

The Dept. of Geological Sciences at the University of Michigan invites applications for the Turner Postdoctoral Fellowship, a highly competitive fellowship in any field of earth sciences. The department is interested in innovative research proposals that can be pursued in collaboration with a faculty member. Applicants are encouraged to contact prospective hosts in advance to discuss areas of common interest (www.lsa.umich.edu/geo/people/faculty).

The Turner Postdoc is a two-year position with an annual salary of $55,000, discretionary research funds totaling $10,000, and a generous benefits package.

Complete application includes: curriculum vitae, research proposal (5-page max), and the names and addresses of at least three references. Email applications to turnerpdf@umich.edu; or Mail to Turner Postdoctoral Committee, Dept. of Geological Sciences, 1100 N. University Ave., Ann Arbor, MI 48109-1005. Application deadline: 7 Jan. 2011.

The University of Michigan is an equal opportunity/affirmative action employer; women and minorities are encouraged to apply.

POSTDOCTORAL & PREDOCTORAL FELLOWSHIPS
SMITHSONIAN INSTITUTION

The Dept. of Mineral Sciences, National Museum of Natural History, Smithsonian Institution, invites fellowship applications. Active areas of research include volcanology, meteorite studies, solar system formation, planetary formation and evolution, mineral spectroscopy, geomicrobiology, environmental mineralogy, experimental petrology, mineral physics, and petrology/geochemistry. The department also houses the National Meteorite Collection, the National Rock and Ore Collection, the National Gem and Mineral Collection, and the Global Volcanism Program. A description of facilities, staff profiles, and collections resources can be found on our website: http://mineralsciences.si.edu.

Graduate fellowships are funded for 10 weeks; postdoctoral candidates should request three years (36 months). Application information for the institution-wide competition is available at www.si.edu/research+study. Application deadline: 15 Jan. 2011. The Smithsonian Institution is an Equal Opportunity Employer.

BATEMAN POSTDOCTORAL FELLOWSHIPS
IN GEOSCIENCES, YALE UNIVERSITY

The Dept. of Geology and Geophysics at Yale University (www.geology.yale.edu) announces an annual competition for one or more Bateman Postdoctoral Fellowships. We welcome applicants with research interests across the full range of disciplines within the Earth Sciences, including studies of the solid earth, oceans, atmosphere, climate dynamics, geochemistry, paleoclimatology, and the evolution of life. Each of these Postdoctoral Associate positions is awarded for two years, providing a stipend ($50,000/yr) and base research funds ($5,000/yr), plus health care benefits and limited expenses for relocation. Applicants should contact a sponsor in the department to identify potential research projects, and then submit a short (2-3 page) statement of research interests and proposed research, a curriculum vita, and list of publications. Applicants should also arrange for a brief letter of endorsement from their Yale faculty sponsor, in addition to three reference letters to be submitted online. The deadline for receipt of all application materials is 14 Jan. 2010, and decisions will be announced by or shortly after 15 Mar. 2011. Successful candidates are expected to begin their program at Yale between 1 July and 31 Dec. 2011.

Yale values diversity among its students, staff, and faculty and especially encourages applications from women and underrepresented minority scholars. Applications and letters of reference should be sent online at https://academicjobsonline.org/ajo/yale/G&G.

INTERDEPARTMENTAL POSTDOCTORAL
FELLOWSHIP IN GEOSCIENCES, YALE UNIVERSITY

The Dept. of Geology and Geophysics at Yale University (www.geology.yale.edu) seeks applicants for a postdoctoral fellowship in research that links geosciences (studies of the solid earth, oceans, atmosphere, climate, and the evolution of life) with other sciences, including, but not limited to, astronomy and astrophysics; environmental studies; physics; chemistry; biology; engineering; anthropology; medical science and public health; economics and political science.

This Postdoctoral Associate position is awarded for two years, contingent on satisfactory progress, and provides a stipend ($50,000/yr) and base research funds ($5,000/yr), plus health care benefits and limited expenses for relocation.

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