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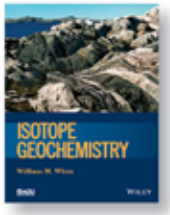

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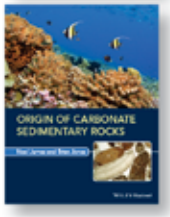

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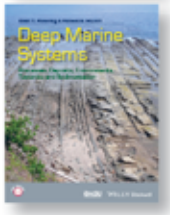

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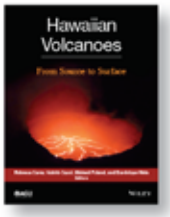

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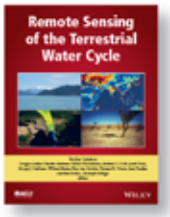

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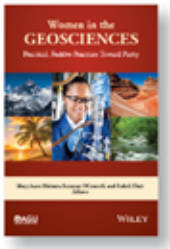

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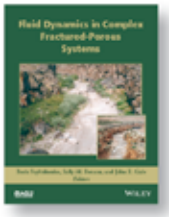

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Cover: True-color Moderate Resolution Imaging Spectroradiometer (MODIS) image of Italy, taken from the Terra satellite on 25 March 2003. Credit: Jacques Descloitres, MODIS Rapid Response Team, NASA/GSFC; http://visibleearth.nasa.gov/view.php?id=65788. See related article, p. 4–9.

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The smart city develops on geology: Comparing Rome and Naples

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ABSTRACT

A smart city is one that harmonizes with the geology of its territory and uses technology to develop sustainably. Until the Republican Times, Rome was a smart city. The ancient settlement of Rome benefitted from abundant natural resources. City expansion took place in such a way as to not substantially alter the morphological and geological features of the area; natural resources were managed so as to minimize the risks. The geology, together with prudent management, ensured Rome's fortune. Naples, which developed in a similar geological context and at almost the same time, was exposed to more geological hazards and had access to fewer natural resources. This was fatal for the city that, while remaining one of the most important of the Mediterranean, did not become the capital of an empire as Rome did. The histories of Rome and Naples highlight the important role of geology in the development of a city and the making of its fortune. Over time, fast urban expansion, rapid population growth, and the overuse of resources led to increased hazards for both cities. As a result, the cities became unstable and fragile, and several natural processes resulted in disasters.

INTRODUCTION

For a city to become smarter means improving the management of its infrastructure and resources to meet the present and future needs of its citizens and businesses. Smart cities are generally considered to be those that are able to invest increasingly in technology with the belief that this will ensure sustainable prosperity. Nevertheless, many past examples have shown how the indiscriminate use of technology in response to a natural hazard–induced risk, instead of generating security, can lead to higher risk and danger (Egner, 2012). We propose that a smart city is one that harmonizes with the geology of its territory and uses technology to reduce economic costs and resource consumption. In Europe, understanding how cities were born several thousand years ago may help us plan better for the future. We compare the diverse historical pasts of Rome and Naples to highlight the importance of geology in determining the fortune of one city compared to the other.

BASIC INFORMATION ABOUT ROME AND NAPLES

Rome and Naples are considered to be cities that developed by the unification of small villages in the eighth century B.C. Both cities have been shown to have existed for more than 2,500 years, during which time they experienced alternating periods of growth and decline. Rome originated from a small village in the ninth century B.C. to become, over centuries, the center of the civilization of the Mediterranean region (Soprintendenza Archeologica di Roma, 2000). The origin of Naples is connected to early Greek settlements established in the Bay of Naples around the second millennium B.C. The establishment of a larger mainland colony (Parthenope) occurred around the ninth to eighth century B.C. and was then re-founded as Naples (Neapolis) in the sixth century B.C. (Lombardo and Frisone, 2006; Giampaola and Longobardo, 2000).

Rome and Naples are located along the Tyrrhenian coast of central-southern Italy in a very young orogenic area (Fig. 1). Both cities lie on recent volcanic deposits (0.8 Ma to present) and on fluvial or coastal sediments, and are not far from the Apennine mountain chain (30–60 km). The geological evolution of the Tyrrhenian margin of Italy generated the natural resources and hazards that would affect the development of these two cities. The geological history of central Italy is driven by the collision between the African and European plates. After the formation of the Alps, part of the European plate containing the Corsica-Sardinia micro-plate broke away and started to migrate eastward, progressively colliding with the western margin of Adria (Apulia) and resulting in the formation of the Apennines (22–19 Ma; Vai and Martini, 2001). At ca. 10 Ma, rollback of the west-dipping subducting slab led to crustal thinning west of the Apennines, which created the Tyrrhenian Sea (Faccenna et al., 2001). Extensional faulting lowered the western margin of the Apennines and facilitated the development of volcanic activity in Latium (including the Sabatini and the Alban Hills volcanoes) and the Campania (Phlegrean Fields, Vesuvius, Ischia) (Peccerillo, 2005).

COMPARING THE RESOURCES AND RISKS OF ROME AND NAPLES

From a historical-analytical perspective, Rome had more favorable geology and fewer risks than Naples. Rome developed on small hilltops that were favorable for defense and communication, and its position on the Tiber alluvial plain at the point where the Tiberina islet was located provided easy communication between the river banks (Häuber, 2013). The hills were also healthy places

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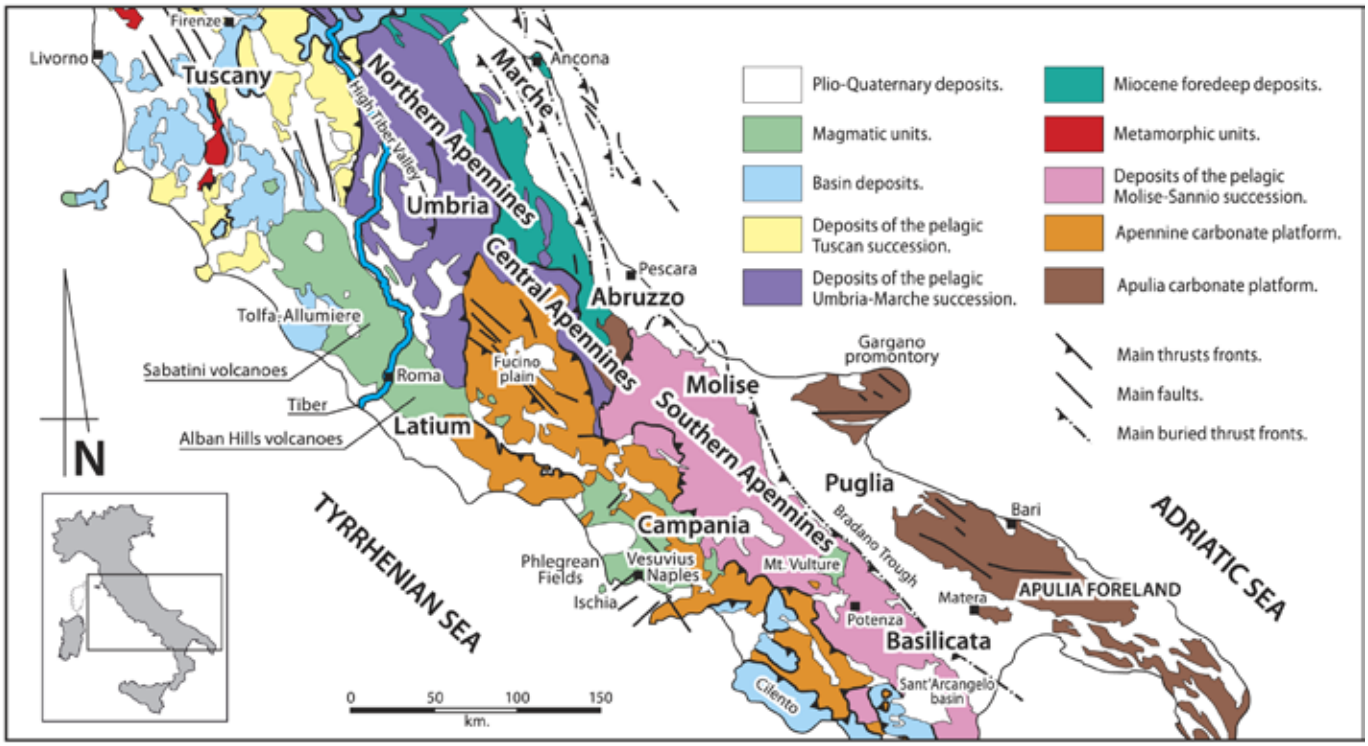

Figure 1. Main geological characteristics of south-central Italy, where the cities of Rome and Naples are located (modified from Butler et al., 2004).

to live, with far fewer incidences of marsh fever, which largely affected the alluvial areas. The hills were created by the fluvial erosion of an ignimbrite plateau sloping gently from the Alban Hills volcano to the southeast. Because of this geomorphology, and the presence of the Monte Mario–Gianicolo ridge to the northwest, Rome naturally expanded to the southeast. The topography in this direction provided an area of ~800 km^2 for the expansion of the city and agriculture and also provided an easy route along which to construct aqueducts.

Naples, on the other hand, was located within an easily defendable bay that drove an economy dominated by sea trade. But the rugged geomorphology of its interior territory significantly limited any other potential of the city. The Vesuvius and Phlegrean Field volcanoes defended the city from possible invaders, but they physically blocked any inland city expansion and made communication and trade with the hinterland population difficult. Over time, Naples mostly grew vertically, using as foundations the natural marine terraces bordering the coast. Geomorphology therefore played an important role in the decision of the city to develop an economy centered on the marine trade rather than agriculture.

An economy based on agriculture was much better suited to Rome, which had an abundance of fertile soils derived from volcanic and alluvial sediments. Farms were plentiful, even inside the city walls, and were mostly on the alluvial plains; they were small and family owned and ensured the self-sustenance of the city.

Rome was also favored by an abundance of water resources, such as the Tiber and Aniene rivers, and several natural springs present inside the city walls. Before the construction of the first aqueduct, the Aqua Claudia (B.C. 312; 400 years after the birth of Rome), at least 23 natural springs, with an average flow rate of more than 80 L/s, provided Rome with water. In addition, Romans drank water from the Tiber and Aniene rivers. These rivers were also highly navigable and so represented an easy and direct route for communication and trade with the hinterland. Conversely, the city of Naples did not have large freshwater resources and lacked natural springs. It also had no river and so lacked this convenient means of delivering goods to the hinterland. Most of the water in Naples was collected from shallow aquifers through a system of wells or water tanks, with a total surface area of ~10,000 m^2, that stored rainwater (Kosso and Scott, 2009; Montuono, 2010). The first aqueduct, the Serino, was built during the age of Augustus (B.C. 27–14 A.D.). However, it subsequently suffered damage from the earthquakes that preceded and coincided with the Vesuvius eruption of 79 A.D.

The geological settings of Rome and Naples provided solid foundations and large resources of several different types of construction material. The ground layers for foundations both in Rome and Naples were mostly made of tuffs and consolidated coastal or alluvial sediments. Rome's foundations are mostly on pyroclastic deposits from the Sabatini and the Alban Hills volcanic districts (Fig. 1). Both volcanoes emplaced several large-volume ignimbrites, mostly comprising lithified tuffs that were often used as building stones. Over time, rocks with increasingly better physical-mechanical characteristics were chosen and excavated at increasingly longer distances from building sites (de Rita and Giampaolo, 2006). In the late Roman Republic, the use of pozzolana (loose scoria ignimbrites) to make concrete was introduced. By mixing pozzolana with lime, Romans created a hydraulic cement that improved their ability to construct infrastructure, even underwater. Rock lavas were used for road

construction and, at the peak of Rome's development, >80,500 km of roads were stone-paved. The Romans also had a large availability of sands, clays, and gravels deposited over time by the Tiber River (Heiken et al., 2007). The abundance of these materials promoted the manufacture and use of bricks, which became very common in Roman buildings. Like Rome, Naples was built on volcanic hills, with the eastern remnants of several coalescent tuff cones and lava domes forming the Phlaegrean Fields (Fig. 1), which were emplaced prior to the violent eruptions of the Campanian Ignimbrite (39 ka) and Neapolitan Yellow Tuff ignimbrites (NYT; 15 ka). The unconsolidated facies of the NYT (pozzolana) were also frequently used to produce hydraulic cements. The NYT represented a solid but soft and easily workable ground layer for buildings, and for digging cisterns and sewers. It was the most widely used building stone in Neapolitan and regional architecture since Greek times (Cardone, 1990; de Gennaro et al., 2000). The urban development of Naples was strongly determined by the underground exploitation of tuffs that created a network of caves and tunnels (Cardone, 1990). Building materials were one of the most important economic resources for both Rome and Naples, and so mining became a very significant industry.

Both Rome and Naples suffered risks associated with frequent earthquakes, flooding, and CO_2 and radon emissions. Seismicity in Rome and Naples was, and still is, mainly associated with two distinct seismogenic areas; namely, the Apennines and the volcanic districts. Earthquakes of VII–VIII Mercalli-Cancani-Sieberg scale (MCS) maximum intensity have occurred in Rome and Naples and were the result of the present extensional regime related to post-orogenic collapse of the Apennines (D'Agostino et al., 2011). The greatest effects of these earthquakes are felt where there is an alternation of soft, loose alluvial and coastal sediments with the more rigid bedrock (marine clay and volcanic sediments). The alternating soft and rigid sediments give rise to an anomalous amplification of ground motion causing buildings to be subjected to long and strong shaking; this occurred in both the historical center of Naples (Nunziata et al., 2000) and along the Tiber river valley in Rome (Heiken et al., 2007). In addition, the low-lying geological setting of Naples has been affected by huge natural and artificial geomorphological changes (Nunziata et al., 2000). Volcanic earthquakes, with maximum intensity of VIII MCS, have originated in the volcanic areas of the Alban Hills since Roman times, while eruptions of Vesuvius have often been accompanied by large earthquakes in the Apennines, 50–60 km to the northeast, such as those that occurred in 63 A.D. and 64 A.D., before the destructive Vesuvius eruption in 79 A.D. The Neapolitan area is also affected by bradyseism, the subsidence and uplifting of the ground surface caused by the volcanic and hydrothermal systems beneath the Phlegrean Fields.

Both Rome and Naples developed during long quiescent periods of their volcanoes. The last known eruption of the Alban Hills is dated ca. 29,000 yr B.P., although more recent phenomena of lahar generation from the crater of Albano have been identified (Funiciello et al., 2003). Similarly, the ancient development of Naples mainly took place during the 3,000 years of quiescence of the Phlegraean Fields and Vesuvius before the 79 A.D. eruption.

Flooding also represented another important hazard both in Rome and Naples. Because of its location close to the Tiber River delta and on parts of its alluvial plane, Rome has frequently been afflicted by floods. Fifteen floods have been described between B.C. 414 and B.C. 4 (Bersani and Bencivenga, 2001), although the Tiber was generally considered as a calm river with few floods. Up until Republican Times, flood damage had not been devastating because competent city planners had placed facilities on the floodplain and most residences on hilltop areas. However, during the Imperial period (B.C. 27–395 A.D.), settlement was also allowed across the floodplain up to the Tiber's banks, as a result of which a large proportion of the city's population was exposed to flooding (Lamb, 1995).

On the other hand, flooding has been a regular phenomenon throughout the history of Naples. The city developed in an area where torrential rain-fed waters flowed into several rugged canyons or gullies on the mountains that unified at the back of the city. The first flood records of the city date back to 1010 A.D., but thick alluvial deposits in the central area of the city testify to the occurrence of floods in pre-Roman time.

Magmatic activity and fault systems are also responsible for elevated toxic gas concentrations in the near-surface environments of Naples and Rome, with the gases produced at depth migrating upward along highly permeable fault zones. The most common gases are CO_2 and H_2S, likely formed by magma cooling and degassing, and by water-rock interactions. Sudden releases of CO_2 have been documented from antiquity until the present day in several areas of the Alban Hills volcanic district. The quantity of CO_2 that rises from the depths and subsequently dissolves into shallow groundwater has been estimated to be more than 4.2×10^9 mol year^{-1}. In addition, elevated Rn comes from the high content of U and Ra present in both volcanic lavas and tuffs. In the Phlegraean Fields volcanic area, many hydrothermal phenomena, such as fumaroles and hot springs, testify to the still active volcanism of this area.

Finally, both Rome and Naples have been affected by anthropogenic hazards. The fast growth of the cities and their populations prompted the urbanization of areas subject to natural hazards, such as river and coastal flood plains previously used for agriculture, thereby exposing the population to flood risk and also reducing the ability of the city to ensure self-sustenance. Another hazard affecting both cities stems from the underground cavities that remained after the prolific quarrying for building materials. The subterranean tunnel networks were so dense and intricate that the vaults of the galleries were prone to collapse. In addition, the lack of a clear separation between water cisterns and sewers exposed the population of Naples to diseases such as cholera.

During late Republican time, continuous construction of new buildings, higher consumption of goods, and the generation and burial of the resultant waste increased the rate at which both cities rose above their original geologic foundations. In the Tiber flood plain of Rome, the anthropic debris layers are 10–15 m thick. In the historical part of Naples, the same deposits can locally reach thicknesses of 20 m (Nunziata and Panza, 2002). Debris layers generally have very poor geotechnical properties and so provide weak foundations that, in the event of an earthquake, can actually magnify seismic waves.

Urbanization also caused degradation of the hill slopes, creating unstable geomorphological conditions that can trigger landslides, especially during the occurrence of seismic tremors. The earliest evidence of slope instability and mass movement in

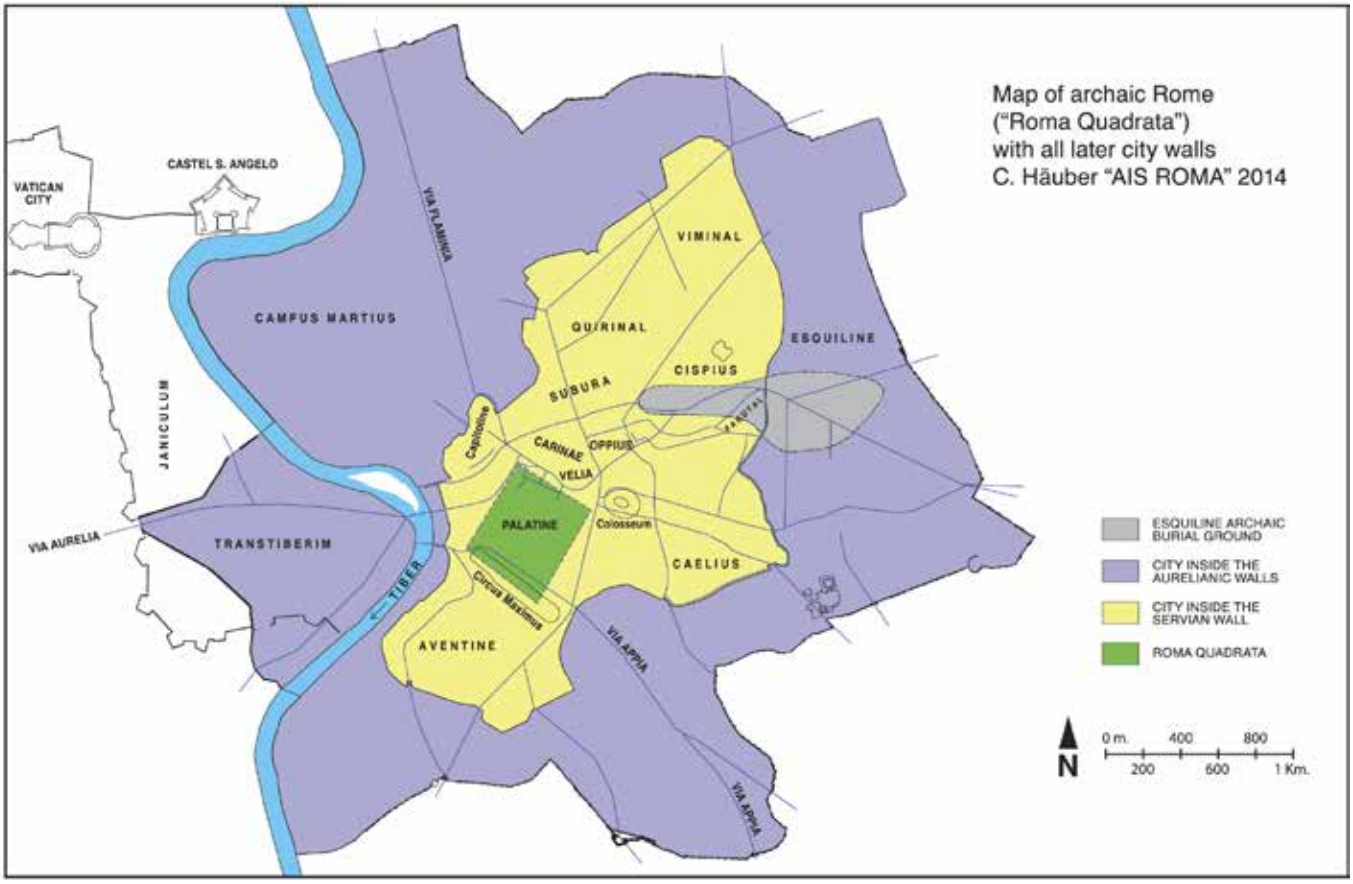

Figure 2. Evolution of Rome from Archaic to Imperial times (Häuber, 2014).

Naples has been discovered in its ancient center, where the city market of the Imperial period (first century A.D.) is partially buried under a chaotic deposit dated to the end of the fifth century (Di Martire et al., 2012). Landslides in and around the Neapolitan area have mostly been related to human activities (around 40%), such as trenching, excavations, and quarrying (Calcaterra and Guarino, 1999). Hill slope instability in Rome was limited and mainly human-induced when urbanization expanded to the margins of valleys.

DISCUSSION AND CONCLUSIONS

Geology was a major contributor to the fortune of Rome, which had more resources and reduced risks relative to Naples. Rome could also safely expand toward the Alban Hills area because of the plateau geomorphology, which further provided an easy path for the construction of the aqueducts. The city could also develop agricultural practices that, until Republican times, ensured its self-sustenance.

Many lessons can be learned if we consider the development of Rome over time (Fig. 2). Rome evolved from a small village that covered just over 100 ha and was enclosed by a perimeter wall of 7 km. During Republican times, it expanded and was enclosed by the 11-km Servian wall. During Imperial times, Rome doubled its size in less than 300 years, attaining a perimeter of 19 km enclosed by the Aurelianic walls (Häuber, 2013). During this time, the population increased to > 1,500,000. The alluvial areas were fully covered by construction and consequently the agricultural areas within the walls disappeared. From revenues of ~540 million sesterces, state expenses included 108 million sesterces to import 3.5×10^5 tons per year of wheat to sustain as much as half the population. In addition, 31–65 million denari (1/4 denario = 1 sesterce) was devoted to military operating costs. Kehoe (1988) estimated that, during the Roman Empire, the population consumed ~200,000 metric tons of wheat annually. A family of six people needed to grow crops on at least 3 ha of land in order to survive. This meant that for self-sustenance, the Roman population needed at least 500,000 ha, an area of land greatly exceeding that which was available around Rome. So Rome became dependent on food imported from overseas to feed the general population and had to harness the resources of its provinces in order to feed and support the revenue of its army, which was spread throughout the empire.

Naples had a different set of problems due to its geological setting and interactions between natural and anthropic dynamics that culminated in numerous risks. Primarily, the difficult terrain surrounding the city severely limited urban expansion (Fig. 3). Steep hills and narrow, abrupt volcanic ridges formed unsurmountable obstacles not only to city expansion but also to communications with the hinterland. This rugged geomorphology and bradyseism forced the city to grow vertically, with a resulting increase in landslide risk. To add to Naples' problems, water resources were scarce and flash-flooding resulting from the

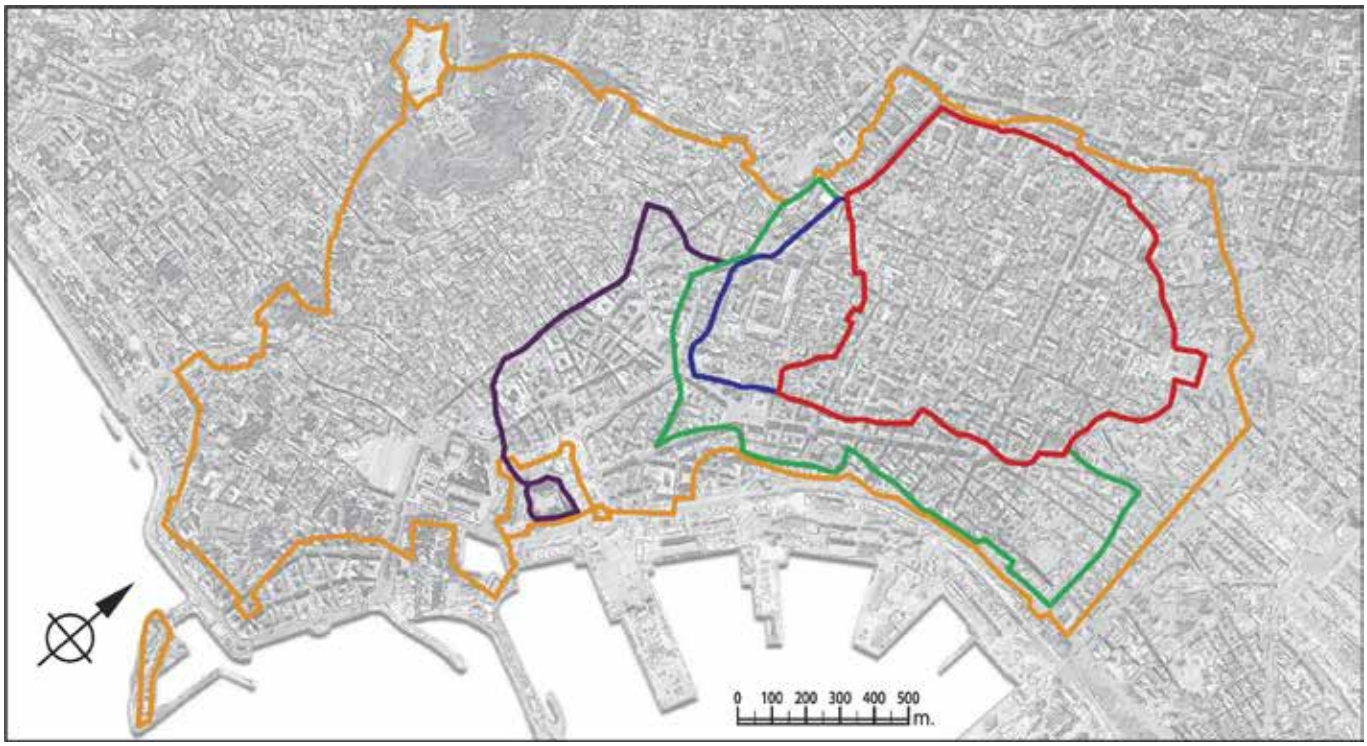

Figure 3. Air photo of Naples showing the extent of the city walls. The red line shows the approximate extent of Naples during the fifth century B.C.; the blue line encloses the enlargement of the city during the fourth century A.D.; the green line shows the wall added during the Angevin period; the violet line shows the extension of the wall during the Aragonese period; the orange line shows the extent of the wall during the Viceroy period (modified from Amato et al., 2009).

sloped terrain frequently wreaked havoc throughout the city. In spite of these problems, Naples was always an important port city, well connected with Greece and Greek culture. On one hand, this was a fortunate situation, but on the other, it caused rapid overcrowding of a city without the necessary local resources. Urban overgrowth and substantial increases in the population were always followed by economic crises and the rapid development of epidemics that resulted in decimation of the population at various points in its history.

Geological knowledge is therefore essential for the sustainable development of a city. The fortune of Rome until Republican times was sourced in the abundance of local resources and in the practical management of the land that ensured reduction of natural risks. With more geological hazards and limited resources, Naples was less fortunate in comparison.

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New Comment & Reply Posted Online

www.geosociety.org/gsatoday/comment-reply/

Comment

COMMENT on "Preexisting fractures and the formation of an iconic American landscape: Tuolumne Meadows, Yosemite National Park, USA"

Jeffrey P. Schaffer, Napa Valley College, California, USA, doi: 10.1130/GSATG205C.1, p. e34.

Reply

REPLY to "COMMENT on 'Preexisting fractures and the formation of an iconic American landscape: Tuolumne Meadows, Yosemite National Park, USA,' by Jeffrey P. Schaffer"

Scott P. Hippensteel, Matthew D. Eastin, and **William J. Garcia,** doi: 10.113/GSATG209Y.1; p. e35.

Original Article

Preexisting fractures and the formation of an iconic American landscape: Tuolumne Meadows, Yosemite National Park, USA, GSA Today, v. 24, no. 11, p. 4–10, doi: 10.1130/GSATG203A.1, http://www.geosociety.org/gsatoday/archive/24/11/article/i1052-5173-24-11-4.htm.

1–4 NOVEMBER

GSA 2015

Baltimore, Maryland, USA

The 2015 Technical Program is Steaming Like a Blue Crab!

The Geological Society of America is on a roll! Coming off of superb annual meetings in Vancouver and the stellar 125th Anniversary celebration in Denver, we are now moving full steam ahead for Baltimore on 1–4 November. Nestled into the Inner Harbor, the Convention Center lines the shore of the Chesapeake Bay, while many of the meeting hotels also share this maritime vista. Not only does the venue border bistros and cultural venues of all variety, but the proximity to Washington D.C. also positions us to effectively communicate our science to policy makers. Let's embrace these opportunities fully!

The Technical Program that has been proposed looks to be very impressive. Five Pardee Symposia will (1) discuss bicentennial of the William "Strata" Smith map and cross sections of the UK and English Channel that propelled structural inquiry; (2) provide an exposé of retreating glaciers that will query global change and include the spectacular cinematography of *Chasing Ice*; (3) examine Earth systems at the dawn of animals and the events that began the Phanerozoic; (4) interrogate state approaches to shale gas development; and (5) survey Appalachian geomorphology, immersing participants into the regional landscape—and it is coupled to an exciting field trip.

Well over 200 topical sessions are planned, in addition to a comprehensive listing of discipline sessions that will accommodate all manner of inquiry. The Annual Program Committee has reconfigured the lunchtime break to be a little longer, from noon to 1:30, allowing premier lectures to be offered as *Feed Your Brain*. We have invited leading scientists from the NSF, NASA, the USGS, and more to share insights with you. In totality, the technical program is certain to deliver the newest, finest science that you well deserve, infused with a local flavor that enriches our global perspective.

Your meeting committee is planning the very best. You will find that the full agenda includes professional development opportunities for everyone. Please support these efforts by submitting an abstract of your work and planning your stay. Join GSA in Baltimore for Halloween and celebrate Planet Earth with all that we are learning of it. For you know what they say in Maryland? Treasure the Chesapeake. All we need now is you!

Patrick Burkhart, Technical Program Chair

Background photo courtesy of Visit Baltimore.

Action Dates

▶ Space request deadline	5 June
▶ Registration opens in	early June
▶ Student travel grants open in	early June
▶ Student volunteer system opens in	early June
▶ Abstracts deadline	11 Aug.
▶ Speaker notifications will be sent in	early Sept.
▶ Housing cancellation fees begin	21 Sept.
▶ Early registration deadline	28 Sept.
▶ Housing deadline	28 Sept.
▶ Registration cancellation deadline	5 Oct.

EXHIBITORS: Reserve Your Space Now!

1–4 NOVEMBER GSA 2015

Baltimore, Maryland, USA

The preeminent gathering of geoscience individuals and organizations

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Photos courtesy of Visit Baltimore.

Call for Papers

▶ **Abstracts deadline:** 11 August

SUBMITTING AN ABSTRACT

- To begin your submission, go to **community.geosociety.org/gsa2015/science/sessions**;
- A fee of US$45 for professionals and US$25 for students will be charged for each abstract submission;
- Please review the two-abstract rule below;
- **Submission deadline:** Tuesday, 11 August.

Poster Presenters

- You will be provided with one horizontal, freestanding 8-ft-wide by 4-ft-high display board, and Velcro for hanging your display is provided at no charge.
- Each poster booth will *share* a 6-ft-long by 30-inch-wide table.
- Electricity will not be available this year, so please plan your presentation accordingly.
- Wi-Fi will be available in the poster hall area.
- Posters should be on display 9 a.m.–5:30 p.m. on Sunday, with authors present 3:30–5:30 p.m. Monday–Wednesday, posters should be on display 9 a.m.–6:30 p.m., with authors present during the afternoon beer reception, 5–6:30 p.m.
- Want to present your poster digitally? As a poster presenter, you will be given the opportunity to present your poster in a digital format. More information will be provided in abstract acceptance notices (1 Sept.). Presenters are responsible for all fees associated with this type of presentation.

Oral Presenters

The normal length of an oral presentation is 12 min. plus 3 min. for questions and answers. You *must* visit the Speaker Ready Room at least 24 hours before your scheduled presentation. All technical session rooms will be equipped with a PC using MS Office 2013.

Two-Abstract Rule

- You may submit two volunteered abstracts, *as long as one of the abstracts is for a poster presentation*;
- Each submitted abstract must be different in content; and
- If you are invited to submit an abstract to a Pardee Keynote Symposium or a topical session, the invited abstracts do not count against the two-abstract rule.

2015 Joint Technical Program Committee

Chair: Patrick Burkhart, patrick.burkhart@sru.edu
Technical Program Manager: Nancy Wright, nwright@geosociety.org

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Joseph Thomas Pardee (1871–1960)

Pardee Keynote Symposia

P1. Celebrating the Genius of William "Strata" Smith: Bicentennial Anniversary of Smith's Revolutionary Map

Advocate: George H. Davis

Smith's 1815 *Geological Map of England and Wales and Part of Scotland* stands as a milestone in the geological sciences. Smith's genius influenced geology's formative period, and beyond! The session explores "Smith" fundamentals in relation to our science today.

P2. Savor the Cryosphere

Advocates: Patrick Burkhart; Greg Baker; Paul Baldauf

"Savor the Cryosphere" will be the ultimate colloquium for 2015 that examines the retreat of glaciers on Earth, coupled to the perturbation of other Earth systems by an intensely warming climate. Three prestigious investigators seek to demonstrate that "seeing is believing." The program includes a screening of *Chasing Ice*, coupled to a panel discussion with Q&A. The panel features: James Balog (Extreme Ice Survey), Richard Alley (*The Two-Mile Time Machine*), and Lonnie Thompson (tropical ice in South America, Africa, and Asia).

P3. Earth-Life Systems at the Dawn of Animals

Advocates: James D. Schiffbauer; Marc Laflamme; Simon A.F. Darroch

Geobiologists, evolutionary biologists, paleontologists, sedimentologists, geochemists, and earth systems scientists are assembled to showcase high-impact research, identify the frontiers of current research, and present key questions to be addressed in future prospects on the rise of animals across the Precambrian–Cambrian transition.

P4. Similar Information, Different Results: Fracking from State to State

Advocates: R. Laurence Davis; Christopher P. Carlson

Using similar data, different states have formulated very different approaches to addressing oil and gas recovery from shale plays using hydrofracking. During this session, geologists and policy makers representing several states will outline their state's policies and discuss how they were developed. The presentations will be followed by a panel discussion about approaches to formulating policy for controversial issues along with time for questions and discussion with the audience.

P5. Appalachian Geomorphology

Advocates: Frank J. Pazzaglia; Gregory S. Hancock; Sean F. Gallen

This full-day session is dedicated to new research and synoptic presentations of geomorphic processes and rates as seen through the lens of the Appalachian landscape, the spawning ground of the great paradigms championed by Davis and Hack. The session will continue the discussion started during pre-meeting field trips also devoted to the topic of Appalachian geomorphology and will be linked to a topical session with a similar focus. We envision addressing topics including, but not limited to, dynamic uplift, fluvial incision, drainage network steadiness, rates and processes of erosion, hillslope and periglacial processes, and soils.

Topical Sessions

Bridging Two Continents

T1. **Bridging Two Continents: Active Intracontinental Tectonics in Asia and North America and the Associated Geohazards**

Disciplines: Tectonics/Tectonophysics

Advocates: Jing Liu; An Yin; Mian Liu

Intracontinental tectonics, exemplified by the diffuse crustal deformation in central Asia and the western U.S., and mid-continental earthquakes in North China and the eastern-central U.S., remains enigmatic. This session seeks researchers from all disciplines to exchange data and ideas to better understand active intracontinental tectonics and associated geohazards.

T2. **Bridging Two Continents: Advances in Crustal Subduction and Ultrahigh-Pressure Metamorphism**

Disciplines: Petrology, Metamorphic; Tectonics/Tectonophysics; Geochemistry

Advocates: Jane A. Gilotti; Yong-Fei Zheng

Presentations that explore the mineralogical, petrological, geochemical, geochronologic, and tectonic aspects of crustal subduction and ultrahigh-pressure metamorphism are welcome. Papers presenting theoretical, analytical, or conceptual advances toward the understanding of deep subduction-zone processes are encouraged.

T3. **Bridging Two Continents: Comparative Studies of Accretionary Orogenesis in the Central Asian Orogenic Belt, North American Cordillera, and Other Orogenic Belts**

Disciplines: Structural Geology; Tectonics/Tectonophysics; Sediments, Clastic

Advocates: John Wakabayashi; Wenjiao Xiao; Laura E. Webb

We seek contributions on aspects of the accretionary orogenesis of the Central Asian Orogenic Belt and the North American Cordillera. Comparative studies or research on either belt, or on other accretionary orogens, are welcome.

T4. **Bridging Two Continents: Diamonds, Zircons and Native Elements in the Mantle: New Discoveries and Models on the Properties and Petrogenesis of Oceanic Mantle Lithosphere**

Disciplines: Mineralogy/Crystallography; Petrology, Metamorphic; Tectonics/Tectonophysics

Advocates: Yildirim Dilek; Paul T. Robinson; Juhn G. Liou; Jingsui Yang

Contributions on the processes of element fluxing, crust-mantle recycling, and petrogenetic evolution of the mantle, based on studies of ophiolites and oceanic lithosphere and using mineralogical, geochemical, and geodynamic data for modeling at nano, micro, and global scales are welcome.

T5. **Bridging Two Continents: Geologic Configuration of the Tibetan Plateau Region Prior to the Indo-Asian Collision: Setting the Stage for Development of a High Elevation Plateau**

Disciplines: Tectonics/Tectonophysics; Structural Geology; Sediments, Clastic

Advocates: Amy L. Weislogel; Delores M. Robinson

Geoscientists from diverse disciplines will assess the complicated geologic record produced by successive tectonic collisions, with the aim of piecing together the geologic history that culminated in Earth's largest and highest plateau.

T6. **Bridging Two Continents: Mid-Latitude Climate during Cretaceous Greenhouse States: Comparison between East Asia and North America**

Disciplines: Paleoclimatology/Paleoceanography; Tectonics/Tectonophysics

Advocates: Stephan A. Graham; Chengshan Wang

Understanding Cretaceous greenhouse climate may be helpful for future climate predictions. Comparison of the Terrestrial Songliao Basin in East Asia and the Western Interior Seaway Basin in North America facilitates integration of mid-latitude climate in the Cretaceous. Topics on basin evolution and paleoclimate change are encouraged.

T7. **Bridging Two Continents: New Insights into the Mechanisms of Continental Deformation from SinoProbe Deep Seismic Reflection Profiling and Receiver-Function Studies of the Lithosphere**

Disciplines: Tectonics/Tectonophysics

Advocates: Shuwen Dong; Larry Brown

International seismological observations recently achieved significant progress; the SinoProbe of China continues to explore lithospheric structures from efforts of many scientists. This session allows scientists to exchange new findings and insights, and stimulates cooperation and discussion to better understand the mechanism of continental deformation and tectonics.

T8. **Bridging Two Continents: Supercontinents in Earth's History: New Perspectives from Precambrian Geology of Asia and North America**

Disciplines: Precambrian Geology; Tectonics/Tectonophysics

Advocates: Mingguo Zhai; J. Brendan Murphy; Joseph G. Meert

This session will concentrate on paleogeographic reconstructions of Precambrian paleocontinent/supercontinents with specific emphasis on Asian and North American cratons, early Earth geodynamic and tectonic processes, and the effect of supercontinent cycles on the distribution of mineral resources and evolution of the hydrosphere and atmosphere.

Archaeological Geology

T9. **Developing Proxies for Human Impact on Soil and Sediment Mass Transfer throughout the Holocene**

Disciplines: Archaeological Geology; Quaternary Geology; Geomorphology

Advocates: Thomas Hoffmann; Timothy P. Beach

This session encourages abstracts that provide a global paleo-perspective on the sustainable use of soils, sediments, and river systems.

T10. **Frontiers in Geoarchaeology**

Disciplines: Archaeological Geology; Geomorphology

Advocates: Laura R. Murphy; Justin A. Holcomb

This session will serve as a forum for researchers to present novel approaches under development or applied within geoarchaeology. We welcome methodological and theoretical papers that seek to push the current boundaries of the discipline.

T11. **Terra Firma: Earth Materials, Culture, and Theory**

Disciplines: Archaeological Geology; Quaternary Geology; History and Philosophy of Geology

Advocates: Cynthia M. Fadem; Judson Byrd Finley

This session considers the entire diversity of geology and archaeology in service to each other and encourages exploration of this interface, development of geoarchaeological theory, and novel approaches to defining, representing, and teaching this (inter)discipline.

Coal Geology

T12. **From Peat to Coke: Honoring the Legacy of William Spackman**

Disciplines: Coal Geology; Paleontology, Paleoecology/Taphonomy; Geochemistry; Oil/Gas/Alternative Energy

Advocates: Jen O'Keefe; Frederick Rich; Anne Raymond; John C. Crelling

William Spackman spent his career applying paleobotany, palynology, organic petrography, and geochemistry to cradle-to-grave studies of coal systems, including coking and industrial applications. This session focuses on coal system science from wetland environments to coke.

T13. **Geologic Energy Research**

Disciplines: Coal Geology; Geochemistry; Stratigraphy; Oil/Gas/Alternative Energy

Advocates: Brett J. Valentine; J. Fred McLaughlin; Marc L. Buursink

This session of the highlights research into all geologic energy resources. Topics include research covering coal, petroleum, geothermal and uranium resources, and associated environmental impacts.

Gas venting at the surface from an underground coal fire in Hazard, Kentucky. Photo courtesy of Glenn B. Stracher, 2007.

T14. **Unconventional Resources: New Insights into Eastern Shale Plays**

Disciplines: Coal Geology; Geochemistry; Sediments, Clastic; Oil/Gas/Alternative Energy

Advocates: Brett J. Valentine; J. Fred McLaughlin

This session will examine the emergence and development of unconventional (shale) oil/gas plays in the eastern United States. Topics include thermal and basin maturation/evolution, organic geochemistry, organic petrology, mineralogy, stratigraphy, and petroleum engineering.

Economic Geology

T15. **Dimension Stone and Heritage Stone: Quarries, Building Stones, Monuments, Sculpture, Utilitarian Stones, and More**

Disciplines: Economic Geology; Engineering Geology; Public Policy

Advocates: Joseph T. Hannibal; Barry J. Cooper; Björn Schouenborg

This session includes presentations on dimension-stone geology with a focus on stone resources that have achieved widespread utilization in human culture, including historic construction, monuments, and utilitarian stones. Formal designation and international recognition of heritage stone will be discussed.

T16. **Geochemistry of Unconventional Rare Element Sources**

Disciplines: Economic Geology; Coal Geology; Geochemistry; Oil/Gas/Alternative Energy

Advocates: Nora Foley; Allan Kolker; Clint Scott

This session explores the geochemistry and extraction potential of lanthanides and other rare elements from unconventional sources, such as coal ash, clay, bauxite, laterite, and phosphate deposits, in light of current global supply and demand.

T17. **Metallic Mineral Deposits in the Midcontinent Region of North America: Origin and Exploration**

Disciplines: Economic Geology; Geochemistry; Precambrian Geology

Advocates: Joyashish Thakurta; Edward M. Ripley

Abstracts are encouraged on recent findings related to the origin, occurrence, and evaluation of known metallic mineral deposits, as well as emerging studies on exploration for new deposits in the midcontinent region of North America.

T18. **Metals in Ore Fluids: Sources, Concentrations, Modes of Transport, and Precipitation**

Disciplines: Economic Geology; Geochemistry

Advocates: Ryan Mathur; Martin Appold

This session aims to highlight recent progress in understanding the occurrence of metals in ore fluids based on theoretical, experimental, and case studies.

T19. **Terrestrial Geologic Remote Sensing Applications Using Data from the Newest and/or Simulated Future Airborne and Spaceborne Multispectral and Hyperspectral Sensors**

Disciplines: Economic Geology; Environmental Geoscience

Advocates: Wendy M. Calvin; John C. Mars; Bernard E. Hubbard

This session solicits imaging spectroscopy studies utilizing data from new and/or future imaging spectrometers for a wide range of geologic applications. In particular, we welcome studies aimed at simulating data from the future HyspIRI mission.

Engineering Geology

T20. **Embedded Research Projects in Upper Level Undergraduate Courses: A Plausible Panacea for the Dwindling Science and Engineering (S&E) Researchers Community (Posters)**

Disciplines: Engineering Geology; Environmental Geoscience; Hydrogeology

Advocates: Solomon Isiorho; David O. Omole

Early involvement of young science and engineering (S&E) students in research through their courses becomes important as the S&E population ages. Environmental-related research/projects abstracts by professors/students are encouraged for submission to this session.

T21. **Environmental and Engineering Geology Student Research Competition**

Disciplines: Engineering Geology; Environmental Geoscience; Quaternary Geology

Advocates: William J. Burns; Scott Burns

We encourage students to submit an abstract for the poster or oral presentation on any research related to environmental and engineering geology. Monetary awards will be given to the top presenters.

T22. **Geology and Warfare**

Disciplines: Engineering Geology; Archaeological Geology; History and Philosophy of Geology

Advocates: Nathalie Nicole Brandes; Paul T. Brandes; Audra E. Basal

Geology has had an influence on war throughout history. This session will explore aspects such as locations of fortified positions, use of terrain in battle, and how tactical decisions often include an understanding of geology.

T23. **Landslide, Subsidence, and Debris-Flow Hazards: Integrating Engineering Geology Research and Communication Solutions**

Disciplines: Engineering Geology; Environmental Geoscience; Geoscience Information/Communication

Advocates: Matthew M. Crawford; William J. Burns; Lynn M. Highland; Francis K. Rengers

This session will highlight geologic hazards and engineering geology topics, focusing on landslides and subsidence and emphasizing communication. By linking hazard research with proper guidance for the public, progress can be made toward risk reduction.

T24. **Sedimentology of Large Rock and Volcanic Debris Avalanche Deposits**

Disciplines: Engineering Geology; Sediments, Clastic; Volcanology

Advocates: Anja Dufresne; Stuart Dunning; Sibylle Knapp

Rock/debris avalanche deposits harbor important evidence of their emplacement processes. We welcome contributions of case studies of large landslides that make maximum use of natural exposures, and we encourage a focus on lithological variations.

Environmental Geoscience

T25. **An Early Involvement of Undergraduates and K–12 Students in Geological Research Brings a Strong Sense of Ownership and Achievement for Young Researchers (Posters)**

Disciplines: Environmental Geoscience; Geoscience Education; Geoscience Information/Communication

Advocate: Nazrul I. Khandaker

Undergraduates and K–12 students interested in demonstrating their research skills pertaining to broad geosciences, engineering geology, environmental, and sedimentology/geomorphology topics and receiving professional feedback from the participating attendees are encouraged to consider this topical session.

T26. **From Provenance to Sequestration: A Heavy Metal Journey**

Disciplines: Environmental Geoscience; Geochemistry; Soils

Advocates: Michael Martínez-Colón; Henry Alegria

This session will highlight ongoing geological, biological, and biogeochemical processes involved in the behavior and transport of metals in aquatic and terrestrial systems.

T27. **Intersections of Sustainability and Geosciences**

Disciplines: Environmental Geoscience; Geoscience Education; Geoscience Information/Communication

Advocates: Robert Brinkmann; Leslie North

Papers are sought for a special session on sustainability and the geosciences. The session seeks to highlight work that combines the fields of sustainability and geoscience to examine or educate about environmental and/or societal problems.

T28. **Ponder the Anthropocene**

Disciplines: Environmental Geoscience; History and Philosophy of Geology; Geoscience Information/Communication

Advocates: Patrick Burkhart; Paul Baldauf

Humans and industrialization have substantially perturbed Earth Systems. Assessments of impacts, predictions of trends, and approaches to teaching environmental geology, while maintaining optimism and an undefeatable human spirit, are sought.

T29. **Restoring the Nation's Largest Estuary: Lessons Learned from Efforts to Address Changes in Water Quality and Ecosystem Structure and Function within the Context of Landscape Change and Climate Variability in the Chesapeake Bay and Its Watershed**

Disciplines: Environmental Geoscience; Public Policy; Hydrogeology

Advocates: Christopher P. Carlson; Scott W. Phillips; Joel D. Blomquist; Lewis C. Linker; William C. Dennison

The session will focus on ecosystem response to restoration policies and practices to improve water quality and habitat in the tidal bay and throughout the watershed, emphasizing the influence of land use, geology, ecology, management actions, and climate variability.

T30. **Shale Gas Exploration and Emissions: A Focus on the Marcellus in Western Pennsylvania**

Disciplines: Environmental Geoscience; Engineering Geology; Economic Geology; Oil/Gas/Alternative Energy

Advocate: Gregory J. Mount

This session focuses on research on fugitive gas emissions and produced waters from natural gas wells in Devonian shale to better define the contribution of this activity to the regional and global carbon cycle and environment.

T31. **Unmanned Aerial Vehicles and Their Use in Geologic Reconnaissance (Posters)**

Disciplines: Environmental Geoscience; Engineering Geology

Advocate: Thomas L. Rice

This session will highlight the burgeoning development of UAV/UAS (drone) platforms and sensors that can be utilized in geologic reconnaissance, especially in natural resource and natural hazards assessments. Active or passive remote sensing, in miniature!

T32. **Urban Geochemistry**

Disciplines: Environmental Geoscience; Geochemistry; Geology and Health

Advocates: W. Berry Lyons; David T. Long

This session encourages presentations that qualify and quantify the geochemical and biogeochemical impacts (temporal and spatial) of urbanization and urban activities on soil, water, and air resources, as well as on human and ecosystem health.

T33. **Using Long-Term Research in the Baltimore Urban Environment in Scientific Decision Making and Education**

Disciplines: Environmental Geoscience; Public Policy; Geoscience Education

Advocates: Suzanne O'Connell; Steward Pickett

Urban environments create heat islands, modify hydrology, and require large influxes of resources. The Baltimore LTER project investigates multiple biogeochemical systems. Data collected is used to understand the complex urban environment and educate students and policymakers.

Geochemistry

T34. **Deep Weathering, Ancient Landscapes, and Regolith-Dominated Terrains**

Disciplines: Geochemistry; Geomorphology; Economic Geology

Advocate: Ignacio Gonzalez-Alvarez

Regolith-dominated terrains extend throughout large areas of the world. Weathered profiles in these regions reach depths of hundreds of meters and are complex due to weathering processes overprinting developed for millions of years.

T35. **Honoring the Diverse Career of Dr. W. Berry Lyons: Geochemistry from Polar Deserts to Tropical Watersheds**

Disciplines: Geochemistry; Hydrogeology; Limnogeology

Advocates: Sarah K. Fortner; Carolyn B. Dowling; Karen Johannesson; Klaus Neumann; Carmen A. Nezat

This session honors W. Berry Lyons and his many contributions to geochemistry. Dr. Lyons has investigated polar to tropical settings. His research, collaborative abilities, and leadership inspire many and have built new directions in geochemistry.

T36. **Mercury Biogeochemistry: Sizing up Element 80 in the Earth System**

Disciplines: Geochemistry; Environmental Geoscience; Geomicrobiology

Advocates: Nathan Yee; John Reinfelder

This session will feature recent advances in mercury (Hg) biogeochemistry focusing on geochemical and microbial Hg transformations, Hg stable isotope fractionation processes, and novel remediation strategies at contaminated sites.

GSA GeoCorps™ America participant.

T37. **Origins and Early Evolution of Life at the Mineral/Water Interface**

Disciplines: Geochemistry; Mineralogy/Crystallography; Precambrian Geology

Advocates: Charlene F. Estrada; Punam Dalai; Nita Sahai

This session encourages studies that explore prebiotic organic molecule interactions with minerals that may have influenced the origins of life on early Earth and, potentially, on other terrestrial bodies.

T38. **Sigma Gamma Epsilon—Undergraduate Research (Posters)**

Disciplines: Geochemistry; Paleontology, Biogeography/Biostratigraphy; Environmental Geoscience

Advocate: Erika R. Elswick

The goal of this session is to highlight recent and ongoing undergraduate research in a student-friendly forum. The session is open to students and faculty co-authors working in any area of the geosciences.

T39. **Sources, Transport, Fate, and Toxicology of Trace Elements and Organics in the Environment**

Disciplines: Geochemistry; Environmental Geoscience; Geology and Health

Advocates: LeeAnn Munk; David T. Long; W. Berry Lyons

Basic and applied research on trace elements and organics in the environment are encouraged. Topics include those that relate to understanding and modeling sources, transport and fate; human and ecosystem health; environmental assessment and remediation.

T40. **Tracing Biogeochemical and Hydrological Processes in Urban Landscapes**

Disciplines: Geochemistry; Hydrogeology; Soils

Advocates: Joel Moore; Elizabeth Herndon

Although more than 50% of humans are urban dwellers, biogeochemical processes in urban landscapes are understudied. We encourage studies that use geochemical tools to trace water and solute fluxes and biogeochemical reactions in urban settings.

Geoinformatics

T41. **Digital Dirt: Evaluating and Minimizing Discrepancies that Accrue between Digital Data and the Natural World They Represent**

Disciplines: Geoinformatics; Paleontology, Paleoecology/Taphonomy; Paleontology, Phylogenetic/Morphological Patterns

Advocates: Walton A. Green; Benjamin Kotrc; Luke Mander

This session is intended to attract case studies in digital data acquisition and quality control from any area of the geological sciences in which data accuracy critically affects theories about the natural world.

T42. **Geoscience Data Repositories and Data Management Services**

Disciplines: Geoinformatics; Geoscience Information/Communication; Public Policy

Advocates: M. Lee Allison; Bruce Herbert

This session is intended to examine options and examples of design and implementation of geoscience data repositories along with data management services that can meet the emerging federal requirements and community needs.

T43. **IS-GEO: Intelligent Systems Research to Support Geosciences**

Disciplines: Geoinformatics; Geoscience Information/Communication; Geoscience Education

Advocates: Suzanne A. Pierce; Basil Tikoff

Intelligent Systems for Geosciences (IS-GEO) is an emerging field of inquiry that advances understanding of Earth systems using cyberinfrastructure and analytical techniques to collect, mine, visualize, and communicate information and then transform data into new insights.

T44. **Our Data Belong in Our Hands: 3-D Printing—The Future of Geoscience Research and Education (Posters)**

Disciplines: Geoinformatics; Geoscience Education

Advocates: Franciszek Hasiuk; Ian Saginor

Three-dimensional printing is a novel technology that allows highly accurate, customized, and tangible models to be printed at low cost. This session will allow researchers and educators to comingle, sharing research results, workflows, and curriculum.

T45. **Transforming the Life of the Geoscientist from Planning to Post-Submission: Cyberinfrastructure as an Agent of Change**

Disciplines: Geoinformatics; Geoscience Information/Communication; Public Policy

Advocates: Simon Goring; Noah McLean

This end-user focused session will showcase the ways that science supported by EarthCube and other large-scale cyberinfrastructure projects will help shape and advance the research and outreach activities of geoscientists now and in the future.

T46. **Using Digitized Data in Geological and Paleontological Research**

Disciplines: Geoinformatics; Paleoclimatology/Paleoceanography; Paleontology, Diversity, Extinction, Origination

Advocates: Talia S. Karim; Gil Nelson

Digitization programs in paleontology and geology are producing large amounts of easily accessible data. This session will present developments in the research uses of digitized geoscience data and recent advances in data-publishing and mobilization.

Geology and Health

T47. **Geology and Health: A Decade of Progress**

Disciplines: Geology and Health; Environmental Geoscience; Hydrogeology

Advocates: Thomas H. Darrah; Suzette A. Morman; Andrew Hunt; Kevin E. Nick; Saugata Datta

Geology and health is a young but impactful discipline with significant contributions to critical society issues. This session presents state-of-the-art research on the application of geological knowledge and techniques to assess potential health risks or benefits of geological materials.

Geomicrobiology

T48. **Geomicrobiology: Microbes as a Geologic Force on Modern and Ancient Earth**

Disciplines: Geomicrobiology; Geochemistry; Precambrian Geology

Advocates: Nathan Yee; Clara S. Chan

This session will feature recent advances in geomicrobiology, focusing on the interplay between microbial and geochemical processes, microbial life in the deep subsurface, and biosignatures in the geologic record.

T49. **Mechanistic Insights into the Biogeochemical Processes Controlling Phosphorus Transport and Cycling**

Disciplines: Geomicrobiology; Geochemistry; Soils

Advocates: Yuanzhi Tang; Nadine Kabengi; Rixiang Huang

This session focuses on the technological advancement and fundamental understanding of the mechanisms and kinetics of biogeochemical processes that control the transport and transformation of phosphorus at the solid-aqueous interface.

T50. **Microbial Hydrocarbon Formation and Biodegradation: Organisms, Pathways, Environmental Limitations, and Isotope Signatures**

Disciplines: Geomicrobiology; Geochemistry; Coal Geology; Oil/Gas/Alternative Energy

Advocates: Denise Akob; Tracy M. Quan; David S. Vinson

This session highlights findings on the role of microbes in hydrocarbon resources, including formation/biodegradation pathways and environmental controls on subsurface microbial activity. We welcome laboratory and field approaches incorporating genomics, isotopes, geochemistry, or hydrogeology.

T51. **Molecular Methodology and the Heart of Geobiology**

Disciplines: Geomicrobiology; Geochemistry; Geoscience Education

Advocates: John R. Spear; Victoria A. Petryshyn; Frank A. Corsetti

In the past 15 years, geobiological discovery has been made primarily through various molecular methodologies that unlock mysteries of the rock record. We welcome contributions that highlight achievements and advances in geobiological research. Interdisciplinary participation is encouraged.

Geomorphology

T52. **From the River Channel to the Drainage Divide: Processes, Driving Mechanisms, and the Direction of Topographic Change in the Appalachians**

Disciplines: Geomorphology; Quaternary Geology

Advocates: Gregory Hancock; Frank J. Pazzaglia; Sean F. Gallen

This session will focus on landscape evolution, active processes, and rates of landscape change in the Appalachians and the mechanisms driving erosion in an ancient orogen (e.g., dynamic topography, piracy, and climate).

T53. **Geoheritage Matters (Posters)**

Disciplines: Geomorphology; Geoscience Education; History and Philosophy of Geology

Advocates: Benjamin van Wyk de Vries; Tom Casadevall

Geoheritage is the protection of geological features, and it has strong outreach content. The session will discuss the evolution of geoheritage as geology and society advance, and its variation in time and socio-geographic location.

Canyon at Gramada, Peru. Photo by Kevin E. Nick.

T54. **Geomorphology and Hydrology of Wildland Fires**

Disciplines: Geomorphology; Environmental Geoscience

Advocates: Daniel Cadol; Francis K. Rengers

This session seeks to bring together researchers studying the processes by which wildland fires affect the transport of water, sediment, and pyrogenic debris down hillslopes and through the fluvial network.

T55. **Investigating Coastal Environments: A Tribute to Derald G. Smith**

Disciplines: Geomorphology; Marine/Coastal Science; Sediments, Clastic

Advocate: Harry M. Jol

As coastal depositional settings become vulnerable to short/long-term changes, it is important to understand their geomorphic complexity. The session will explore how various field methods (e.g., GPR, coring, OSL) aid in better understanding these dynamic environments.

T56. **Landslide Inventories and Time Series: Data Collection, Statistics, Geospatial Analysis, and Relationships to Other Geohazards**

Disciplines: Geomorphology; Geophysics/Geodynamics

Advocates: Martin Klose; Dalia B. Kirschbaum; Lynn M. Highland; Bodo Damm

This session is focused on statistical and geospatial analysis of landslide inventories. Methods of collecting landslide data also occupy center stage in this session. We welcome contributions dealing with other types of geohazards as well.

T57. **Soil to Sediment—From Geologic to Modern Time Scales: A Session to Honor the Work of Milan Pavich**

Disciplines: Geomorphology; Soils; Quaternary Geology

Advocates: Allen C. Gellis; Dorothy Merritts; Robert C. Walter

This session honors Milan Pavich's 39-year professional career. Milan made major contributions to understanding the factors important in landscape evolution and sediment production, at geologic to modern time scales.

T58. **Undergraduate Research Talks: The Next Step in Student Research Projects**

Disciplines: Geomorphology; Quaternary Geology; Environmental Geoscience

Advocates: Jacqueline A. Smith; Bradley G. Johnson; Edward C. Hansen

This session provides a venue for undergraduate students and recent graduates to present talks on completed research projects. Students may submit abstracts for research projects in any subdiscipline of geology, earth science, or environmental science.

Geophysics/Geodynamics

T59. **Advances in Crustal Geophysics and Tectonics: In Honor of G.R. Keller**

Disciplines: Geophysics/Geodynamics; Tectonics/Tectonophysics; Geoinformatics

Advocates: Kevin L. Mickus; Catherine M. Snelson; Dennis L. Harry

This session is to honor G.R. Keller, a leader in applying geophysics to solve tectonic and geoinformatic problems. He has used seismic and potential field data to investigate numerous tectonic environments (e.g., continental rifts, orogenic belts, and plateau uplifts) worldwide.

T60. **An Updated View on Caribbean Tectonics**

Disciplines: Geophysics/Geodynamics; Tectonics/Tectonophysics; Volcanology

Advocates: Margarete Jadamec; Kevin Burke; Andrew V. Newman

This session integrates geologic and geophysical observations to provide an updated tectonic configuration of the Caribbean and examine processes from mantle flow to tectonic and earthquake cycle behavior to the closure of the Panama isthmus.

T61. **Geophysical Solutions to Geological Problems: Current Research Results and the Annual George P. Woollard Award Presentation**

Disciplines: Geophysics/Geodynamics

Advocates: Samantha E. Hansen; Nicholas C. Schmerr

Contributions that employ geophysics to solve geologic problems are emphasized. This session also honors the recipient of the George P. Woollard Award for his or her outstanding geophysics contributions that advance our understanding of geology.

T62. **Integrating Geophysical Characterization of the Near Surface for Carbon Cycle Studies in Peatland Soils**

Disciplines: Geophysics/Geodynamics; Soils; Geochemistry

Advocates: Gregory J. Mount; William Wright; Matthew McClellan

This session focuses on the use of near-surface hydrogeophysical methods to understand carbon cycle dynamics in the shallow subsurface, including studies on release events and potential storage.

T63. **Intraplate Earthquakes, Seismotectonics, and Geodynamics in Eastern and Central North America**

Disciplines: Geophysics/Geodynamics; Tectonics/Tectonophysics; Engineering Geology

Advocates: J. Wright Horton Jr.; Christine A. Powell; Robert A. Williams

Intraplate earthquakes and seismic zones in eastern and central North America are poorly understood. The 2011 Virginia earthquake, technological advancements, EarthScope, and GeoPRISMS offer exciting research opportunities. We welcome contributions in any geoscience or engineering discipline.

T64. **Rotations, Oroclinal Bending; Variscan-Alleghenian Nondipoles; Diagenetic Enigmatic Remagnetizations; Vignettes of Orogenies and Oceans: A Celebration of Rob Van der Voo's Career**

Disciplines: Geophysics/Geodynamics; Tectonics/Tectonophysics; Sediments, Carbonates

Advocates: John W. Geissman; Joseph G. Meert

Our session honors the numerous contributions to the geosciences, involving a wide spectrum of scales and processes, by Professor Rob Van der Voo over his 45-year career at the University of Michigan.

T65. **Utilizing 2-D and 3-D Near-Surface Geophysics to Generate Improved Surface and Subsurface Geologic Maps**

Disciplines: Geophysics/Geodynamics; Environmental Geoscience; Structural Geology

Advocates: Gregory S. Baker; Brian Miller

Geologic maps remain a critical tool for problems in the "near surface" (upper ~200 m), whether structural, environmental, glaciological, hazards, groundwater, or infrastructure related. Near-surface geophysical techniques enhance the quality and confidence of geology maps, and recent examples will be presented.

Geoscience Education

T66. **Beginning a New Era in Earth Science Education: The Role of Geoscience in Implementing the Next Generation Science Standards**

Disciplines: Geoscience Education; Public Policy

Advocates: Michael J. Passow; Michael E. Wysession; Jacqueline E. Huntoon; Emily E. Gochis; Alexandria Guth; Ashley E. Miller

Representatives from school districts, professional societies, teacher training programs, and informal science institutions share examples of incorporating the geosciences to integrate disciplinary core ideas, cross-cutting concepts, engineering practices, and holistic thinking into emerging NGSS-aligned programs.

T67. **Changing Cultural Climate for Improved Access to (GEO) Science Careers**

Disciplines: Geoscience Education; Geoscience Information/ Communication

Advocates: Mary Anne Holmes; Marilyn J. Suiter

This session explores how strategies to change the academic cultural climate can be successfully adapted to improve access for those historically underrepresented to be welcomed into careers in STEM.

T68. **Climate Literacy: Formal and Informal Education and Outreach Activities and Research and Evaluation Measures of Success**

Disciplines: Geoscience Education; Public Policy

Advocates: Tamara Shapiro Ledley; Monica H. Barnes; Bonnie Murray

GSA GeoCorps™ America participant.

The session will focus on both activities (formal education, informal education, outreach activities, and partnerships beyond the sciences) and research (education, social, and cognitive) that can extend the reach and effectiveness of climate literacy efforts.

T69. **Closing the Diversity Gap in Geoscience: Successful Models, Best Practices, Benefits, Outcomes, and Next Steps**

Disciplines: Geoscience Education; Geoscience Information/ Communication; Environmental Geoscience

Advocates: Ashanti Johnson; David Siegfried; Lois Ricciardi

This session presents successful models, practices, benefits, outcomes, and next steps for closing the diversity gap in geoscience. Program stakeholders highlight how fusing academic, research, and diversity activities foster an inclusive and equitable geoscience community.

T70. Digital Technology in Real and Virtual Geoscience Experiences (Posters)

Disciplines: Geoscience Education; Geoscience Information/ Communication

Advocates: Declan De Paor; Steven J. Whitmeyer; Callan Bentley

Digital technology is transforming geoscience practices. We seek poster presentations addressing applications of digital technology to all aspects of geoscience teaching, research, and outreach, with an emphasis on the importance and usefulness of innovations.

T71. **Enticing Urban Youth into the Geosciences**

Discipline: Geoscience Education

Advocate: Alexander E. Gates

This session assembles the many unusual efforts and innovative techniques to entice students from the many urban centers where there are great, untapped resources for increasing interest and diversity in the geosciences.

T72. **Ethics of Geoscience in Practice and Application**

Disciplines: Geoscience Education; Environmental Geoscience; Public Policy

Advocates: Cindy Palinkas; Vincent S. Cronin

Geoscientists have ethical obligations in conducting research, informing society of geo-resources and hazards, and student training. This session aims to discuss these obligations through presentation of research results and needs, case studies, and educational strategies.

T73. **Everyone Says They're Teaching Earth Systems, But What Does That Really Mean?**

Disciplines: Geoscience Education; Geoscience Information/Communication; History and Philosophy of Geology

Advocates: Eric J. Pyle; Don Duggan-Haas

What does it mean to teach earth systems science? This session includes a series of cases and strategies that have been used to build understandings of Earth as a system and of systems more broadly.

T74. **Extended Geology Trips with Special Emphasis on Study Abroad**

Discipline: Geoscience Education

Advocates: Tania-Maria Anders; Mark Boryta

This session will offer tips, tricks, and topics for developing and running extended geology field trips both nationally and internationally. We especially encourage submissions that focus on how to implement study abroad programs that include considerable field components.

T75. **Field-Based Educational Research: Insights from Field Camps, Field Trips, and Field-Based Courses**

Disciplines: Geoscience Education; Geoscience Information/Communication

Advocates: Miriam Barquero-Molina; Angela Van Boening; Heather L. Petcovic; Lauren N. Holder

This session will present rigorous research in field-based geoscience education, including field camps, courses, trips, field-based research, and professional contexts. Research involving cognitive science such as spatial thinking, navigation, visualization skills, and utilizing teaching as research in the field will also be covered.

T76. **Geocorps™ America and Mosaics in Science Programs: Successful Partnerships Promoting Individual Professional Development and Application of Geoscience and Related Fields to Management of America's Public Lands**

Disciplines: Geoscience Education; Geoscience Information/Communication; Public Policy

Advocates: Matthew Dawson; Elizabeth Norby; Melody Holm

The GeoCorps™ America and Mosaics in Science programs provide professional development opportunities for students and professionals in the geosciences and other natural resource science fields to apply specialized skills to projects on public lands.

T77. **Geology and Hydrology in the National Parks: Research, Mapping, and Resource Management**

Disciplines: Geoscience Education; Hydrogeology; Geoscience Information/Communication

Advocates: Bruce A. Heise; F. Edwin Harvey; Jason P. Kenworthy

This session addresses the roles of geology and hydrology in national parks. Presentations are encouraged on geologic and hydrologic research, paleontology, and geologic and water resource management in units of the U.S. National Park system.

T78. **Geoscience Alliance: Blending Traditional Knowledge and Western Science to Develop Solutions for Real-World Problems**

Disciplines: Geoscience Education; Environmental Geoscience; Public Policy

Advocates: Nievita Bueno Watts; Diana Dalbotten; Wendy Smythe

Geoscience Alliance is a national movement dedicated to broadening the participation of Native Americans in the geosciences. We will highlight efforts that integrate traditional knowledge and western science to solve real-world problems.

T79. **Geoscience Career Planning in the Classroom and Beyond**

Disciplines: Geoscience Education; Geoscience Information/Communication; Hydrogeology

Advocate: Larry McKay

The goal of this topical session is to explore ways to improve the involvement of academic institutions, employers, and professional organizations in preparing geoscience students for success in job searches and career planning.

T80. **Integrating Students with Learning Differences into a Geoscience Curriculum: Examples, Strategies, and Lessons**

Discipline: Geoscience Education

Advocates: N.P. Lang; Lyman P. Persico

This session aims to increase the teaching strategies for geoscience educators working with students with a learning difference by drawing upon the previous experiences of both educators and students.

T81. **Intentional Integration of Research into the Curriculum: Undergraduate Research as a Teaching Practice**

Discipline: Geoscience Education

Advocates: Patricia Manley; Robert D. Shuster; Elizabeth A. Johnson

This session will focus on undergraduate research as a teaching practice. Presentations ranging from examples of individual exercises to scaffolding research skills development throughout the curriculum are encouraged.

T82. **Linking Cognitive Science, Geoscience Education, and Disciplinary Geoscience Practice**

Discipline: Geoscience Education

Advocates: Carol J. Ormand; Basil Tikoff; Thomas F. Shipley

Cognitive science research illuminates challenges in spatio-temporal thinking and suggests strategies for overcoming these challenges. This session will present theoretical and empirical work on cognitive science-based approaches to learning, from middle school to professional development.

T83. **Methods for Conducting Research about Teaching and Learning in the Geosciences**

Disciplines: Geoscience Education; Geoscience Information/Communication

Advocates: Nicole LaDue; Laura A. Lukes; Katherine Ryker; Kim A. Cheek

Geoscience Education Research (GER) draws upon methods used in a variety of social science fields, including psychology, education, and anthropology. This session encourages presenters to highlight classic and novel methods used in their research.

T84. **Practical Faculty-Related Issues Associated with Classroom Transformation**

Discipline: Geoscience Education

Advocates: Jennifer A. Roberts; Gregory S. Baker

Intense focus on classroom transformation by faculty has been successfully supported by many team-led studies. However, individual faculty may encounter practical hurdles and roadblocks during the application of proven transformational pedagogy methods. Examples—and solutions where they exist—will be presented.

T85. **Preparing Pathways in K–12 Classrooms for Tomorrow's Diverse Geoscience Workforce: Teachers, Students, and Communities**

Disciplines: Geoscience Education; Geoscience Information/Communication; Public Policy

Advocates: Marilyn J. Suiter; Keith A. Sverdrup

This session will provide examples of teacher preparation programs that support the development of STEM teacher- and administrator-leaders who establish classroom learning environments that reflect diversity and multiculturalism in K–12 STEM education.

T86. **Research on Teaching and Student Learning in the K–12 Earth Science Classroom**

Discipline: Geoscience Education

Advocates: Laura A. Guertin; Tanya Furman

Addressing global challenges and science literacy begins with K–12 earth-science teaching. This session will share research, tested instructional resources, models, and tools to enhance the content knowledge and skills of K–12 earth-science teachers and students.

T87. **Supporting Geoscience Student Transfer: Collaborations, Partnerships, and Practices for Success**

Disciplines: Geoscience Education; Public Policy

Advocates: Benjamin A. Wolfe; Eric M.D. Baer

Topics for this session may include advising and support strategies, articulation agreements, curricular alignment, 2YC–4YC faculty interactions, cross-institutional student research projects, field trips, bridge programs, recruitment programs, and/or research or case studies on transfer patterns, challenges, and approaches.

T88. **The Future of Secondary School and Undergraduate Geology and Earth Science**

Disciplines: Geoscience Education; Geoscience Information/Communication; Public Policy

Advocates: Richard J. Diecchio; Eric J. Pyle

Despite robust secondary earth-science standards and improvements in introductory geology curricula, challenges remain from middle grades to undergraduate science, including perceived lack of rigor, college acceptance criteria, and confusion with other sciences. This session will discuss challenges and potential solutions.

T89. **Trans-Disciplinary Pedagogical Strategies—Enhancing STEM Instruction through Real-Time Problem Solving Facilitated by Interdisciplinary, Project-Based Learning**

Disciplines: Geoscience Education; Geoscience Information/Communication

Advocate: Lee J. Florea

Our integrated marketplace demands our students become more versatile and better problem solvers. This session acknowledges attempts to blend STEM-based courses with other subject areas for trans-disciplinary, project-based experiences.

T90. **Undergraduate Geoscience Education and Research Opportunities Supported by NSF Funding Programs**

Discipline: Geoscience Education

Advocates: Jill Singer; Jeffrey Ryan

This session will highlight activities that engage undergraduates and broaden participation in the geosciences. Contributions from NSF-DUE–funded projects and those from research funding programs are encouraged. Examples of models and strategies for establishing collaborations involving experienced and early-career faculty are encouraged.

T91. **Using Place-Based and/or Data-Driven Approaches in Geoscience Undergraduate Teaching and Research**

Discipline: Geoscience Education

Advocates: Diana Dalbotten; Emily Goesling

This session explores exemplary teaching approaches that are either place-based or data-driven, and especially the possibility of creating place-based, data-driven learning experiences for undergraduates.

Geoscience Information/Communication

T92. **Clear As Mud? Advancing Communication in the Geosciences**

Disciplines: Geoscience Information/Communication; Public Policy; Geoscience Education

Advocates: Justin M. Samuel; Christa K. Stratton; Susanna W. Blair

Communication research offers insight that can help us build a better societal conversation about science and advance more scientifically based policy decisions. This session examines dynamics for improving engagement across the geoscience/society interface.

T93. **Climate Change Preparedness: What We Know, What We Can Do, and How We Can Work Together**

Disciplines: Geoscience Information/Communication; Public Policy; Environmental Geoscience

Advocates: Erik R. Hankin; Elizabeth Landau; Lexi Shultz

Climate change is no longer just about future impacts—it's also about what we are already experiencing today. This session explores the varying impacts of climate change and how scientists, policy makers, business leaders, and other stakeholders can help us prepare and cope.

T94. **Entering Our Third Century in the Footsteps of William Smith: Status and Future of Geological Mapping**

Disciplines: Geoscience Information/Communication; Hydrogeology; Engineering Geology

Advocates: Richard C. Berg; Holger Kessler; Peter T. Lyttle; Hazen A.J. Russell; Harvey Thorleifson

This session will highlight new mapping and innovations in geological mapping, including data management, Web accessibility, 3-D, and applications in water and land management.

T95. **Evolution of the Data Life Cycle**

Disciplines: Geoscience Information/Communication; Geology and Health; Geoscience Education

Advocate: Hannah Winkler

With the increased expectations in sharing of geoscience research data and complexities in the evolution of the data life cycle, we evaluate best practices in scientific data collection, preservation, recovery, and subsequent reuse.

T96. **Geologic Maps and Their Derivatives (Posters)**

Disciplines: Geoscience Information/Communication; Hydrogeology; Engineering Geology

Advocates: Richard C. Berg; Holger Kessler; Hazen A.J. Russell; David R. Soller; Harvey Thorleifson

This poster session will highlight new geologic maps, mapping programs, and innovations in geological mapping, including data management, Web accessibility, 3-D, and applications in water and land management.

T97. **Specimen-Based Research and the Reality of Paleontological Resource, Specimen, and Data Management: Strengthening Partnerships among Federal Land Managers, Repositories, and Researchers**

Disciplines: Geoscience Information/Communication; Public Policy; History and Philosophy of Geology

Advocates: Kathy A. Hollis; Brian T. Huber; Hans-Dieter Sues; Julia F. Brunner; Vincent L. Santucci; Scott E. Foss

The goal of this session is to promote a better understanding of mutual interests in paleontological resources and what practices need to be in place for better science and resource management, including data accessibility and sharing, among all stakeholders.

History and Philosophy of Geology

T98. **The Great Images in Geology**

Disciplines: History and Philosophy of Geology; Paleontology, Biogeography/Biostratigraphy; Tectonics/Tectonophysics

Advocates: Renee M. Clary; Joanne Bourgeois

Presented papers will explore the great images in geology that have become cornerstones within the science, as well as interesting, but incorrect, graphics that have been revised through further scientific investigations.

Hydrogeology

T99. **A Showcase of Undergraduate Research in Hydrogeology**

Disciplines: Hydrogeology; Geoscience Education

Advocates: Kallina M. Dunkle; Cailin Huyck Orr; Jeffrey D. Wilcox; Christopher S. Lowry

This session is designed for undergraduates presenting research and senior theses in the field of hydrogeology. Prizes will be awarded for top presentations. The session will conclude with information for undergraduates interested in hydrogeology research.

T100. **Advances in Groundwater Modeling**

Disciplines: Hydrogeology; Environmental Geoscience; Karst

Advocates: Javier Vilcaez; Todd Halihan

This session will address the application of advanced computational methods to predict the fate of groundwater and contaminants in reactive porous and fractured aquifers at the pore and field scales.

T101. **Arsenic: Source to Sustainability**

Disciplines: Hydrogeology; Environmental Geoscience; Geology and Health

Advocates: Prosun Bhattacharya; Abhijit Mukherjee; Alan E. Fryar; Saugata Datta; Mohammad Alauddin

The session will focus on studies of on-the-source and hydrological and (bio)geochemical processes controlling the fate of dissolved arsenic, and the finding of alternate sustainable water and its societal effects.

T102. **Characterization and Remediation of Fractured Rock**

Discipline: Hydrogeology

Advocates: Kent Novakowski; Bernie Kueper

Papers on fundamental transport processes related to remediation in fractured rock, the application of numerical modeling to the design of remedial programs, novel characterization methods, or unique case studies (either laboratory of field) are solicited.

T103. **Contaminant Transport, Fate, and Remediation in Fractured Rocks**

Disciplines: Hydrogeology; Environmental Geoscience; Geochemistry

Advocates: Claire R. Tiedeman; Michelle M. Lorah; Lee Slater

This session welcomes all aspects of research on contaminated fractured rocks, including laboratory, field, and modeling investigations of hydraulic, transport, and biogeochemical properties and processes that control contaminant fate, transport, and remediation.

T104. **Delivery of Nutrients and Contaminants by Groundwater to Estuaries and Their Watersheds**

Disciplines: Hydrogeology; Marine/Coastal Science; Geochemistry

Advocates: Ward E. Sanford; Holly A. Michael; Claire Welty

We welcome contributions that investigate fluxes of groundwater and associated chemicals to estuaries, coastal waters, and their watersheds. Field and modeling investigations that include interactions between physical, geochemical, and biological factors are encouraged.

T105. **Fate and Remediation of Organic and Metal Contaminants in Wetlands and Sediments**

Disciplines: Hydrogeology; Environmental Geoscience; Geochemistry

Advocates: Michelle M. Lorah; Isabelle Cozzarelli; Upal Ghosh

This session focuses on processes controlling the fate of organic and metal contaminants in shallow groundwater and sediment, including in wetlands, estuaries, and lakes, and application to defining natural attenuation and developing, implementing, and monitoring remediation.

T106. **From Green Roofs and Gutters to Urban Streams: Advancing Urban Watershed Hydrology through Innovative Field and Modeling Approaches**

Disciplines: Hydrogeology; Environmental Geoscience

Advocates: Rosemary Fanelli; Rose Smith; Karen L. Prestegaard

We welcome research contributions that highlight novel field and modeling approaches to improve our understanding of how urbanization and associated management practices (watershed restoration, stormwater management, or green infrastructure) influence water flow through urbanized watersheds.

T107. **In-Situ Technologies for Energy Resource Extraction: The Role of Water**

Disciplines: Hydrogeology; Engineering Geology; Environmental Geoscience; Oil/Gas/Alternative Energy

Advocates: Tanya J. Gallegos; Carleton R. Bern

This session explores water-related research in emerging or established in-situ technologies (e.g., in-situ recovery [ISR], borehole hydraulic mining, in-situ retorting, hydraulic fracturing) for recovering oil, gas, uranium, or coal, including hydrogeology, (bio)geochemistry, and water management.

T108. **Nanomaterials in Hydrogeology**

Disciplines: Hydrogeology; Geochemistry; Environmental Geoscience

Advocate: William E. Sanford

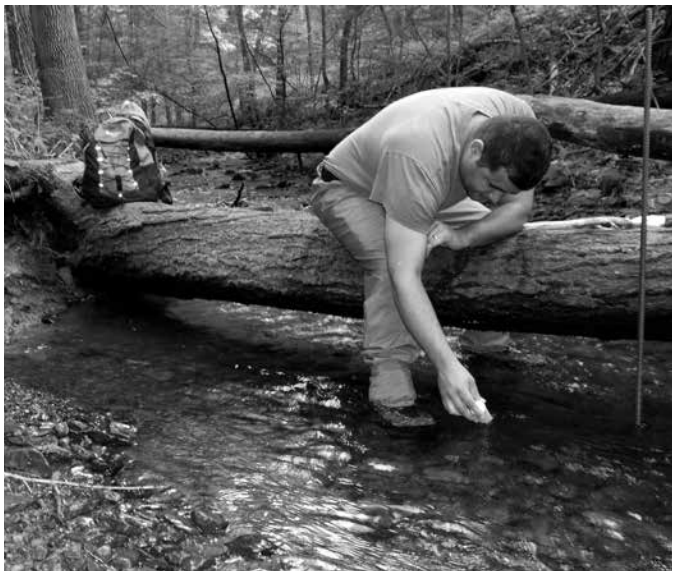
This session will focus on manufactured nanomaterials as contaminants, their use as tracers of groundwater flow and transport, and their development for contaminant remediation. Contributions of laboratory- and field-scale and theoretical studies are encouraged.

T109. **Reservoir Connectivity and Fluid Migration during Unconventional Oil and Gas Development: Implications for Hydraulic Fracturing, CO_2 Storage, Enhanced Oil Recovery, and Waste Water Injection**

Disciplines: Hydrogeology; Environmental Geoscience; Geochemistry; Oil/Gas/Alternative Energy

Advocates: Madalyn S. Blondes; Mark A. Engle

This session explores water, gas, and petroleum movement between reservoirs and into freshwater aquifers. Potential topics include source of formation water in shale gas plays, potential for injection-related transport, and stability of abnormally pressured reservoirs.



GSA GeoCorps™ America participant.

T110. **Satellite Remote Sensing Applications in Hydrology and Geology**

Disciplines: Hydrogeology; Geoinformatics; Environmental Geoscience

Advocates: Richard Becker; Adam M. Milewski

Understanding of hydrology and geology on regional scales depends upon consistent regional observations. We seek research presentations on applications integrating remote sensing observations with traditional methods in hydrology and geology, especially in data sparse regions.

T111. **Sustainability and Resilience in Major Urban Areas: The Need for Earth and Environmental Science Information in Formulating Plans, Policies, and Programs**

Disciplines: Hydrogeology; Environmental Geoscience; Public Policy

Advocates: Robert J. Shedlock; Claire Welty

We seek presentations from across disciplines to explore how earth and environmental science information in urban areas is informing planners and policy makers responsible for environmental management, sustainability, and resilience programs in their metropolitan areas.

T112. **Understanding Saline Fluid Flow Systems: From Saltwater Intrusion to Geologic-Scale Brine Migration**

Disciplines: Hydrogeology; Environmental Geoscience; Marine/Coastal Science

Advocates: Fabien Magri; Andrew H. Manning; Alicia M. Wilson

This session seeks contributions that improve our understanding of saline fluid flow systems at local (coastal) to geologic scales by applying numerical, hydrochemical, and field investigations.

T113. **Urban Groundwater Effects beyond Impervious Surface Cover**

Discipline: Hydrogeology

Advocates: Claire Welty; Aditi S. Bhaskar; John M. Sharp

The view of urban processes that affect urban groundwater quantity and quality is expanding beyond impervious surfaces to include green infrastructure, leaky infrastructure, and altered evapotranspiration. This session focuses on impacts of these processes to groundwater and stream baseflow.

Karst

T114. **Advances in Island and Coastal Karst Investigations**

Disciplines: Karst; Marine/Coastal Science; Environmental Geoscience

Advocates: Jonathan B. Sumrall; Patricia N. Kambesis

We seek presentations that highlight recent advances in island and coastal karst aquifer processes, morphometric analysis, geochemical systems, paleoclimate reconstruction, innovative research techniques, critical zone processes, and other related fields from all over the world.

T115. **Cave Exploration, Survey, and Science: Historical to Modern Perspectives, Methods, and Techniques**

Disciplines: Karst; Hydrogeology; Geomorphology

Advocates: Jason Polk; Patricia N. Kambesis

Cave exploration and survey have a long history of providing baseline data to the sciences. This session provides historical perspective on exploration and survey techniques and advances in survey methods, processing, and visualizations.

T116. **Contamination in Karst: Beyond the Case Study**

Disciplines: Karst; Hydrogeology; Environmental Geoscience

Advocates: Sarah K. Carmichael; Ellen K. Herman

Karst aquifers are an important drinking water source and are particularly vulnerable to contamination. This session will highlight new work on karst contamination modeling and methodologies that take us beyond single case studies.

T117. **Enhancing the Toolkit for Karst Investigations**

Disciplines: Karst; Hydrogeology; Geophysics/Geodynamics

Advocates: Douglas Gouzie; Toby Dogwiler; Joseph Myre

This session encourages papers presenting applications of novel, emerging, or increasingly cost-effective tools to be used in karst investigations. Topics include recent advances in instrumentation and remote sensing, isotopic and geophysical methods, computational models of karst processes and systems, and other emerging methods.

T118. **Extreme Karst: Exploring the Limits of Karstification on Earth and throughout the Solar System**

Disciplines: Karst; Planetary Geology; Hydrogeology

Advocates: Karl Leon Mitchell; George Veni

Karst processes and landscapes result from dissolution under radically different environments, chemistries, and timescales. This session quantitatively and theoretically compares different karst development in extreme or unusual circumstances on Earth and other worlds.

T119. **Geological Interactions within the Global Carbon Cycle**

Disciplines: Karst; Geochemistry; Environmental Geoscience

Advocates: Chris Groves; Jonathan B. Martin

While over vast timescales interactions between water, the atmosphere, and minerals influence partitioning of Earth's carbon, less attention has been focused on shorter timescales. This session emphasizes links between carbonate minerals and Earth's carbon cycle.

T120. **Karst Processes and Speleogenesis: Advances in Monitoring, Modeling, and Measurements**

Disciplines: Karst; Hydrogeology; Geomorphology

Advocates: Benjamin F. Schwartz; Matthew D. Covington

This session seeks to highlight recent advances in the study of karst systems, with emphasis on process studies, method development, modeling advances, instrumentation innovations, long-term monitoring, and more.

T121. **New Perspectives in Karst Geomicrobiology and Redox Geochemistry: Advances from 20 Years of Interdisciplinary Research and Exploring Our Future Frontiers**

Disciplines: Karst; Geomicrobiology; Geochemistry

Advocates: Annette Summers Engel; John R. Spear; Sarah K. Carmichael; Hazel A. Barton; Philip C. Bennett

Twenty years after the Karst Waters Institute–sponsored symposium, "Breakthroughs in Karst Geomicrobiology and Redox Geochemistry," we welcome contributions that highlight major achievements and latest advances in karst research. Interdisciplinary participation is encouraged.

T122. **Remote Sensing and Geophysical Imaging in Karst**

Disciplines: Karst; Geophysics/Geodynamics

Advocates: Lewis Land; Daniel H. Doctor

Geophysics and remote sensing tools are frequently used for investigations of karst phenomena. We welcome papers that address the use of remote sensing and geophysical imaging in karst regions, including both airborne and ground-based methods.

Limnogeology

T123. **Carbon Cycling in Lakes**

Disciplines: Limnogeology; Geochemistry; Sediments, Clastic

Advocates: Johan C. Varekamp; Amy Myrbo

Lakes cycle carbon through photosynthesis or as depocenters for terrestrial particulate carbon. We seek abstracts that deal with carbon inputs, outputs, or cycling processes in lakes. We have a special interest in lakes with a volcanic or geothermal carbon input.

T124. **Hot or Cold, Wet or Dry: The Diachroneity of Late Pleistocene and Holocene Lacustrine Climate Events**

Disciplines: Limnogeology; Paleoclimatology/Paleoceanography; Quaternary Geology

Advocates: Scott W. Starratt; Michelle F. Goman

Climate events (e.g., the YD and MCA) are identified at numerous sites across North America, but their timing varies with local conditions. Using a range of lacustrine proxies, this session focuses on the reasons for this variability.

T125. **Lakes of the World**

Disciplines: Limnogeology; Sediments, Clastic; Geochemistry

Advocates: Scott W. Starratt; Johan C. Varekamp

"Lakes of the world" celebrates lake science for and from a worldwide audience. Lakes are important fresh water reservoirs and their sediments contain records of global change, pollution, and ecological successions.

Marine/Coastal Science

T126. **Bathymetric Analysis of Axial Seamount's Southeastern Flank, Juan de Fuca Ridge (Posters)**

Disciplines: Marine/Coastal Science; Volcanology

Advocate: Anna DeGeorge

The bathymetry of the southeastern flank of Axial Seamount was analyzed for the purpose of better understanding the dynamic morphology of underwater volcanoes molded by basaltic eruptions over time.

T127. **Continental Shelf and Estuarine Seafloor Mapping and Shallow Stratigraphy on the North American East Coast**

Disciplines: Marine/Coastal Science; Geomorphology; Quaternary Geology

Advocates: Joseph Kelley; Laura Brothers

This session focuses on seafloor mapping using geophysical remote sensing tools, supported by groundtruth observations to provide new insights into processes acting on the East Coast shelf and in estuaries, and the resulting stratigraphy.

T128. **Field and Modeling Approaches to Understanding the Response of Coupled Barrier-Backbarrier Systems to Coastal Change**

Disciplines: Marine/Coastal Science; Geomorphology; Sediments, Clastic

Advocates: Christopher J. Hein; Jorge Lorenzo Trueba

This session encourages papers on field modeling and integrated studies of barrier-backbarrier evolution as coupled, dynamic systems in response to sea-level and climate change over the Holocene and future projections.

T129. **Forecasting the Coastal Response to Sea-Level Rise: Integrating the Past and Present to Inform the Future**

Disciplines: Marine/Coastal Science; Quaternary Geology; Paleoclimatology/Paleoceanography

Advocates: Erika E. Lentz; Benjamin T. Gutierrez; Simon E. Engelhart

This multidisciplinary session examines new observation and modeling research exploring the response to sea-level rise across coastal landscapes over a variety of timescales, and includes examples of decision support applications for management.

T130. **Sediment Transport Processes and Patterns on the Inner Continental Shelf**

Disciplines: Marine/Coastal Science; Sediments, Clastic

Advocates: E. Robert Thieler; George Voulgaris

Sediment transport in inner shelf environments occurs on a variety of timescales and can generate distinct sedimentary records. We seek field, laboratory, or modeling contributions that explore storm-event to millennial-scale forcing and response.

Mineralogy/Crystallography

T131. **Gemological Research in the 21st Century: Exploration, Geology, and Characterization of Diamonds and Other Gem Minerals**

Disciplines: Mineralogy/Crystallography; Economic Geology; Geoscience Information/Communication

Advocates: James E. Shigley; Dona Mary Dirlam; Wuyi Wang; Lee A. Groat; Thomas Stachel; Barbara L. Dutrow; Howard Coopersmith; Nancy J. McMillan; William B. Simmons

Gemstones are the most recognized, sought after, and highly valued of all minerals. This session will focus on exploration for gems, documenting their conditions of formation, characterizing the properties of gems, and improving the means of their identification.

T132. **Mineralogy of Diagenesis on Earth and Mars: In Honor of Nicholas J. Tosca, 2015 MSA Awardee**

Disciplines: Mineralogy/Crystallography; Planetary Geology; Sediments, Clastic

Advocates: Scott M. McLennan; M. Darby Dyar; Andrew H. Knoll

This session honoring Nick Tosca, winner of the 2015 MSA Award, will be devoted to recent experimental, theoretical, and observational advances in characterizing and interpreting the mineralogical relationships developed during aqueous diagenesis on both Earth and Mars.

T133. **Mineralogy Writ Small: A Tribute to the Distinguished Career of David R. Veblen**

Disciplines: Mineralogy/Crystallography; Geochemistry; Oil/Gas/Alternative Energy

Advocates: Peter J. Heaney; Joanne E. Stubbs; David C. Elbert

This session will honor Dr. David R. Veblen for his contributions to crystallography, mineralogy, and petrology, as well as his profound influence as an educator during a career spanning more than 35 years.

T134. **Radiation Effects, Mineralogy, and Materials Science of Actinides: In Honor of Rodney C. Ewing, 2015 Roebling Medalist**

Disciplines: Mineralogy/Crystallography; Geochemistry; Environmental Geoscience

Advocates: Peter C. Burns; William J. Weber; Ian Parsons; E. Bruce Watson; Alexandra Navrotsky; Ginger Sigmon

In honor of Prof. Rodney C. Ewing, 2015 Roebling Medalist of the Mineralogical Society of America, this session emphasizes radiation effects, mineralogy, and materials science of actinides, including applications to nuclear fuel cycle science and policy.

T135. **The Hunt for Red Beryl and Topaz**

Disciplines: Mineralogy/Crystallography; Economic Geology; Petrology, Igneous

Advocate: Curtis L. Hollabaugh

This session will focus on the occurrence of and exploration for red beryl and topaz. We welcome abstracts on the mineralogy, petrology, geochemistry, and economic geology of topaz rhyolites.

Paleoclimatology/Paleoceanography

T136. **Decadal to Century-Scale Proxy Climate Records in High-Altitude and High-Latitude Landscapes**

Disciplines: Paleoclimatology/Paleoceanography; Quaternary Geology; Environmental Geoscience

Advocates: Michael O'Neal; Brian Hanson

This session emphasizes research that is focused on using proxy records to identify the effects of regional climate forcings in high-altitude and high-latitude landscapes.

T137. **Fresh Perspectives on Critical Transitions in Earth History: Insights from Novel Tools or New Successions**

Disciplines: Paleoclimatology/Paleoceanography; Geochemistry; Geomicrobiology

Advocates: Victoria A. Petryshyn; Aradhna Tripati

This session will highlight new discoveries on critical transitions in the evolution of climate or life based on new localities and/or methods.

T138. **From the Caspian to Mediterranean: Environmental Change and Human Response during the Quaternary (IGCP 610)**

Disciplines: Paleoclimatology/Paleoceanography; Paleontology, Biogeography/Biostratigraphy; Archaeological Geology

Advocates: Valentina Yanko-Hombach; Tamara Yanina

The session provides cross-disciplinary and cross-regional correlation of geological, archaeological, environmental, and anthropological records to explore interrelationships between environmental change and human adaptation in the Caspian–Black Sea–Mediterranean corridors during the Quaternary.

T139. **Insights from Microfossils, from Traditional to Novel Approaches (Posters)**

Disciplines: Paleoclimatology/Paleoceanography; Paleontology, Paleoecology/Taphonomy; Geochemistry

Advocates: Miriam E. Katz; Katharina Billups

Traditional uses of microfossils are central to many research applications, while novel geochemical approaches utilizing microfossils have exploded in recent years. This session highlights both traditional and innovative microfossil applications in terrestrial and marine environments, including modern analogs.

T140. **Late Paleocene and Early Eocene Hyperthermal Events in Terrestrial and Marine Systems**

Disciplines: Paleoclimatology/Paleoceanography; Geochemistry; Paleontology, Diversity, Extinction, Origination

Advocates: Jean M. Self-Trail; Marci M. Robinson

This session will examine late Paleocene–early Eocene hyperthermal events in terms of the response of critical ecosystems to climate change in terrestrial, shallow marine, and deep-sea environments.

T141. **Sedimentary Records and Modeling of High Latitude Glacial and Sea Ice Systems**

Disciplines: Paleoclimatology/Paleoceanography; Sediments, Clastic; Marine/Coastal Science

Advocates: Sandra Passchier; Kristen St. John

Polar ice sheets and sea ice as climate feedbacks in the Earth system are studied through geophysical interpretations, analyses of marine sediment cores, and marine ice-sheet and ocean modeling.

T142. **The Middle Paleozoic World**

Disciplines: Paleoclimatology/Paleoceanography; Paleontology, Paleoecology/Taphonomy; Stratigraphy

Advocates: Adam David Sproson; David Selby; James R. Ebert

This session will explore new research related to changes in paleoclimatology, paleoceanography, paleoecology, sedimentology, stratigraphy, geochemistry, and tectonic evolution during the Silurian and Devonian periods.

T143. **What Makes a Juicy Rock? Global Climate Events and Deposition of Organic Rich Shales through Time**

Disciplines: Paleoclimatology/Paleoceanography; Geochemistry; Sediments, Clastic; Oil/Gas/Alternative Energy

Advocates: Stephen E. Grasby; Jennifer Galloway

This session will explore recent advances in understanding how major global events, such as marine anoxia, tectonics, volcanism, and climate change, have affected the deposition and nature of organic-rich shale through time.

Paleontology

T144. **200 Years and Going Strong: The Role of Paleontology in Geologic Mapping (Posters)**

Disciplines: Paleontology, Biogeography/Biostratigraphy; Stratigraphy; Sediments, Clastic

Advocates: Lucy E. Edwards; Dee Ann Cooper; Roger W. Cooper

In celebration of the 200th anniversary of the publication of William Smith's geologic map of Britain, this session illustrates how fossils continue to be important to geologic mapping in the 21st century.

T145. **Conodonts from Black Shales and Other Rocks: In Honor of Anita G. Harris**

Disciplines: Paleontology, Biogeography/Biostratigraphy; Paleoclimatology/Paleoceanography; Paleontology, Diversity, Extinction, Origination

Advocates: D. Jeffrey Over; Stephen A. Leslie; Randall C. Orndorff; John E. Repetski

Conodonts continue to be in the forefront of research in Paleozoic and Triassic rocks. All aspects of current conodont-related research are welcomed; the session honors Anita Harris, whose own research spanned most of the field.

T146. **Palynology**

Disciplines: Paleontology, Biogeography/Biostratigraphy; Paleontology, Paleoecology/Taphonomy; Paleoclimatology/Paleoceanography

Advocate: Peter P. McLaughlin Jr.

This session features presentations from the field of palynology, including pollen, spores, dinoflagellates, other organic-walled microfossils, and associated particulate organic matter and kerogen, and encompassing both fossil and modern materials.

T147. **Biotic Interactions and Their Influence on Long-Term Evolution**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy; Paleontology, Phylogenetic/Morphological Patterns

Advocates: Paul D. Taylor; Lee Hsiang Liow

Biotic interactions such as competition, predation, and symbiosis are important ecological processes with consequences for long-term evolution that require innovative approaches to infer in the fossil record because they are seldom directly preserved.

T148. **Cenozoic Evolution of Tropical Biota and Environments: A Session Honoring the Contributions of Ann F. Budd**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Paleoecology/Taphonomy

Advocates: James S. Klaus; Kenneth G. Johnson; Francesca R. Bosellini; Thomas Stemann

This session honors the contributions of Ann F. Budd to understanding the systematics, paleoecology, and macroevolutionary history of Cenozoic marine biota of the tropics in response to changing oceanographic and climatic conditions.

T149. **Co-Evolution of Life and Planet: Broad-Scale Controls on Biodiversity**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleoclimatology/Paleoceanography; Geochemistry

Advocates: Peter J. Harries; Richard J. Twitchett

This session will explore links between the evolving Earth system, including the geosphere, atmosphere, and biosphere throughout Earth's history, with particular emphasis on factors controlling and influenced by biodiversity at various spatial and temporal scales.

T150. **Early and Middle Triassic Restructuring Following the End-Permian Mass Extinction**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy

Advocates: Carlie Pietsch; Margaret L. Fraiser

This session encourages contributions focused on redefining the Early and Middle Triassic recovery or "restructuring" intervals by characterizing chaotic paleoenvionmental conditions, including extreme temperature excursions and low oxygen events with comparison to changes in community diversity and ecological complexity.

T151. **Foraminiferal Responses and Recovery from Environmental Stressors**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy; Marine/Coastal Science

Advocates: Michael Martínez-Colón; Benjamin J. Ross; Natasha Méndez-Ferrer

This session seeks to highlight mechanisms responsible for spatial, temporal, or physiological responses to natural and anthropogenic environmental disturbances.

T152. **Geobiology of Critical Transitions: Integrating Fossils, Proxies, and Models**

Disciplines: Paleontology, Diversity, Extinction, Origination; Geomicrobiology; Geochemistry

Advocates: A.D. Muscente; Natalia Bykova; Jesse S. Broce; James D. Schiffbauer

This session will bring together research on critical transitions throughout the geological record to further the understanding of interactions between the biosphere, lithosphere, and atmosphere during transformative intervals in Earth's history.

T153. **Mass Extinction Causality: Records of Anoxia, Acidification, and Global Warming during Earth's Greatest Crises**

Disciplines: Paleontology, Diversity, Extinction, Origination; Geochemistry; Volcanology

Advocates: David P.G. Bond; Paul B. Wignall; Mike Widdowson

This session explores the paleontology, stratigraphy, and geochemistry of mass extinctions, high-resolution records of anoxia, ocean acidification, and global warming, and their mechanistic links to the ultimate drivers of change (e.g., large igneous province eruptions).

T154. **Phanerozoic Evolution in the Oceans: Effects of Warming and Chemical Changes**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleoclimatology/Paleoceanography

Advocates: Jere H. Lipps; Malcolm Barrie Hart

The history and evolution of benthic and pelagic marine organisms have been impacted significantly by the five major and ~25 lesser Phanerozoic extinction and radiation events, resulting in new ecosystems and biotas.

T155. **Timing of the Origins and Evolution of Unicellular Eukaryotes**

Disciplines: Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Paleoecology/Taphonomy

Advocates: Malgorzata Moczydlowska-Vidal; Stanley Awramik; Heda Agić

This session involves a search for affinities of unicellular eukaryotes by paleobiologic, biochemical, and ultrastructural methods, and timing of major lineage origins by fossil record with the aim of reconstructing the tree of life and reconciling with molecular clock estimates.

T156. **Earth Underfoot: New Frontiers in Ichnology and Zoogeomorphology**

Disciplines: Paleontology, Paleoecology/Taphonomy; Paleontology, Biogeography/Biostratigraphy; Geomorphology

Advocates: Ilya V. Buynevich; Stephen T. Hasiotis; Brian F. Platt

This session will feature recent discoveries in trace fossil research, neoichnology, and zoogeomorphology, including novel techniques for identifying and characterizing traces in a variety of media, from continental to deep marine settings.

T157. **Eat, Prey, Love, and Burrow: Tracing Animal Behavior through Time**

Disciplines: Paleontology, Paleoecology/Taphonomy; Sediments, Clastic; Sediments, Carbonates

Advocates: Adiël A. Klompmaker; Devapriya Chattopadhyay; Patricia H. Kelley

Varied evidence allows interpretation of fossil animal behavior (e.g., ichnofossils, animals "caught in the act") geochemistry. This session presents research on any type of behavior (e.g., feeding, mating, locomotion, symbiosis) throughout the history of life.

T158. **Perspectives on Multi-Element Skeleton Taphonomy: Case Studies, Approaches, and Advances**

Disciplines: Paleontology, Paleoecology/Taphonomy; Paleontology, Biogeography/Biostratigraphy

Advocates: Matthew B. Vrazo; James R. Thomka

This session will explore new methods and concepts within taphonomic studies of organisms with multi-element skeletons (e.g., arthropods, echinoderms, vertebrates) for both ancient and modern ecological and environmental reconstruction.

T159. **The Fossil Record of Parasite-Host Interactions: New Perspectives and Approaches**

Disciplines: Paleontology, Paleoecology/Taphonomy

Advocates: John Warren Huntley; Kenneth De Baets

Parasitism is ubiquitous among living organisms and there is a growing appreciation of its role in shaping the history of life. This session highlights advances in the study of parasites and hosts in deep time.

T160. **Topics in Paleoecology: Modern Analogues and Ancient Systems**

Disciplines: Paleontology, Paleoecology/Taphonomy; Paleontology, Diversity, Extinction, Origination; Paleontology, Phylogenetic/Morphological Patterns

Advocates: Darrin J. Molinaro; Carolyn M. Furlong; Amelinda E. Webb; Gary J. Motz

This session will highlight the diversity of paleoecological research, organized within the framework of biotic interactions/predation, community/organismal ecology, and fidelity/conservation paleobiology.

T161. **Echinoderm Paleobiology: Diversity, Form, and Phylogeny**

Disciplines: Paleontology, Phylogenetic/Morphological Patterns; Paleontology, Diversity, Extinction, Origination; Paleontology, Paleoecology/Taphonomy

Advocates: David F. Wright; Selina R. Cole; Jeffrey R. Thompson

This session will address broad, cutting-edge topics in the understanding of echinoderm evolution and paleontology. This complex topic will include trends in phylogeny, morphology, paleoecology, macroevolution, taphonomy, and systematics.

Petrology, Igneous

T162. **A Lower Crustal Perspective on Magmatic Arc Processes**

Disciplines: Petrology, Igneous; Petrology, Metamorphic; Tectonics/Tectonophysics

Advocates: Harold H. Stowell; Keith Klepeis; Joshua J. Schwartz

New data sets and improved tools set the stage for improved understanding of magmatic arc processes. We encourage submissions on magma generation, mass transfer, vertical crustal motion, relationships between deformation and magma emplacement, and metamorphism at mid- to lower-crustal levels.

T163. **A Matter of Perspective: Integrating Macro- and Micro-Scale Evidence in Investigations of Magmatic Origins and Histories**

Disciplines: Petrology, Igneous; Volcanology; Geochemistry

Advocates: Tamara L. Carley; Tenley J. Banik; Lily L. Claiborne; Susanne McDowell

Together we will discuss magma: its origins, emplacement, and everything in between. We encourage dialog around creative integration of multi-scale evidence—from macro to micro perspectives. We also encourage broad participation, especially from early-career scientists.

T164. **Magmatic Processes in Peridotites: Connection to Tectonics**

Disciplines: Petrology, Igneous; Volcanology; Tectonics/Tectonophysics

Advocates: Gordana Garapic; John Wakabayashi; Ulrich Faul

Melting and melt segregation influence the dynamics of partially molten mantle and the chemistry of melt and residuum. Submissions are welcome on all aspects of mantle melting, including experimental, field, and modeling studies.

T165. **Zen and Now: Honoring the Legacy of E-an Zen's Contributions to Geology**

Disciplines: Petrology, Igneous; Mineralogy/Crystallography; Geoscience Education

Advocates: Philip M. Piccoli; Jane M. Hammarstrom; H. Catherine Skinner; Guy L. Hovis

This multidisciplinary session will honor the legacy of E-an Zen's contributions to geology.

Petrology, Metamorphic

T166. **Metamorphic Petrology: New Approaches and Outcomes**

Disciplines: Petrology, Metamorphic; Geochemistry; Tectonics/Tectonophysics

Advocates: David R.M. Pattison; Matthew J. Kohn; Frank S. Spear; Bernardo Cesare

Rapid advances across the discipline of metamorphic petrology make this a timely session. We wish to make the session as broadly appealing as possible, hence the general title.

T167. **Metamorphic, Metasomatic, and Igneous Processes in the Mid- and Deep Continental Crust: Mechanisms and Processes That Impact Mass Transport and Rheology**

Disciplines: Petrology, Metamorphic; Petrology, Igneous; Structural Geology

Advocates: G. Christopher Koteas; Callum J. Hetherington

Showcase the integration of field studies, with textural and compositional analysis, and modeling of processes in continental crust: This session will highlight mechanisms and processes that produce, transport, and modify the deep continental crust.

T168. **Subduction, Fluids, Accessory Minerals, and Trace Elements: A Celebration of Sorena Sorensen's Career**

Disciplines: Petrology, Metamorphic; Geochemistry; Mineralogy/Crystallography

Advocates: Barbara L. Dutrow; Sarah Penniston-Dorland; Virginia Sisson

This session will focus on metamorphosed subduction-related rocks including metamorphosed rocks of the subduction channel as well as arc crust, associated fluids, and minerals, cathodoluminescence, and trace elements that provide information about their petrogenesis.

T169. **The Extremes of Metamorphism**

Disciplines: Petrology, Metamorphic; Tectonics/Tectonophysics; Structural Geology

Advocates: Victor Guevara; Chris Yakymchuk; Besim Dragovic; Omar Bartoli

Extreme crustal metamorphism (UHT, UHP) informs us about fundamental Earth processes, but difficulties in quantifying such metamorphism remain. We encourage innovative approaches to understanding the hottest, deepest, shortest, longest, oldest, and youngest metamorphism on Earth.

Planetary Geology

T170. **Experimental Investigations of Planetary Geologic Processes (Posters)**

Disciplines: Planetary Geology; Geochemistry; Geophysics/Geodynamics

Advocates: Danielle Y. Wyrick; Paul K. Byrne

This session solicits abstracts regarding experimental and laboratory analyses of geologic processes and materials under the range of dynamic, kinematic, temperature, pressure, and chemical parameters found throughout the Solar System.

T171. **Exploring the Sedimentary Rock Record of Mars**

Disciplines: Planetary Geology; Sediments, Clastic; Stratigraphy

Advocates: Kathryn M. Stack; Kenneth Edgett; Kevin Lewis

This session will include a synthesis of sedimentary rocks on Mars and implications for surface processes, depositional settings, and environments of early Mars.

T172. **Geology of Dwarf Planets: First Results from NASA's *Dawn* Mission to Ceres**

Disciplines: Planetary Geology; Geomorphology; Stratigraphy

Advocates: David A. Williams; Debra L. Buczkowski

Dwarf planets are small planetary objects whose geology is unknown. 2015 marks the first exploration of Ceres by NASA's *Dawn* mission. This session reports first results on the geology of Ceres, including the role of water in shaping this world.

T173. **Impact Cratering on Earth and in the Solar System**

Disciplines: Planetary Geology; Geophysics/Geodynamics

Advocates: Christian Koeberl; Jeffrey Plescia

Data from terrestrial fieldwork, advances in modeling and experimentation, and spacecraft data have provided significant new insight into the characteristics of the impact cratering processes. This session will provide an opportunity to share information and insight.

T174. **Microscopic Impact Records**

Disciplines: Planetary Geology; Mineralogy/Crystallography; Geochemistry

Advocate: Aaron J. Cavosie

Advances in instrumentation allow microstructural and geochemical investigations of impact records at microscopic and smaller scales, providing new insights on impact histories. This session welcomes contributions describing approaches to unraveling small-scale records of impact processes.

T175. **Oceans, Fire, and Ice of the Outer Solar System**

Discipline: Planetary Geology

Advocate: D. Alex Patthoff

We encourage abstracts relating to surface, structural, and tectonic processes; interior, and thermal evolution of solid bodies of the outer solar system; and planetary analogs. This includes experimental, observational, and theoretical approaches.

T176. **Past and Present Biosignature Recognition on Earth and Mars**

Disciplines: Planetary Geology; Sediments, Clastic; Sediments, Carbonates

Advocates: Sally L. Potter-McIntyre; Charity Phillips-Lander

Diagnostic biosignatures can be from extant life (e.g., spectral atmospheric signatures) or preserved in the rock record (e.g., stromatolites). This forum will discuss advances in the search for life, focusing specifically on Earth and Mars.

T177. **When Water Meets Rock: Aqueous Alteration in the Solar System**

Disciplines: Planetary Geology; Geochemistry; Mineralogy/Crystallography

Advocates: Rebecca N. Greenberger; John F. Mustard

This session brings together mineralogic and geochemical studies of orbital and landed measurements with results from field, laboratory, meteoritical, and modeling investigations that address aqueous processes in surface and subsurface environments throughout solar system history.

Public Policy

T178. **70 Years of Geoscience at UNESCO: Past, Present, and Future**

Disciplines: Public Policy; Environmental Geoscience

Advocates: P. Patrick Leahy; John W. Hess

Topics to be covered include the following: Geoheritage, U.S. involvement in the IGCP, the International Hydrologic Centre, the International Tsunami Warning System operated by the IOC, the ICSU Future Earth initiative, and the IUGS Minerals initiative.

T179. **Coordination of Civil Earth Observations: Review, Status, and Applications of Earth Observation Systems**

Disciplines: Public Policy; Geoinformatics

Advocate: Timothy Stryker

The session will provide an overview of the National Plan for Civil Earth Observations as well as technical examples of key products and services supported by Earth observing systems across relevant Societal Benefit Areas (SBAs).

T180. **Geoscience in the Public Square: Meeting the Challenges and Seizing the Opportunities**

Disciplines: Public Policy; Geoscience Information/Communication; Environmental Geoscience

Advocates: Frank Fletcher; Ivor van Heerden

An examination of the challenges and opportunities that are faced by geoscientists who toil in the public square, including communicating with the general public, interfacing with political officials and educating geoscience students about policy issues.

T181. **Non-Traditional Funding for Research: Opportunities and Challenges**

Discipline: Public Policy

Advocates: Erik R. Hankin; Maeve A. Boland; Kasey S. White

Non-traditional mechanisms for research funding, such as Internet crowdfunding and federal prizes, are increasing, along with the share of research funded outside the federal government. This session will examine advantages and limitations of this shift.

T182. **Similar Information, Different Results: Fracking from State to State (Posters)**

Disciplines: Public Policy; Environmental Geoscience; Oil/Gas/Alternative Energy

Advocates: R. Laurence Davis; Christopher P. Carlson

Using similar data, different states have formulated different approaches to oil and gas recovery using hydrofracking. At this session, geologists and policy makers will outline their state's policies and discuss how they were developed.

T183. **Strategies to Achieve Public Policy Action to Mitigate Anthropogenic Climate Disruption**

Disciplines: Public Policy; Environmental Geoscience; Geology and Health

Advocate: George T. Stone

Effective public policy action to mitigate anthropogenic climate disruption is imperative. The goal of this session is to focus attention on this historic challenge and to discuss workable strategies to greatly reduce greenhouse gas emissions.

Quaternary Geology

T184. **African Environments across Space and through Time: Integrating Modern and Ancient Climate Data for Insights into Terrestrial Ecosystem Dynamics**

Disciplines: Quaternary Geology; Paleoclimatology/Paleoceanography; Geochemistry

Advocates: David Patterson; Sophie B. Lehmann; Naomi E. Levin

This session seeks to better understand the relationship between African climate and terrestrial ecosystem dynamics in both modern and ancient contexts.

T185. **Coastal Hazards from Minutes to Millennia**

Disciplines: Quaternary Geology; Tectonics/Tectonophysics; Marine/Coastal Science

Advocates: Simon E. Engelhart; Andrew C. Kemp; Benjamin P. Horton

Reconstructions of relative sea level, coastal earthquakes, and extreme inundation events (storms/tsunamis) are of local to global interest. Devastating extreme events have placed significant socioeconomic relevance on understanding human-land-ocean interaction and coastal dynamics.

T186. **Estimating the Timing and Characteristics of Continental Earthquakes from Geologic Data**

Disciplines: Quaternary Geology; Tectonics/Tectonophysics; Geomorphology

Advocates: Mark Quigley; Timothy Stahl

We seek contributions focused on determining the timing, source locations, magnitudes, and shaking characteristics of paleoearthquakes through careful study of landslides, rockfall deposits, liquefaction features, sedimentary deposits, and/or other geologic, geomorphic, and biologic phenomena.

T187. **Geology, Geomorphology, and Biogeography of the Amazon: Integrating Approaches and Disciplines to Understand the Evolution of a Unique Ecosystem**

Disciplines: Quaternary Geology; Paleontology, Biogeography/Biostratigraphy

Advocates: Carlos Henrique Grohmann; John M. Bates

In the Amazon Basin, landscape evolution plays a vital role as a driver of biotic diversification. We welcome contributions on all fields related to the evolution of Amazonian landscape/environment/biome.

T188. **Inside or Out? Investigations into Driving Forces in Fluvial Systems**

Disciplines: Quaternary Geology; Geomorphology; Paleoclimatology/Paleoceanography

Advocates: Kerry Riley; Tammy Rittenour

This cross-disciplinary session investigates the interplay between allogenic forcing (climate, tectonics) and autogenic processes (slope/transport thresholds) in stratigraphic and geomorphic records of fluvial response. Field-based and experimental studies across time and spatial scales are encouraged.

T189. **New Applications of Geochronologic Techniques to Quaternary and Archaeological Settings**

Disciplines: Quaternary Geology; Archaeological Geology; Paleoclimatology/Paleoceanography

Advocates: Harrison Gray; Michelle Summa Nelson; Kerry Riley

This session investigates innovative applications of dating techniques to investigations of Quaternary deposits, landscapes, and archaeological settings. We also encourage contributions that highlight new applications of dating methods (OSL, TCN, radioisotopes) to address novel research questions.

T190. **Paleoecological Patterns, Ecological Processes, Modeled Scenarios: Crossing Temporal Scales to Understand an Uncertain Future**

Disciplines: Quaternary Geology; Paleoclimatology/Paleoceanography; Stratigraphy

Advocates: Miriam C. Jones; Simon Goring; Debra A. Willard; Jennifer O'Keefe; Claude Hillaire-Marcel; David P. Dethier; Lucy E. Edwards; Amy Myrbo; Johan Varekamp

This session will explore the visions, challenges, and applications of paleoecological research that uses information at multiple spatial or temporal scales to improve predictive models of ecosystem, climate, and/or biogeophysical change.

T191. **Reconstructing Arctic Glaciers and Ice Sheets: Chronology, Geomorphology, and Climate Records**

Disciplines: Quaternary Geology; Geomorphology; Paleoclimatology/Paleoceanography

Advocates: Sarah M. Principato; Jason P. Briner; Nicolás E. Young

This session focuses on reconstructions of glaciers and ice sheets in the Arctic and sub-Arctic. Studies ranging from the Pleistocene to the Holocene and include new glacial chronologies, glacial geomorphology, glacier sediment records, and modeling are encouraged.

Sediments, Carbonates

T192. **Lawrence A. Hardie Commemorative Session**

Disciplines: Sediments, Carbonates; Geochemistry; Limnogeology

Advocates: Tim K. Lowenstein; Robert V. Demicco; Linda Hinnov

Research arising from the scientific contributions of Lawrence Hardie (1933–2013) is celebrated with talks in the fields of carbonate and evaporite sedimentology and geochemistry, secular variations in seawater chemistry, and cyclic deposition of carbonates.

T193. **Sedimentary Environment and Process Studies: The Emerging Generation of Scientists (Posters)**

Disciplines: Sediments, Carbonates; Sediments, Clastic; Stratigraphy

Advocates: Katherine Giles; Marjorie Chan

This session welcomes students' scientific contributions on sedimentary geology. Topics can range broadly from studies of ancient to modern sediments, carbonates to clastics, and sedimentary processes and their products in the geologic record.

Sediments, Clastic

T194. **New Horizons in Paleogeography: Principles, Innovative Methods, and Application to Resource Exploration**

Disciplines: Sediments, Clastic; Sediments, Carbonates; Paleontology, Biogeography/Biostratigraphy

Advocates: Adam D. Woods; Wan Yang

Paleogeography is an interdisciplinary and inclusive field that integrates data from across the geosciences. This session will examine innovative paleogeographic principles and methods, modern and ancient analogs, and the application of paleogeography to resource exploration.

T195. **Paleoenvironmental Reconstruction of Hominin Sites: New Methods, New Data, and New Insights**

Disciplines: Sediments, Clastic; Limnogeology; Soils

Advocates: Cynthia M. Liutkus-Pierce; Gail M. Ashley; Andrew S. Cohen

This session will showcase current research on paleoenvironmental reconstruction of hominin sites and will highlight innovative techniques, the latest data, and new insights.

T196. **Revisiting the Atlantic Continental Margin: New Insights on the Geologic Evolution of North American Passive Margin Basins**

Disciplines: Sediments, Clastic; Stratigraphy; Marine/Coastal Science

Advocates: Barrett T. Dixon; Jacob A. Covault; Brian W. Romans; Steve M. Hubbard

The North American Atlantic continental margin has a complex geological history. As governments, academia, and industry refocus on this margin, this session will highlight research characterizing this geographically vast and geologically diverse area.

T197. **Sedimentary Basins**

Disciplines: Sediments, Clastic; Sediments, Carbonates; Stratigraphy

Advocate: D. Jeffrey Over

This section will cover current research associated with the sedimentation and stratigraphy of sedimentary basins.

T198. **Shale Gas Basins: Their Stratigraphy, Sedimentary Environments, Tectonics, and Structural Evolution (Posters)**

Disciplines: Sediments, Clastic; Structural Geology; Tectonics/Tectonophysics; Oil/Gas/Alternative Energy

Advocates: Ibrahim Çemen; Jack C. Pashin; James O. Puckette; Denise J. Hills

This forum will facilitate discussion and exchange of ideas and encourage collaboration to help design research methods to test important questions related to different geological problems associated with shale-gas basins throughout the world.

T199. **Tracks in the Mud: Advances and Techniques in Vertebrate Ichnology**

Disciplines: Sediments, Clastic; Paleontology, Paleoecology/Taphonomy; Archaeological Geology

Advocates: Matthew R. Bennett; Peter L. Falkingham

Vertebrate tracks, whatever the substrate or track-maker (ancient human or extinct dinosaur), catch the imagination. The community of engaged researchers is interdisciplinary, and this session will reflect this sharing knowledge, experience, and best practice.

Soils

T200. **Hillslope Dynamics: Integrating Soils, Hydrology, and Climatic Processes to Understand Weathering and Sediment Transport on Drainage Basin Slopes**

Disciplines: Soils; Hydrogeology; Geomorphology

Advocates: Eric V. McDonald; J. Bruce J. Harrison; Michael Young

Hillslope dynamics: integrating soils, hydrology, and climatic processes to understand weathering and sediment transport on drainage basin slopes.

T201. **Modifications to the Pedosphere during the Holocene and Anthropocene: Examination of Past, Present, and Future Soil Dynamics**

Disciplines: Soils; Environmental Geoscience; Archaeological Geology

Advocates: Phillip P. Allen; Philip Greenwood

Soil formation, transformation, and erosion are essential components of the geological cycle and have fundamental societal significance. The current debate about pedological resilience and sustainability benefits from studies of soil-climate-human interactions in the recent past.

T202. **Paleosol Case Studies: Resurrecting Ancient Critical Zones through Space and Time**

Disciplines: Soils; Sediments, Clastic; Paleoclimatology/Paleoceanography

Advocates: Emily J. Beverly; R. Hunter Harlow; William E. Lukens

Paleosols record dynamic processes operating on past landscapes. We welcome case studies focusing on terrestrial paleoclimatology, particularly those utilizing paleosols to understand spatial and temporal changes in Critical Zones of the past.

T203. **Soil Water in the Hydrosphere and Biosphere**

Disciplines: Soils; Hydrogeology; Quaternary Geology

Advocates: Michael Young; Todd G. Caldwell

Soil water content is a vital determinant of critical zone processes, influencing climate, evapotranspiration, runoff, and recharge processes. We solicit research that highlights the importance of soil water on hydrological processes.

T204. **The Reactive Soil: Processes at the Bio-Geo Interface in the Rhizosphere**

Disciplines: Soils; Geochemistry; Geomicrobiology

Advocates: Zsuzsanna Balogh-Brunstad; Marjorie Schulz; Megan Andrews

Biogeochemical reactions of the rhizosphere control soil development, sediment formation, nutrient and water availability, and carbon cycling. We seek to better understand these processes. We seek submissions from any laboratory, field, and/or modeling studies.

Stratigraphy

T205. **Integration of Microfossils and Sedimentology in Stratigraphic Analysis**

Disciplines: Stratigraphy; Paleontology, Biogeography/Biostratigraphy; Paleontology, Paleoecology/Taphonomy

Advocate: Peter P. McLaughlin Jr.

The integration of sedimentology and microfossils brings significant benefits to stratigraphic analysis. This session will cover practical geologic problem-solving and novel approaches in the integration of microfossils and sedimentologic analysis for stratigraphic investigations of ancient terrestrial and marine sediments.

Structural Geology

T206. **Constraints on Fault Constitutive Behavior from Nature, Lab, and Theory**

Disciplines: Structural Geology; Geophysics/Geodynamics

Advocates: Phillip G. Resor; Johanna M. Nevitt; W. Ashley Griffith; Thomas M. Mitchell

In this session we seek contributions from studies of active deformation, exhumed faults, and laboratory experiments that characterize the range of fault constitutive behavior and the underlying physical processes and properties that govern fault slip.

T207. **Folds and Folding: Earth's Surface to Depth**

Disciplines: Structural Geology; Tectonics/Tectonophysics; Economic Geology

Advocates: Juliet G. Crider; Mary Beth Gray

We seek contributions on the kinematics and mechanics of folds, active or ancient, across the spectrum of rheology and scale, and the relationship of folding to tectonic history, active crustal deformation, and fluid migration.

T208. **Perspectives on Orogenic Evolution, Dating Brittle Faults and Mylonitic Shear Zones, Bending Mountains, and Assembling Supercontinents: A Session to Honor the Career of Ben Van der Pluijm**

Disciplines: Structural Geology; Tectonics/Tectonophysics; Petrology, Metamorphic

Advocates: Arlo Brandon Weil; Eric Tohver; Bernie Housen; Samuel Haines

This session honors the work of Ben van der Pluijm with a focus on the variety of temporal and spatial scales that Ben and his students work on to better understand the complex evolution of orogenic systems.

T209. **Rheological Behavior of Ductile Lithosphere during Strain Localization**

Disciplines: Structural Geology; Tectonics/Tectonophysics; Geophysics/Geodynamics

Advocates: Vasileios Chatzaras; Julie Newman; Basil Tikoff

This session seeks contributions from field-based, microstructural, experimental, and modeling studies that provide new insights on the deformation processes promoting strain localization and shear zone formation in the lower crust and upper mantle.

T210. **Strike-Slip Fault Systems Transfer Stress Inboard from the Subduction Zone Margin Leading to Basin Subsidence and Orogenesis, Are Conduits for Magmatism, and Are Responsible for Far-Traveled Terrane Translation**

Disciplines: Structural Geology; Tectonics/Tectonophysics

Advocates: Jeff Benowitz; John I. Garver; Michele Cooke

Strike-slip faults act to partition and transfer plate boundary stresses into the continental interior and are responsible for block translation. We seek contributions from all geologic and geophysical disciplines on the geodynamics of strike-slip faults.

T211. **Structural Geology and Geomechanics in the Petroleum Industry**

Disciplines: Structural Geology; Economic Geology; Oil/Gas/Alternative Energy

Advocates: J. Steve Davis; Peter Hennings

This session highlights structural geology and geomechanics research with strong petroleum industry applicability. Topics include regional structural analysis, computational and kinematic deformation modeling, fracture and fault characterization, and the interaction of buoyant fluids with geologic structures.

Tectonics/Tectonophysics

T212. **Deconstructing Rodinia: Neoproterozoic-Cambrian Geologic Evolution of Laurentia's Margins**

Disciplines: Tectonics/Tectonophysics; Precambrian Geology; Paleoclimatology/Paleoceanography

Advocates: Chris Holm-Denoma; Arthur J. Merschat

This session aims to bring together scientists with broad interests and ideas regarding the breakup of Rodinia and its impact on the geosphere and biosphere, especially in regard to the Neoproterozoic-Cambrian geologic evolution of Laurentia's margins.

T213. **Integrating Perspectives on the Formation, Evolution, and Destruction of Continental Crust: From 0 to 4600 Ma**

Disciplines: Tectonics/Tectonophysics; Petrology, Igneous; Precambrian Geology

Advocates: Paul A. Mueller; Robert Stern; David Snyder; M.B. Magnani; M.E. Bickford

Constraining the extent to which the geochemical, geophysical, and tectonic characteristics of modern arc systems (oceanic and continental) and LIPS (large igneous provinces) can be applied to the Precambrian record (Archean and Proterozoic) of crustal evolution.

T214. **Mountains across the Oceans: Caledonian, Variscan, and Appalachian Orogenies through Time**

Disciplines: Tectonics/Tectonophysics; Structural Geology; Petrology, Metamorphic

Advocates: Jeffrey Marsh; Loic Labrousse; Nicolas Pinet; Stacia M. Gordon

This session seeks abstracts concerning the Caledonian, Variscan, and Appalachian orogens and aims to have a wide variety of geologic subdisciplines represented, with work from geologists, geophysicists, and modelers.

T215. **Novel Methods, Applications, and Data Interpretations in Thermochronology**

Disciplines: Tectonics/Tectonophysics; Geochemistry; Geomorphology

Advocates: Alexis K. Ault; William R. Guenthner

This session highlights new thermochronometers, novel applications of existing thermochronometers, and innovative approaches to interpreting complex datasets. Contributions addressing a range of geologic questions and from the high to low temperature thermochronology communities are encouraged.

T216. **Recent Developments in Understanding Rift Systems: What We've Learned and What We Still Don't Know**

Disciplines: Tectonics/Tectonophysics; Volcanology; Sediments, Clastic

Advocates: Nathalie Nicole Brandes; Paul T. Brandes; Audra E. Basal

This multidisciplinary session focuses on recent studies concerning modern and ancient rift systems, including structure and tectonics, volcanic activity, ore deposit formation, and sedimentation.

T217. **Rift-Drift, Seafloor Spreading, and Subduction Zone Tectonics of Collisional Orogens: Comparative Analysis of the Circum-Mediterranean and Appalachian-Caledonian Orogenic Belts**

Disciplines: Tectonics/Tectonophysics; Structural Geology; Geophysics/Geodynamics

Advocates: Andrea Festa; Yildirim Dilek

Contributions presenting new geological, geochemical, geochronological, and geophysical data and tectonic models from the Circum-Mediterranean and Appalachian-Caledenonian orogenic belts are welcome in order to discuss processes involved in different stages of their collision-driven geodynamic evolution.

Volcanology

T218. **Comparative Approaches to Studying Impact Ejecta Deposits and Volcanic Flows**

Disciplines: Volcanology; Planetary Geology

Advocate: Jacob E. Bleacher

Similarities between impact ejecta deposits and volcanic flows are leading to comparable research approaches. Techniques for the study of both deposit types will be compared in this session.

T219. **Intraplate and Divergent Boundary Volcanism: A Tribute to the Distinguished Career of David Clague**

Disciplines: Volcanology; Petrology, Igneous; Geochemistry

Advocates: Wendy A. Bohrson; Jacqueline Dixon

David Clague, 2015 MGPV Distinguished Career Award recipient, is recognized for his multidisciplinary, data-intensive approach to studying volcanoes. This session will feature research by those inspired by Dave's many contributions to volcanology, petrology, and geochemistry.

Discipline Categories

Can't find a topical session that fits your abstract? No problem! In addition to topical sessions, we offer the following discipline categories. Discipline sessions are equally vital to our technical program and are an essential addition to the fulfillment of the overall meeting. Encourage your friends to submit a discipline abstract too. Joint Technical Program Chair: Patrick Burkhart, patrick.burkhart@sri.edu; Technical Program Manager: Nancy Wright, nwright@geosociety.org.

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1-4 NOVEMBER
GSA 2015
Baltimore, Maryland, USA

Registration

- **Registration will open** in early June
- **Early registration deadline:** 28 September
- **Cancellation deadline:** 5 October

REGISTRATION FEES (in U.S. dollars)

	EARLY	STANDARD/ ONSITE
	(June–28 Sept.)	(after 28 Sept.)
Professional member, full meeting	US$365	US$445
Professional member, one day	US$235	US$265
Professional member 70+, full meeting	US$265	US$350
Professional member over 70+, one day	US$165	US$190
Professional non-member, full meeting	US$490	US$560
Professional non-member, one day	US$305	US$325
Student member, full meeting	US$120	US$155
Student member, one day	US$75	US$85
Student non-member, full meeting	US$160	US$195
Student non-member, one day	US$100	US$110
High-school student	US$40	US$40
K–12 professional, full meeting	US$55	US$65
Field Trip or Short Course only	US$40	US$40
Guest or spouse	US$85	US$90
Low income country*	50%	50%

*Participants from countries classified as "Low or Lower Middle Income Economies" by the World Bank need only pay 50% of the category fee for full meeting or one day registration. Online registration is not available for "Low or Lower Middle Income Economy" registrants. Please fill out a hardcopy version of the registration form and mail it to GSA, P.O. Box 9140, 3300 Penrose Place, Boulder CO, 80301-9140, USA.

GSA International

Travel Grants

- **Application deadline:** 10 July 2015

GSA International is offering travel grants to help support the participation of international scientists and students at GSA 2015 in Baltimore, Maryland, USA. Travel grant funds are limited; grants will not cover the full cost to attend the meeting but are intended to help offset the combined cost of registration, housing, and travel.

Applicants do not need to be members of GSA or of GSA International to apply (although it is preferred). Applicants must be residing outside of North America and presenting at the GSA meeting.

To Apply

Applicants who intend to submit an abstract will be considered for travel grants, with the expectation that you will submit your abstract on time and be presenting at the meeting. You will be asked to provide a title and author list for the abstract you plan to submit.

GSA International management board members intend to let applicants know about their status (successful or not) by 24 July 2015, which allows a 90-day window for processing travel visa documents.

If you have questions, please contact **Nazrul I. Khandaker,** Secretary and Coordinator of International Travel Grants and Awards Program for GSA International, nkhandaker@york.cuny.edu.

www.geosociety.org/GSA_International/travelgrants.htm

THE GEOLOGICAL SOCIETY OF AMERICA®

GSA INTERNATIONAL

Accommodations

GSA has selected a range of hotels in terms of proximity, rate, and style to meet your needs and preferences. Please check the GSA website at **community.geosociety.org/gsa2015/attendeeinfo/accommodations** for the housing map and room reservation procedures. Below is the list of hotels and group rates for our block. Rates are in U.S. dollars and do not include the current applicable tax of 15.5%.

HOTEL	RATE (single/double)	MORE THAN 2 ADULTS	DISTANCE TO BCC	DAILY PARKING**
Baltimore Harbor Hotel*	$179	$20/person	3 blocks	$32 valet
Baltimore Marriott Inner Harbor at Camden Yards	$209	$20/person	1 block	$27
Days Inn Inner Harbor	$139	$10/person	1 block	$28
Hampton Inn Baltimore Downtown/ Conv. Ctr.*	$159	no additional cost	3 blocks	$29
Hilton Baltimore (headquarter hotel)	$215	$15/person	connected	$30 self; $42 valet
Holiday Inn Inner Harbor	$175	$10/person	2 blocks	$25 self
Hyatt Regency Baltimore	$209	$25/person	connected	$28 self; $40 valet
Lord Baltimore Hotel	$179	$20/person	3 blocks	$31 valet
Renaissance Baltimore Harborplace Hotel	$209	$20/person	2 blocks	$30
Sheraton Inner Harbor	$189	$20/person	connected	$27 self; $39 valet

Complimentary Internet will be provided in all guest rooms booked through GSA/Visit Baltimore Housing Services.
*Breakfast included in rate
**Parking rates subject to change

⚠ **ALERT:** The official GSA housing bureau is Visit Baltimore Housing Services. In order to receive the GSA group rate at each hotel, reservations must be made through Visit Baltimore Housing Services and not with the hotels directly. GSA/Visit Baltimore Housing Services DOES NOT contact attendees to solicit new reservations. If you are contacted by a vendor who claims to represent GSA, please notify the GSA Meetings Department at meetings@geosociety.org or +1-303-357-1041. Please do not make hotel arrangements or share any personal information through any means other than a trusted, reliable source.

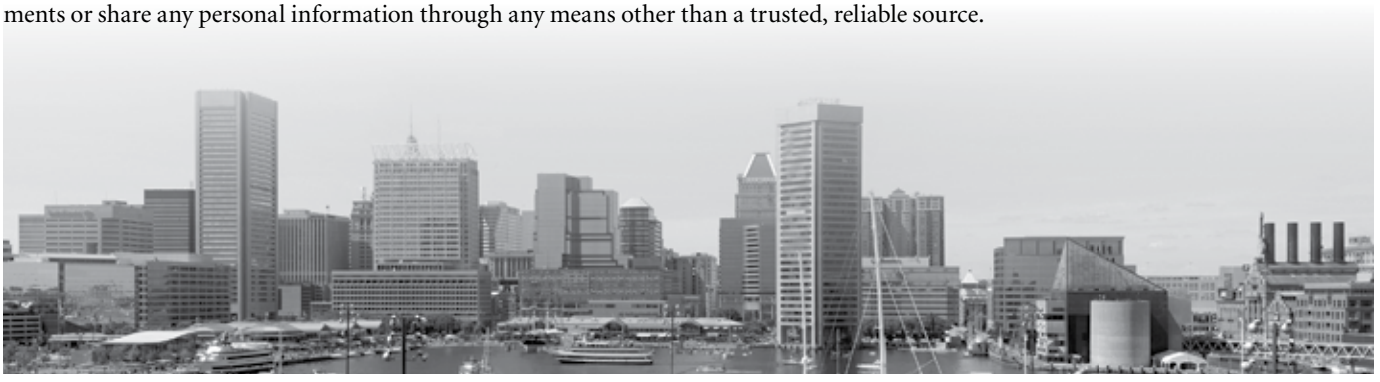


Photo courtesy of Visit Baltimore.

Baltimore 2015 Travel Information

Baltimore is served by the Baltimore/Washington International Thurgood Marshall Airport (BWI; **www.bwiairport.com/en**), with more than 700 daily domestic and international flights. Southwest Airlines offers the most nonstop flights daily, followed by Delta and US Airways. BWI is about 11 miles/17 min. via taxi or rental car and 37 minutes via light rail from the Baltimore Convention Center.

Baltimore is also served by 80 trains daily at the Amtrak Penn Station, 1515 North Charles Street. For more information, check **www.amtrak.com** and/or call +1-800-USA-RAIL. Penn Station is about three miles from the Baltimore Convention Center.

International Attendees

If you are visiting the United States from outside of the country and do not have U.S. citizenship, you may require a visa; go to http://travel.state.gov/content/visas/english/visit/visitor.html to learn more. **You can obtain and print out GSA's 2015 Annual Meeting invitation letter at community/geosociety.org/gsa2015/attendeeinfo/travel.**

1-4 NOVEMBER
GSA 2015
Baltimore, Maryland, USA

Event Space Requests

Please let us know about your non-technical events by entering them into our online event space request database. Space is reserved on a first-come, first-served basis; in order to avoid increased fees, you *must* submit your request for meeting rooms before the 5 June deadline. The event space request submission should be used for the following:

- Meeting rooms to hold events (i.e., business meetings, luncheons, receptions, etc.) at the Baltimore Convention Center or Hilton Baltimore—with no food/beverage minimum or room rental fee from the facility/hotel;
- To ensure that your event is listed in the meeting program book, in the personal scheduler, and the mobile app, as well as on the GSA website; and
- For off-site events (events that are *not* being held at the Baltimore Convention Center or Hilton Baltimore).

Deadline: 5 June

Photo courtesy of Visit Baltimore.

If your event is by "invitation only" or "private" you can indicate that on your submission to limit who has access to the information. For example, for private events, you simply check the "private" box and the information won't be included in any of our listings. If your event is by invitation only, please indicate that in the **Notes to GSA** section.

GSA's EMPLOYMENT SERVICE CENTER

Elevate Your Candidate Search

Take advantage of the opportunity to **interview qualified geoscientists** at the GSA 2015 Annual Meeting in Baltimore: Reserve your interview space online beginning in June; check the website below for more information.

community.geosociety.org/gsa2015/science-careers/careers/esc.

GSA Partners with
Our Associated Societies for GSA 2015

GSA has a long tradition of collaborating with like-minded organizations in pursuit of mutual goals to advance the geosciences. As the Society looks to the future, it aims to build strong, meaningful partnerships with other societies and organizations across the country and around the world in service to members and the global geoscience community. National and international societies with consistent aims and missions of advancing the geosciences and/or science in general are invited to affiliate with GSA as an Associated Society.

GSA currently works with its 72 Associated Societies and 18 specialty science Divisions to build a dynamic Annual Meeting technical program and stimulating events during the meeting. Many of our Associated Societies will present their representative science, hold tailored events, and have exhibit booths during GSA 2015 this November. GSA is looking forward to hosting these valued partners and organizations. Members of Associated Societies also receive the GSA member registration rate to the Annual Meeting.

To learn more, go to www.geosociety.org/divisions/.

THE GEOLOGICAL SOCIETY OF AMERICA®

ON TO THE FUTURE

Travel Awards

▶ **Application deadline:** 29 May

The On To the Future (OTF) Program provides partial travel awards to students who belong to groups that are underrepresented in the geosciences to attend their first GSA Annual Meeting. GSA highly encourages low-income, minority, first-generation, non-traditional, veterans, and students with disabilities to apply. Learn more via the OTF website: **community.geosociety.org/OTF**

The Geological Society of America® ON TO THE FUTURE

What's Your Problem; What's Your Point?

Sunday, 1 Nov., 11:30 a.m.–2 p.m.

Target audience:
Early-career geoscientists.

Application required; e-mail **editing@geosociety.org** for more information.

Join this FREE how-to lunch session to gain skills as you venture into the process of preparing and publishing papers, and learn more about peer review.

GSA Career Pathway Programs

(*Formerly known as mentor programs.*)

Attend one of our popular career panels at this year's Annual Meeting. All students who attend will receive a FREE meal, useful career advice, and the opportunity to meet some very interesting professionals.

Women in Geology Career Pathways Reception: Sun., 1 Nov.

Geology in Industry Career Pathways Luncheon: Sun., 1 Nov.

Geology in Government Career Pathways Luncheon: Mon., 2 Nov.

For more information, go to **www.geosociety.org/mentors/.**

GSA Professional Development

Be Heard & Be Interesting

Science communication strategies for interacting with the public, policy makers, and social media

Sat., 31 Oct. 2015, 8 a.m.–noon. Professionals: US$35; students: US$25; includes continental breakfast. Limit: 30. Sign up on your meeting registration form or call GSA Sales and Service, +1-800-443-4472, to add the workshop.

Have you ever struggled to explain your research to a friend? Would you like to be able to tell your Senator your views on policy? Are you interested in having a presence on Twitter but are not sure how? Learn from experts and each other as you hone your public communication and outreach skills, and practice in a safe and comfortable setting.

You will leave knowing how to create clear and concise messages that are targeted to your audience and how to prepare for a media interview. You will learn strategies for using social media, identify opportunities for interacting with lay publics in your community, and gain an understanding of how to approach policy makers on scientific issues.

Communication skills are key to a successful career and important in all aspects of life. Give yours the attention they deserve.

1–4 NOVEMBER
GSA 2015
Baltimore, Maryland, USA

community.geosociety.org/gsa2015

OPEN ACCESS
GSA JOURNALS ARE COMING

Harry "Hap" McSween, *GSA President*

Abstract

Beginning in 2017 and phased in over the following three years, all GSA journals will be freely available online (i.e., open access). GSA journals will retain their high quality; there will be no change in current editorial or peer-review policies and procedures. The major impact of this change for GSA will be a loss of subscription revenues that currently underwrite many GSA programs. To offset these losses, a publication fee will be instituted along with the designation of some strategic funds to assist authors who lack resources to pay these fees. GSA leadership is reviewing all existing programs to find savings by modification or elimination of non-mission–critical activities and seeking other financial options for the transition. In addition, annual membership dues will modestly increase, and Council will restrict new strategic initiatives until the implementation process is completed. The GSA Foundation will increase its activity in support of GSA programs.

INTRODUCTION

GSA Council in October 2014 voted to move all GSA journals (*GSA Bulletin*, *Geology*, *Geosphere*, and *Lithosphere*) to open access, phased in over a three-year period beginning in 2017. Phasing in open access over three years will permit GSA's professional publications staff and editors to manage the transition smoothly and to allow GSA to make the necessary financial arrangements to accommodate the significant decline in revenues now generated by journal subscriptions.

WHAT IS OPEN ACCESS?

In simplest terms, open access is publication via the internet that is "digital, online, free of charge to the reader, and free of most copyright and licensing restrictions" (Suber, 2013). As Suber notes, it is compatible with peer review and need not detract from the quality of scientific publications.

WHAT WILL HAPPEN?

The key elements of the Council's decision are

- GSA journal articles will be immediately accessible online, by anyone, at any time, anywhere in the world, with no required subscription. The present implementation model has this occurring in a phased manner, as follows:
  - 2017: *Geology* becomes open access;
  - 2018: *Geosphere* and *Lithosphere* become open access; and
  - 2019: *GSA Bulletin* becomes open access.
- With implementation of open access, the page charges as well as color charges for photos and illustrations that exist with printed journals will cease, but an article publication fee will be charged.
- For authors unable to pay this fee, GSA will develop a process for the provision of full or partial subventions from strategic funds or other sources.
- The quality of GSA journal publications will remain as they are now since there will be no changes in editorial policies, peer review procedures, or article acceptance standards.
- The Society is actively reviewing its current business practices in order to absorb the anticipated declines in journal-derived revenue. This will include some changes in or elimination of existing GSA programs determined to no longer to be effective or central to GSA's mission. In addition, annual membership dues will be modestly increased to offset some revenue losses.
- Effective January 2017, all GSA journal content, including full access to the journal archives, will be freely available online to GSA members.

WHY IS GSA MOVING TO OPEN ACCESS NOW?

The much-vaunted and anticipated digital future has arrived. This now-mature technology will allow GSA to lead the scientific community in expanding the reach and impact of our science. GSA can eagerly embrace this opportunity or passively wait for it to be forced upon us.

For 127 years, our Society has embraced the mission articulated in its Constitution of 1888 to promote "the science of geology by the issuance of scholarly publications" (Article II). In 1888, the only means of accomplishing this goal was to publish traditional journals that would be sent to all members and housed in the collections of university and other research libraries across the globe. Consistent with this historical role and through the dedication of professional staff and the unselfish commitment of editors, authors, and reviewers, GSA publications are acknowledged to be among the most stimulating, rigorously reviewed, and high-impact sources of scientific information in the earth sciences. That will not change and, in fact, the impact of these journals should increase.

But, in 2015, the publishing paradigm *is* changing. The opportunity to publish the results of research online means that no researcher anywhere in the world need be denied immediate access to the latest scientific findings—and no author is prevented

from having her research read by anyone interested in the results. This fulfills the intent of our founders in a manner they could not have imagined or anticipated.

Open access will strengthen and expand the reach of our science, but only if societies such as GSA willingly embrace this change and find the means to assure that the quality of Society-sponsored online scientific publishing is indistinguishable from the quality of its publications under our traditional model.

GSA Council has determined that geoscience research will best prosper when immediate access to refereed publications is no longer restricted to the few who pay for subscriptions or have convenient access to a research library. Council has proactively embraced the philosophical position that the Society's intent "to be the premier geological society supporting the global community in scientific discovery, communication, and application of geoscience knowledge" (GSA Vision Statement, 2013) is assured and enhanced by the promulgation of the best science to the maximum number of scientists, practitioners, and members of the general public.

In the twenty-first century, this means open access publication of journals.

WHAT ARE THE CONSEQUENCES OF OPEN ACCESS?

Not surprisingly, such a change in publication practices has significant consequences—some are opportunities, and some will be challenges that must be met.

Open access forces a profound shift in how scientific publications are financed. In simplest terms, this is a shift from the "reader pays" to the "producer pays." Since there have always been many more "readers" (i.e., subscribers), than authors, this is a shift in the net funds supporting scientific publication. And, of course, traditional sources of funding for such things as page or color charges must now be reassigned to publication fees.

Ceasing print publication will result in savings. Publication costs such as printing, mailing, handling, storage, and subscription fulfillment will, for all intents and purposes, cease to exist. However, there will be no savings in such areas as editorial oversight, peer review, or publication formatting, as these practices will not go away. In addition, the costs associated with electronic hosting of journals and archives are significant and continuing, but in our current hybrid digital/analog age, these expenses are already being borne by the Society.

From the author's point of view, there will be an additional financial burden in the form of publication fees, though these are likely to be the same order of magnitude of page or color charges in many cases. But there is a significant benefit, as noted in a *Nature* Web Focus article by S. Harnad et al. (2004). Several recent studies in the fields of computer science, astrophysics, and mathematics have reported up to threefold increases in citations for open-access publications as compared to "pay-to-access" publications. We also foresee technological advances that may make GSA publications more interactive and useful to readers.

Real financial challenges will result from the elimination of subscription revenues to GSA in particular and, in fact, of all professional scientific societies. Subscription revenues to learned societies have been steadily declining for a decade or more as fewer members subscribe to paper journals and more institutional libraries limit subscriptions or provide access through a variety of bundling services. But we must be honest that embracing open access may convert a steady revenue decline from dwindling journal subscriptions into a precipitous one.

Such a predicted decline in one of GSA's primary revenue streams requires of GSA leadership a fulsome review of all current activities with the goal of seeking and implementing real cost savings. That process has begun. As noted previously, annual membership dues will increase modestly so that GSA can continue to support the important programs that members have asked for and which, in the past, were supported by journal subscriptions.

And, finally, the GSA Foundation Board of Trustees has eagerly embraced the transition to open access and will, with Foundation staff, work tirelessly over the next few years to obtain new resources to support ongoing programs at GSA, thus freeing up more GSA resources to help with the transition.

CONCLUSIONS

GSA could lead or GSA could follow. Governmental agencies are increasingly considering mandating versions of open access as a consequence of the recognition by policy makers that it is difficult to justify restricting access to publicly funded science (see Holdren, 2013). GSA could passively await these mandates, since it is conceivable that, as a consequence of political compromises, the mandated versions of open access may continue to permit some kinds of more-traditional publication to persist for a time. For example, the Holdren memorandum allows a one-year embargo before an article is freely available to all online. However, it is not clear that this compromise position will hold (see Harnad et al., 2004).

In the view of GSA's leadership, the compromise position is not consistent with our traditions or our vision for the future. We see our mission as assuring that our members are able to (1) be confident that their published scientific findings can reach the entire "universe" of interested scholars and practitioners without traditional barriers that have, frankly, become obsolete in the digital age; and (2) be able to access GSA publications online as a benefit of membership in both GSA and the geoscience community as a whole.

The next few years will be challenging ones as open access is implemented. But this is the right thing to do at this time. We are confident that GSA and our science will emerge stronger and more vibrant as a consequence.

REFERENCES CITED

Harnad, S., Brody, T., Vallieres, F., Carr, L., Hitchcock, S., Gingras, Y, Oppenheim, C., Stamerjohanns, H., and Hilf, E., 2004, The green and the gold roads to Open Access: Nature, Web Focus, http://www.nature.com/nature/focus/accessdebate/21.html (last accessed 16 Mar. 2015).

Holdren, J.P., 2013, Memorandum for the Heads of Executive Departments and Agencies, Subject: Increasing Access to the Results of Federally Funded Scientific Research: Washington, D.C., Executive Office of the President, Office of Science and Technology Policy, 22 Feb. 2013, http://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf (last accessed 16 Mar. 2015).

Suber, P., 2013, Open Access Overview: Focusing on open access to peer-reviewed research articles and their preprints: Earlham College, 13 Dec. 2013, http://legacy.earlham.edu/~peters/fos/overview.htm (last accessed 16 Mar. 2015).

GeoCareers Corner

Top Tips for Graduating (and Current) Students

Did your graduation date sneak up on you? Have you been too busy with the end of your semester to begin your job search? Here are some tips for recent graduates or current students to help you get your job search started.

Get Your Résumé in Order

There are many online resources for crafting a good résumé, but it is important to hone in on (1) the organization and look of your résumé (on average, an employer spends less than 10 *seconds* looking at a single résumé, so you want impeccable organization with clear headings and precise language); (2) the statement of work experience (be sure to include quantifiable accomplishments that highlight your skills, not a drab description of your job responsibilities); and (3) getting an external review of your résumé. Misspelled words, grammatical errors, or inconsistent tone are likely to ruin your chances for an interview. A good rule of thumb is to have your university career services center review your résumé.

Conducting a Job Inventory and Informational Interviewing

Where should you begin looking for a job? Yes there are plenty of websites out there that you will inevitably search at some point, but another idea is to take an inventory of the research facilities, companies, institutions, organizations, and government agencies (city, county, and federal) in your area to see which ones match your interests and needs. You can also check out GSA's Geoscience Job Board for current employment opportunities: www.geosociety.org/classiads/.

From there you can go through your personal contacts to see if there is anyone who might know someone who works at those institutions. If yes, then ask for an e-mail introduction. If you don't have a contact, you can identify someone online and set up an informational interview. This would just be a short meeting (30 min.) with someone who works at the place you are interested in just to make an initial connection. It is not an *interview* per se; you're just making a new contact, finding out about what it's like to work in that industry, and hopefully building a relationship that may point you in the direction you want to go. GSA Annual Meetings also offer plenty of opportunities to network with potential employers or learn more about a particular field.

Professionalize Your Online Presence

Your online image is important and may be the first place a potential employer goes before scheduling an interview. According to a recent (2014) CareerBuilder survey, 43% of employers researched potential candidates through social media sites, and 45% used a search engine like Google. Take proactive measures to clean up your Facebook, Twitter, Instagram, etc., profiles. Consider changing your personal settings to hide images and posts. You can also filter through comments, photos, or information that may be unprofessional and delete them. Remember that posting content in the spirit of good humor may mean something else to a potential employer who does not know you.

While starting your job search can be daunting, it is inevitably a learning process. With each new step along the way, there are many lessons to be learned and applied. Don't be afraid to reflect on each step and make improvements and to reach out to your mentor(s), contacts, university career services departments, friends, and family to support you along the way.

To learn more, visit the new GSA Careers webpage
www.geosociety.org/careers

THE GEOLOGICAL SOCIETY OF AMERICA®

GSA is open to your ideas and questions regarding what career-related information you'd like to read more about. E-mail Tahlia Bear at tbear@geosociety.org to share your ideas.

CALL FOR NOMINATIONS

GSA DIVISION AWARDS

STRUCTURAL GEOLOGY AND TECTONICS

Stephen E. Laubach Structural Diagenesis Award

Proposals due 10 June

The Stephen E. Laubach Structural Diagenesis Research Award Fund promotes research combining structural geology and diagenesis, and curriculum development in structural diagenesis. The donors believe multidisciplinary approaches often reveal new insights into long-standing problems and expose productive avenues for enquiry. To help promote the cross-disciplinary emphasis of this annual award, the Sedimentary Geology and Structural Geology & Tectonics Divisions have been designated to jointly select the recipient. Graduate students, postgraduate and faculty-level researchers are eligible. For more information, go to **http://rock.geosociety.org/sgt/Laubach.htm.**

HISTORY AND PHILOSOPHY OF GEOLOGY

History and Philosophy of Geology Student Award

Nominations due 15 June

This award in the amount of US$1,000 recognizes excellence in a student paper to be given at the national GSA meeting; oral presentations are preferred. Students should submit an abstract of their proposed talk and a 1,500–2,000-word prospectus for consideration. The proposed paper may be (1) on the history or philosophy of geology; or (2) a literature review of ideas for a technical work or thesis/dissertation; or (3) some imaginative aspect of the history or philosophy of geology we have not thought of before. Submit nominations to Kathleen Lohff at kathylohff.msn.com. For more information, go to **www.gsahist.org/hapg_award/awards.htm.**

MINERALOGY, GEOCHEMISTRY, PETROLOGY, AND VOLCANOLOGY (MGPV)

MGPV Distinguished Geologic Career Award

Nominations due 15 July

This award goes to an individual who, throughout his or her career, has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, volcanology, with emphasis on multidisciplinary, field-based contributions. Submit nominations to J. Alex Speer, Mineralogical Society of America, 3635 Concorde Pkwy, Ste 500, Chantilly, VA 20151-1110, USA; jaspeer@minsocam.org. For more information, go to **www.geosociety.org/divisions/mgpv/awards.htm.**

MGPV Early Career Award

Nominations due 15 July

This award will go to an individual near the beginning of his or her professional career who has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, and/or volcanology, with emphasis on multidisciplinary, field-based contributions. Nominations are restricted to those who are within eight years past the award of their final degree. Extensions of up to two years will be made for nominees who have taken career breaks for family reasons or because of serious illness. Submit nominations to J. Alex Speer, Mineralogical Society of America, 3635 Concorde Pkwy, Ste 500, Chantilly, VA 20151-1110, USA; jaspeer@minsocam.org. For more information, go to **www.geosociety.org/divisions/mgpv/awards.htm.**

STUDENT GRANTS, AWARDS & SCHOLARSHIPS

Kerry Kelts Award

Application deadline: 31 July, 12 a.m. EST

Applications are invited for the Kerry Kelts Research Awards of the GSA Limnogeology Division. This year, one award of US$1,000 for undergraduate or graduate student research related to limnogeology, limnology, or paleolimnology is available.

Prepare your application as a PDF (or PDFs) with your last name in all file names. The application file should contain a research summary and a short CV (two pages max.). The research summary must include a description of the proposed research, its limnogeological significance, why the award funds are needed for the project, and a brief description of the student's other funding sources. Be sure to include a title. The maximum length for the summary is five pages, including figures and captions; the list of references cited is not included in this limit. Send your application to Division Chair Joop Varekamp, jvarekamp@wesleyan.edu. Please include "Kelts Award application" in the subject line.

GSA and the Limnogeology Division hope to increase the number of Kelts awards, named for visionary limnogeologist and inspiring teacher Kerry Kelts, in the future. If you can help support this award, please send your donation, labeled "Kerry Kelts Research Awards of the Limnogeology Division," to GSA at P.O. Box 9140, Boulder, CO 80301-9140, USA.

4th International EarthCache Event

When: Sat., 19 Sept. 2015

Where: Rammelsberg World Heritage Museum and Visitor Mine, Goslar, Germany

EarthCaching gets people out in the field to learn about their planet first-hand. Participants in this annual event will learn all about EarthCaching, interact with EarthCachers from around the globe, meet EarthCache developers and reviewers, find local EarthCaches, and engage in many other exciting and educational activities. The 2015 event, in the beautiful Harz Mountains of north-central Germany, will be the first International EarthCache Event outside of North America. For details, go to **www.earthcache.org,** visit our Facebook page at **www.facebook.com/earthcache,** or contact Gary Lewis at glewis@geosociety.org.

Let the Earth be Your Teacher!

News about GSA Members

GSA Fellow **Patricia H. Kelley** of the University of North Carolina, Wilmington, has been selected to receive one of four U.S. Professors of the Year awards. Sponsored by the Carnegie Foundation for the Advancement of Teaching and administered by the Council for Advancement and Support of Education (CASE), the awards recognize professors for their excellence in undergraduate teaching and mentoring.

The Association of American State Geologists (AASG) has recognized GSA Fellow **P. Patrick Leahy** with its prestigious Pick and Gavel Award. This award was initiated by AASG in 1999 to recognize distinguished friends of geology who have made major contributions to advancing or facilitating the role that geoscience plays in society.

THE GEOLOGICAL SOCIETY OF AMERICA®

Help Shape the Future of Geoscience— Serve on a GSA Committee

Deadline: 15 June 2015

Terms begin 1 July 2016 (unless otherwise indicated)

If you are looking for the opportunity to work toward a common goal, give back to GSA, network, and make a difference, then we invite you to volunteer (or nominate a fellow GSA member) to serve on a Society committee or as a GSA representative to another organization.

Learn more and access the nomination form at **www.geosociety.org/aboutus/committees/.** Use the online form or download a hardcopy and mail it to Pamela Fistell, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA; fax: +1-303-357-1074; pfistell@geosociety.org.

ACADEMIC AND APPLIED GEOSCIENCE RELATIONS COMMITTEE

Two member-at-large vacancies (industry-related field) (3-year terms; E, M)

This committee is charged with strengthening and expanding relations between GSA members in applied and academic geosciences. As such, it proactively coordinates the Society's effort to facilitate greater cooperation between academia, industry, and government geoscientists. **Qualifications:** Committee members must work in academia, industry, or government and be committed to developing a better integration of applied and academic science in GSA meetings, publications, short courses, field trips, and education and outreach programs. Professional interest: Environmental & Engineering Geology, Hydrogeology, Karst, Quaternary Geology & Geomorphology, Structural Geology & Tectonics, Sedimentary Geology. Members must also be active in one or more GSA Division.

ARTHUR L. DAY MEDAL AWARD

Two member-at-large vacancies (3-year terms; E, T)

This committee selects candidates for GSA's Arthur L. Day Medal. **Qualifications:** Members should have knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems."

DIVERSITY IN THE GEOSCIENCES COMMITTEE

Three member-at-large vacancies (3-year terms; E, M)

This committee provides advice and support to GSA Council and initiates activities and programs that will increase opportunities for people of ethnic minority, women, and persons with disabilities and raise awareness in the geosciences community of the positive role these groups play within the geosciences. The committee is also charged with stimulating recruitment and promoting positive career development for these groups. **Qualifications:** Members of this committee must be familiar with the employment issues these groups face; expertise and leadership experience in such areas as human resources and education is also desired.

EDUCATION COMMITTEE

One representative vacancy: Undergraduate student representative (2-year term; B, E, M)

This committee works with GSA members representing a wide range of education sectors to develop informal, pre-college (K–12), undergraduate, and graduate earth-science education and outreach objectives and initiatives. **Qualifications:** Members of this committee must have the ability to work with other interested scientific organizations and science teacher groups.

GEOLOGIC MAPPING AWARD COMMITTEE

Two member-at-large vacancies: One member-at-large and one student member-at-large (3-year terms; E)

The purpose of this committee is to generate, receive, and evaluate candidates for the Geologic Mapping Award. This award acknowledges contributions in published high-quality geologic mapping that led the recipient to publish significant new scientific or economic-resource discoveries, and to contribute greater understanding of fundamental geologic processes and concepts. The objective is to encourage training and support toward production of excellent, accurate, detailed, purposeful geologic maps and cross sections. There are no restrictions on map products with respect to size or scale. GSA's Geological Mapping Award will be made on an annual basis, leaving the option open for multiple awards to be given under unusual circumstances in any given year, or to make no award in any given year.

B—Meets in Boulder or elsewhere; **E**—Communicates by phone or electronically; **M**—Meets at the Annual Meeting; **T**—Extensive time commitment required during application review period (15 Feb.–15 Apr. 2016).

GEOLOGY AND PUBLIC POLICY COMMITTEE

Two member-at-large vacancies: One member-at-large (3-year term) and one student representative (2-year term) (B, E, M)

This committee provides advice on public-policy matters to Council and GSA leadership by monitoring and assessing international, national, and regional science policy; formulating and recommending position statements; and sponsoring topical white papers. This committee also encourages the active engagement in geoscience policy by GSA members. **Qualifications:** Members should have experience with public-policy issues involving the science of geology; ability to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for GSA Members; and familiarity with appropriate techniques for the dissemination of information.

GSA INTERNATIONAL

Two vacancies: Chair of the Interdisciplinary Interest Group (IIG) and Chair of International Awards Subcommittee (4-year terms; E, M)

Serve as GSA's coordination and communication resource seeking to promote, create, and enhance opportunities for international cooperation related to the scientific, educational, and outreach missions shared by GSA and like-minded professional societies, educational institutions, and government agencies. Build collaborative relationships with Divisions and Associated Societies on international issues and serve as a channel for member-generated proposals for international themes.

JOINT TECHNICAL PROGRAM COMMITTEE

Three vacancies: One member-at-large (Precambrian), one member-at-large (paleoceanography/paleoclimatology), and one Soils Interdisciplinary Interest Group Representative (2-year terms, 1 Dec. 2015–30 Nov. 2017; E)

Members of this committee help finalize the technical program for GSA's annual meetings by participating in the Web-based selection and scheduling of abstracts, as well as topical session proposal review. **Qualifications:** Members must be familiar with computers and the Web, be a specialist in one of the specified fields, and be available in late July–mid-August for the organization of the annual meeting technical program.

MEMBERSHIP AND FELLOWSHIP COMMITTEE

Two member-at-large vacancies (academic) (3-year terms; B, T)

This committee draws its members from academia, industry, and government; contributes to the growth of GSA membership; and attends to the changing needs of Society members by focusing on attracting and retaining students, professionals working in industry, and those studying and working outside the United States. This committee also reviews and makes recommendations for Fellowship to Council. **Qualifications:** Committee members should have knowledge of GSA's member benefits and services. Extensive time commitment required 1 Feb.–30 Mar.

NOMINATIONS COMMITTEE

Two member-at-large vacancies (3-year terms; B, E)

This committee recommends nominees to GSA Council for the positions of GSA Officers and Councilors, committee members, and Society representatives to other permanent groups. **Qualifications:** Members must be familiar with a broad range of well-known and highly respected geoscientists.

PENROSE CONFERENCES AND FIELD FORUMS COMMITTEE

Two member-at-large vacancies (3-year terms; E)

This committee reviews and approves Penrose Conference and Field Forum proposals and recommends and implements guidelines for the success of these meetings. **Qualifications:** Committee members must be past conveners of a Penrose Conference or Field Forum.

PENROSE MEDAL AWARD COMMITTEE

Two member-at-large vacancies (3-year terms; E)

Members of this committee select candidates for the Penrose Medal Award. Emphasis is placed on "eminent research in pure geology, which marks a major advance in the science of geology." **Qualifications:** Members should be familiar with outstanding achievers in the geosciences worthy of consideration for the honor.

PROFESSIONAL DEVELOPMENT COMMITTEE

One vacancy: Student member-at-large (3-year term; E)

This committee directs, advises, and monitors GSA's professional development program; reviews and approves proposals; recommends and implements guideline changes; and monitors the scientific quality of courses offered. **Qualifications:** Members must be familiar with professional development programs or have adult education teaching experience.

RESEARCH GRANTS COMMITTEE

Seven member-at-large vacancies (3-year terms; B, T)

Committee members evaluate student research grant applications and select grant recipients. **Qualifications:** Members should have experience in directing research projects and in evaluating research grant applications. **Extensive time commitment required** 1 Feb.–30 Apr.

YOUNG SCIENTIST AWARD (DONATH MEDAL) COMMITTEE

One member-at large vacancy (3-year term; E)

Committee members investigate the achievements of young scientists who should be considered for this award and make recommendations to GSA Council. **Qualifications:** Members should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences."

Call for Committee Service continued on p. 56

B—Meets in Boulder or elsewhere; **E**—Communicates by phone or electronically; **M**—Meets at the Annual Meeting; **T**—Extensive time commitment required during application review period (15 Feb.–15 Apr. 2016).

Call for Committee Service continued from p. 55

GSA REPRESENTATIVES TO OTHER ORGANIZATIONS

GSA Representative to the America Association for the Advancement of Science (AAAS) (3-year term begins 1 Jan. 2016; B)

GSA currently has one representative for Section E (Geology & Geography). **The GSA representative must be a member of AAAS.** The renewable term begins on the day following the last day of the AAAS annual meeting in February. Normally, representatives are chosen based on who can be expected to be attending the AAAS meetings under other auspices.

GSA Representative to the North American Commission on Stratigraphic Nomenclature (3-year term begins 1 Nov. 2015; M)

The purposes of the Commission are to develop statements of stratigraphic principles, recommend procedures applicable to classification and nomenclature of stratigraphic and related units; review problems in classifying and naming stratigraphic and related units; and formulate expressions of judgment on these matters. Most members of the Commission are representatives of the fields of paleontology, biostratigraphy, and stratigraphy.

Committee, Section, and Division Volunteers:

Council Thanks You!

GSA Council acknowledges the many member-volunteers who, over the years, have contributed to the Society and to our science through involvement in the affairs of the GSA. Your time, talent, and expertise help build a solid and lasting Society.

THE GEOLOGICAL SOCIETY OF AMERICA®

In Memoriam

The Society notes with regret the deaths of the following members (notifications received between 27 Oct. 2014 and 26 Feb. 2015).

Larry D. Agenbroad
Hot Springs, South Dakota, USA
Date of death: 31 Oct. 2014
GSA notified: 5 Nov. 2014

Don L. Anderson
Cambria, California, USA
Date of death: 2 Dec. 2014
GSA notified: 5 Dec. 2014

John S. Baldwin
Houston, Texas, USA
Date of death: 14 Jun. 2014
GSA notified: 15 Dec. 2014

Donald A. Beattie
Jacksonville, Florida, USA
Date of death: 14 Aug. 2014
GSA notified: 3 Dec. 2014

Darwin R. Boardman II
Stillwater, Oklahoma, USA
Date of death: 11 Jan. 2015
GSA notified: 12 Jan. 2015

Richard L. Bowen
Hattiesburg, Mississippi, USA
Date of death: 6 Oct. 2014
GSA notified: 15 Dec. 2014

Stephen P. Bowles
Kamuela, Hawaii, USA
Date of death: 17 Aug. 2014
GSA notified: 5 Dec. 2014

Charles W. Copeland Jr.
Tuscaloosa, Alabama, USA
Date of death: 16 Aug. 2014
GSA notified: 3 Dec. 2014

Clinton D.A. Dahlstrom
Victoria, British Columbia, Canada
Date of death: 16 Jan. 2015
GSA notified: 20 Jan. 2015

Noel Eberz
Naalehu, Hawaii, USA
Date of death: 5 Feb. 2015
GSA notified: 20 Feb. 2015

Delos E. Flint
Reno, Nevada, USA
Date of death: 12 Nov. 2014
GSA notified: 11 Dec. 2014

Roy W. Graves Jr.
Tulsa, Oklahoma, USA
Date of death: 12 Jan. 2013
GSA notified: 12 Feb. 2015

Jonathan W. Harrington
Groton, New York, USA
Date of death: 16 Nov. 2014
GSA notified: 18 Nov. 2014

Edward A. Hay
Rocklin, California, USA
GSA notified: 6 Jan. 2015

Richard W. Jones
Billings, Montana, USA
GSA notified: 28 Jan. 2015

Robert Kerrich
Sooke, British Columbia, Canada
Date of death: 17 Apr. 2013
GSA notified: 12 Dec. 2014

Ward E. Kilby
Victoria, British Columbia, Canada
Date of death: 1 Jun. 2014
GSA notified: 11 Dec. 2014

Morris W. Leighton
Tallahassee, Florida, USA
Date of death: 11 Apr. 2014
GSA notified: 9 Dec. 2014

Richard P. Nickelsen
Lewisburg, Pennsylvania, USA
Date of death: 23 Nov. 2014
GSA notified: 6 Feb. 2015

Nazario Pavoni
Adliswil, Switzerland
Date of death: 10 Oct. 2014
GSA notified: 12 Jan. 2015

Douglas W. Rankin
Reston, Virginia, USA
Date of death: 25 Feb. 2015
GSA notified: 26 Feb. 2015

John J.W. Rogers
Durham, North Carolina, USA
Date of death: 14 Jan. 2015
GSA notified: 20 Jan. 2015

Robert G. Smalley
Glendora, California, USA
Date of death: 27 May 2014
GSA notified: 1 Dec. 2014

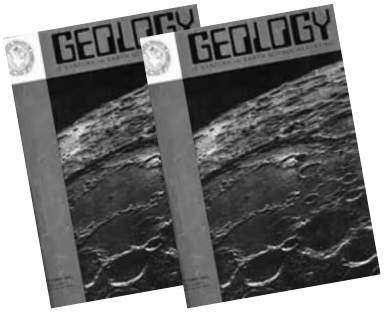
Rudolph G. Strand
Folsom, California, USA
GSA notified: 24 Nov. 2014

James H. Wandersee
Baton Rouge, Louisiana, USA
Date of death: 1 Jan. 2014
GSA notified: 18 Nov. 2014

Timothy F. Wawrzyniec
Denver, Colorado, USA
Date of death: 6 Nov. 2014
GSA notified: 13 Nov. 2014

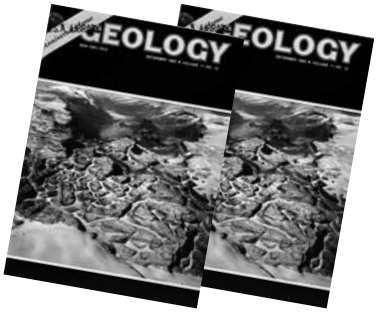
To honor a friend or colleague with a GSA memorial, please go to **www.geosociety.org/pubs/memorials/mmlGuid.htm** to learn how.

Contact the GSA Foundation, **www.gsafweb.org,** if you would like to make a gift in memory of a colleague, friend, or family member.



Geology—Past & Future

REVISITED



Editor's note: The following is the ninth installment of our encore presentation of articles that highlighted the 10th anniversary of the first issue of *Geology*, as published in *Geology* in Dec. 1983 [v. 11, no. 12, p. 679–691, doi: 10.1130/0091-7613(1983)11<679:GAF>2.0.CO;2]. Each section was written by a different author (author affiliation notations are as originally published in 1983). See the August 2013 *GSA Today* (v. 23, no. 8, p. 18–19) for the first installment and table of contents. In this issue: article 18: "Igneous rocks," by Alexander R. McBirney; and article 19: "Tectonics," by E.M. Moores.

Igneous rocks

Alexander R. McBirney, *Department of Geology, University of Oregon, Eugene, Oregon 97403*

Ten years ago, two topics dominated the published work on igneous rocks: lunar magmatism and plate tectonics. Whether these were the most important issues or not, they certainly accounted for the largest number of papers and the greatest expenditures of time and money. Whatever one's stand on magma oceans or the europium content of KREEP, all would agree that the impact of the lunar program on petrology was profound. It set new standards of research and led to vastly improved analytical and experimental techniques. In 1973 plate tectonics was the "unifying theory" to which we sought to relate all magmatic processes. Given the fervor of the times, disillusion was inevitable. All exciting new ideas, once they are fashionable, are doomed to become old-fashioned. So it is still too early to expect an objective appraisal. Nevertheless, it is worth considering what has happened to our views of igneous activity in each of the major tectonic settings—spreading axes, subduction zones, and intraplate "hot spots."

Thanks to refined geological and geophysical surveys of the deep oceanic ridges, detailed geochemical and petrologic studies of ophiolites, and core samples of the deep ocean floor, we have an elegantly documented model for magma chambers under ocean ridges. But geophysicists tell us they find no seismic evidence that these magma chambers exist. Try as they will, they simply cannot find them!

The mantle plumes that in 1973 were proliferating at such an astonishing rate have since been decimated. The descending plume, "gravitational anchor," or "emulp" (plume spelled backwards) has plummeted from sight. Few question the time-distance relations in island chains, but does anyone have a convincing explanation of what is going on?

Ten years ago, it seemed patently obvious that andesites are primary magmas generated in Benioff zones by melting of subducted sediments. Today, most would agree that the dominant magma of arcs is basaltic; evidence that subducted sediments contribute anything to calc-alkaline magmas is at best ambiguous. Indeed, it would be hard to find a consensus that sediments are even subducted.

If our mission in 1973 was to relate igneous rocks to plate tectonics, trace-element geochemistry was the means by which we aimed to do this. Geochemists in search of the magic component turned first to more and more obscure elements and then to isotopes of those elements, and in time they came upon samarium-neodymium, which is said to be the most important new tool of the decade.

The potentialities of the system are indeed impressive. I wonder, though, whether these tools of geochemistry may not have outstripped our understanding of the physical processes to which we apply them. How many times in the past decade have we seen highly sophisticated and costly analytical work interpreted in terms of absurdly inadequate physical models of magmatic evolution?

The increasing awareness of this deficiency one finds in current literature makes the task of forecasting the direction of research for the coming decade an easy one. When the next review of this kind is written, igneous geologists will be as concerned with heat and mass transfer as they are today with REE plots. As a result, I predict that our present confusion about igneous rocks will rise to undreamed-of levels of sophistication.

Send brief comments to gsatoday@geosociety.org. Should this article spark a longer comment, please consider writing a *GSA Today* Groundwork or science article; learn more at www.geosociety.org/gsatoday/.

Tectonics

E.M. Moores, *Department of Geology, University of California, Davis, California 95616*

Ten years ago, tectonics was basking in the first flush of success after the plate-tectonics revolution. People were still applying modern models to whatever existing data they could get their hands on. It seemed clear how geology reflected plate-tectonic processes, and how broad patterns of evolution related to continental drift. The first attempts at relating Alpine tectonics to plate-tectonic processes were being hailed as the greatest contribution since Argand by some Alpine geologists and dismissed as more English language geo-trash by others. Early attempts had been made to relate actualistic processes to Precambrian terrains. Mantle plumes seemed to be a tectonic "rosetta stone" relating absolute motions at the surface to deep mantle or even core processes.

As for predictions, first it seemed that the then-popular attempts to relate Cordilleran or Appalachian tectonics to simplistic "single-stage" subduction zones were likely to undergo revision as new information became available and ideas became more sophisticated. Indeed, the evidence for collage tectonics had been apparent since Warren Hamilton's early plate-tectonic papers in the late 60s and my "crashing island arc" idea, published in 1970. No one would have ever predicted, however, that "suspect terranes" would, as one wag has put it, "multiply like rabbits," or that some of the chief proponents of "noncollision tectonics" of 1973 would become the torch bearers a decade later for "suspect terranes."

Second, it seemed that the use of indirect means, such as paleontology and biogeographic provinces, would make the working out of Paleozoic plate-tectonic boundaries easy. This has proven not to be the case. Despite great progress through the integration of biogeography, sedimentary environments, and ever more precise and subtle paleomagnetic work, the task of working out actual plate boundaries in the Paleozoic, as distinguished from continental positions, has proven elusive. One complicating factor is that the continents are made up of more separate pieces than we originally thought.

Third, it seemed relatively easy to use ophiolite complexes as a tool to calibrate the rate of spreading of ancient oceans. This also has turned out not to be the case. The oceanic crust has itself proven to be so complex that any simple comparison with ophiolitic pseudostratigraphy is probably wrong. Ophiolites themselves have proven to be complex and of uncertain significance.

Fourth, the prediction that plate-tectonic processes would be easy to apply to the Precambrian has proven to be an oversimplification. Paleomagnetic work on Proterozoic rocks has been a great deterrent to simple application of our actualistic models, although the latter clearly are applicable in some instances.

Hardly anyone predicted surprises such as the spectacular success of slip-line field theory in explaining the active tectonics of continental collision zones, or the COCORP results from the southern Appalachians, and the resultant rapid progress toward understanding the nonrigid tectonics of collisional regions.

Several predictions for the next ten years come to mind: (1) The widespread and increasing availability of computer programs will make the generation of structural models from gravity, seismic, and magnetic data as widespread in academia and government as they currently are in industry. Such models will become an integral part of regional structural geology, a fact that will be reflected in most student theses. (2) The crystalline cores of all Phanerozoic mountain ranges will prove to be as allochthonous as the Appalachians. (3) The Andes will prove to be a poor example of the classic "Andean-style" plate boundary. (4) Precambrian orogenic belts will prove to be as allochthonous as Phanerozoic ones. (5) Continental fragmentation and reassembly will turn out to have been at least as frequent in the Proterozoic as in the Phanerozoic.

GSA's Journal for Applied Geology Marks Its 20th Year of Publication

Jerome V. De Graff, *Chair, E&EG Editorial Board*

Environmental and Engineering Geoscience has marked its twentieth year by adding a new feature: electronic pre-publication. This feature enables an accepted and press-ready manuscript to be cited through a digital object identifier (DOI). *Environmental and Engineering Geoscience*, like other GSA journals, is distributed through GeoScienceWorld (GSW). Manuscripts that have been assigned DOI numbers are found on the GSW webpage for *Environmental and Engineering Geoscience* under the heading "Online First" at **http://eeg.geoscienceworld.org/.**

The GSW webpage for *Environmental and Engineering Geoscience* provides a table of contents of the current issue with abstracts for each article. Links accessing articles are provided in the table of contents for subscribers and with payment options for non-subscribers. Past issues are available through the archive, where articles of interest can be by found by browsing contents or using an online search function. Another new feature is the inclusion of archived digital versions of the *Bulletin of the Association of Engineering Geologists* from 1976 through 1994. *Environmental and Engineering Geoscience* is a reorientation of the *Bulletin of the Association of Engineering Geologist* and replaced it as the Association of Environmental & Engineering Geologists' primary journal.

The Geological Society of America (GSA) and the Association of Environmental & Engineering Geologists (AEG) jointly launched *Environmental and Engineering Geoscience* in February 1995. It is dedicated to publishing peer-reviewed, quality articles dealing with what might be termed "applied geology." Under this joint arrangement, the journal is published quarterly and co-edited with one editor appointed by each organization. Dr. Ira Sasowsky recently completed nine years of exemplary service as GSA's appointed editor. He was succeeded by Dr. Brian Katz (see p. 61) in January 2015.

Environmental and Engineering Geoscience provides a venue for original research and case studies on environmental geology, engineering geology, geotechnical engineering, geomorphology, low-temperature geochemistry, applied hydrogeology, and near-surface processes. The GSW webpage provides a listing of the 50 most viewed and most cited papers from the journal, updated monthly. In March 2015, the leading 10 articles under the most-cited category include ones on landslide classification, vadose phase transport, bedrock and structural controls on slope stability, debris flow generation, and geotechnical characteristics of sandstones. These topics illustrate the success of the journal in serving the scientific and technical needs of environmental and engineering geology professionals. Also notable is the selection of journal articles for receipt of GSA's E.B. Burwell, Jr., Award in 2004 and 2010.,

Interested authors can find instructions at **http://eeg.allentrack.net/cgi-bin/main.plex** for preparing submissions. The instructions are available without registering on the site by using the "author instructions" link at the top of the left-hand column on that page. EEG is a traditional journal without an open access option; however, there are no page charges for accepted articles or for the use of color illustrations. Go to

http://eeg.geoscienceworld.org/ at GSW if you are interested in seeing the titles of recent articles in the journal or would like to view a complimentary copy. Current and past issues are available to GSA members who select the journal as part of their annual dues and subscriptions options and to AEG members as part of their annual membership benefits.

GSA Publications Highlights

E&EG to Publish Special Issues

The editors of *Environmental and Engineering Geoscience* (*E&EG*), published quarterly by the Association of Environmental and Engineering Geologists (AEG) and GSA, are planning to publish special issues on timely and relevant topics in the environmental and engineering geosciences (including hydrogeology, low-temperature geochemistry, water-energy nexus, geomorphology, and other Earth surface processes).

"We'd like to encourage organizers and conveners of topical sessions at the GSA Annual Meeting and other scientific meetings to serve as guest editors of special thematic issues that would include high-quality papers presented in their respective topical sessions," said *E&EG* co-editor Brian Katz. A session organizer may want to consider, for example, writing a review paper on a special topic and inviting other authors to contribute manuscripts based on their presentations.

For more information or to discuss possible special issue topics, please contact the co-editors: Abdul Shakoor (ashakoor@kent.edu) and Brian G. Katz (eegeditorbkatz@gmail.com).

Brian G. Katz of the Florida Department of Environmental Protection (and adjunct professor in the Department of Earth, Ocean, and Atmospheric Sciences at Florida State University) was appointed as the new co-editor for *Environmental and Engineering Geoscience* for the term of 2015–2108.

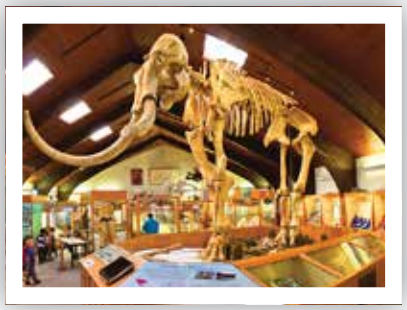
GSA Section Meetings This Month

Anchorage, Alaska, USA. Photo by Jody Overstreet, courtesy Visit Anchorage.

CORDILLERAN
11–13 May
Anchorage, Alaska, USA

Madison, Wisconsin, USA. Photo courtesy GMCVB.

NORTH-CENTRAL
19–20 May
Madison, Wisconsin, USA



Dee the Mammoth, Casper College Tate Museum. Photo courtesy Visit Casper.

ROCKY MOUNTAIN
21–23 May
Casper, Wyoming, USA

www.geosociety.org/Sections/meetings.htm

CALL FOR NOMINATIONS

2016–2017 GSA OFFICERS & COUNCILORS

Deadline: 15 June

The GSA Committee on Nominations requests your recommendations for GSA Officers (Vice President/President-Elect and Treasurer) and Councilors to serve beginning in 2016. Each nomination should be accompanied by basic data and a description of the individual's qualifications.

You can access the online nomination form at **www.geosociety.org/aboutus/officers.htm** or you may send nomination materials to Pamela Fistell, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, pfistell@geosociety.org.

THE GEOLOGICAL SOCIETY OF AMERICA®

Geoscience Jobs & Opportunities

Ads (or cancellations) must reach the GSA advertising office no later than the first of the month, one month prior to the issue in which they are to be published. Contact advertising@geosociety.org, +1.800.472.1988 ext. 1053, or +1.303.357.1053. All correspondence must include complete contact information, including e-mail and mailing addresses. To estimate cost, count 54 characters per line, including punctuation and spaces. Actual cost may differ if you use capitals, boldface type, or special characters. Rates are in U.S. dollars.

Classification	Per Line for 1st month	Per line each addt'l month (same ad)
Positions Open	$9.15	$8.90
Fellowship Opportunities	$9.15	$8.90
Opportunities for Students		
First 25 lines	$0.00	$5.00
Additional lines	$5.00	$5.00

Positions Open

LAB INSTRUCTOR OF GEOLOGY THE UNIVERSITY OF TENNESSEE AT MARTIN

Full-time, 1 year term position starting 1 Aug. 2015. Required: M.S. in geology or a related field from an accredited university by 1 Aug. 2015. Primary teaching duties include lab instruction for intro-level physical and environmental geology. Undergraduate-level lab teaching experience preferred. Applicants should be able to communicate and teach effectively in English. For more information, contact Dr. Stan Dunagan at sdunagan@utm.edu. Review of applications will begin 1 April 2015 and continue until a suitable candidate is found.

8-MONTH TERM INSTRUCTOR POSITION DEPARTMENT OF EARTH SCIENCES UNIVERSITY OF NEW BRUNSWICK

EMPLOYMENT OPPORTUNITIES:
http://www.unb.ca/postings
COMPETITION: #14-30

Applications are invited for a full-time eight-month term position as Instructor in the Department of Earth Sciences at the University of New Brunswick to commence 1 September 2015. We seek a candidate with expertise in structural geology to teach courses at the second, third, and fourth-year levels. Evidence of or demonstrated potential for excellence in teaching is required.

The successful candidate must have a minimum of an M.Sc. and preferably hold a Ph.D. in earth sciences or geological engineering.

Review of applications will begin immediately and continue until a suitable candidate is found.

This position is subject to final budgetary approval.

A letter of application including CV, statement of teaching interests and philosophy and the names of three referees should be sent to Dr. Cliff Shaw, Chair, Department of Earth Sciences, University of New Brunswick, 2 Bailey Drive, Fredericton, NB, E3B 5A3, cshaw@unb.ca.

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. Applicants should indicate current citizenship status.

THE UNIVERSITY OF NEW BRUNSWICK IS COMMITTED TO THE PRINCIPLE OF EMPLOYMENT EQUITY.

TENURE-TRACK ASSISTANT PROFESSOR IN IGNEOUS PETROLOGY/GEOCHEMISTRY DEPARTMENT OF GEOLOGICAL SCIENCES AND ENGINEERING, UNIVERSITY OF NEVADA, RENO

The Department of Geological Sciences and Engineering at the University of Nevada, Reno, seeks an earth scientist for a tenure-track faculty position at the Assistant Professor level in high-temperature earth processes. We seek an outstanding scientist who combines field, laboratory and modeling investigations and will establish an innovative, world-class, externally funded research program in the petrological and/or geochemical evolution of Earth's crust and/or mantle. The applicant will be expected to direct graduate student research at the M.S. and Ph.D. levels and contribute to both undergraduate and graduate education. The specific field of interest is open, but preference will be given to candidates who would complement and interact with our existing strengths in the structural and metamorphic evolution of the lithosphere, economic geology, geothermal systems, and natural hazards. Interested applicants must have a doctorate in geology or a related geoscience field by the time of hire. The Department is part of the Mackay School of Earth Sciences and Engineering, which also includes two state-funded Earth Science units, the Nevada Bureau of Mines and Geology and the Nevada Seismological Laboratory. More information about the Department can be found at http://www.unr.edu/geology.

Applications are due by August 15th, 2015, and review will begin shortly after. All interested applicants should view the application and submit their materials at: http://www.unrsearch.com/postings/17132

Materials that will need to be uploaded include a cover letter, CV, statement of research, statement of teaching philosophy, and complete contact information for at least three letters of reference. We are hoping to fill the position by January 1st, 2016. Questions regarding the search may be addressed to the head of the search committee, Dr. Stacia Gordon, at staciag@unr.edu. The University of Nevada, Reno is an Equal Opportunity/Affirmative Action Employer. Women and underrepresented groups are encouraged to apply.

DIRECTOR ADVANCED ENERGY TECHNOLOGY INITIATIVE, ILLINOIS STATE GEOLOGICAL SURVEY PRAIRIE RESEARCH INSTITUTE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

The Illinois State Geological Survey (ISGS) is part of the Prairie Research Institute (PRI; http://www.prairie.illinois.edu/) at the University of Illinois at Urbana–Champaign which is centrally located between Chicago, St. Louis, and Indianapolis. PRI houses five large scientific surveys covering a wide range of expertise including biology, water resources, climate, geology, sustainable technology and archaeology. The ISGS (http://www.isgs.illinois.edu/) is a premier state geological survey, with over 200 scientists and technical support staff, serving the needs of the public, government, and industry with earth science information and research relevant to natural resources, environmental quality, economic vitality, and public safety. The University is a land-grant institution that provides access to world-class laboratory and academic facilities, Big Ten athletic events, and internationally acclaimed cultural opportunities.

We are seeking an individual to provide leadership, clear scientific vision, and direction to the subdisciplines and staff members that comprise the Advanced Energy Technology Initiative (AETI) at the ISGS. The leadership skills of the individual will encourage multidisciplinary, project-based research within AETI and throughout ISGS, other Surveys, and University related to energy issues; develop, implement, and administer research and service programs of the AETI; and facilitate coordination, communication, and teamwork throughout the PRI and the University. As the Director of AETI, the individual will promote AETI services and capabilities to a variety of stakeholders including government funding agencies, corporations, and legislative representatives. The individual will continue to maintain AETI's domestic and international reputation as a global leader in addressing energy issues.

Ph.D. in geological science, engineering, or related discipline with career emphasis related to energy resources and 15 years of combined research and managerial experience beyond the completion of master's degree. Demonstrated vision, capability, and experience to address challenges facing society related to the advanced energy fields, such as carbon capture and storage, mitigation of fossil fuel emissions, water for energy resource development and power generation, public engagement and education on energy issues, unconventional oil and natural gas resource assessment, natural gas geologic storage, and enhanced oil recovery.

Applications must be received by May 15, 2015. Applicants may be interviewed before the closing date; however, no hiring decision will be made until after that date. To apply, please visit https://jobs.illinois.edu/academic-job-board to complete an online profile and to upload a (1) cover letter, (2) résumé/CV, and (3) the names and contact information (including e-mail addresses) of three professional references. All requested information/documentation must be submitted for your application to be considered. An incomplete application will not be reviewed.

For further information please contact Lori Walston-Vonderharr, Human Resources, Illinois State Geological Survey, at lwalston@illinois.edu or +1-217-244-2401.

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GROUNDWORK
Furthering the Influence of Earth Science

Strategies for Creating a Conspicuous, Effective, and Memorable Poster Presentation

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INTRODUCTION

Many of the major geoscience conferences are experiencing increased attendance, making it impossible to feature all oral presentations. Hence, the number and value of poster presentations are on the rise. For example, during the past 10 years, posters consistently comprised ~66% of the presentations at the American Geophysical Union (AGU) Fall Meeting, but overall poster numbers grew rapidly and now represent thousands of presentations each day (Fig. 1). Similarly, the European Geosciences Union (EGU) General Assembly is now made up of 66% poster presentations, also resulting in thousands of poster presentations each day. Posters at the Geological Society of America (GSA) Annual Meeting comprised an average of 37% of presentations during the last decade.

In light of the increasing number of posters at large geoscience conferences, authors must work hard to give conspicuous, effective, and memorable poster presentations. In all the chaos of the poster hall at large conferences—socializing, searching for beverages and bathrooms, and the hundreds to thousands of simultaneous presentations—you have a lot of competition for people's attention. Here, we provide a "road map" of strategic steps for presenters who want their science to stand out among the rising sea of posters. We also point out some key open-access resources that will further improve posters when paired with these strategies.

CONTEXT: ORAL VERSUS POSTER PRESENTATIONS

Oral and poster presentations are very different formats in terms of preparation, execution, and professional interaction. Oral presentations provide an opportunity to *disseminate* well-developed scientific findings or hypotheses within a short timeframe (10–20 min.), followed by a brief question and answer period (2–5 min.). The oral presentation format does not allow much social interaction or opportunity to receive immediate insights about your research from the community. On the other hand, posters allow you to *give and receive* in-depth information and feedback about your research. The poster presentation is social and enables extended professional interactions that can greatly benefit your research and career. Thus, posters deserve much respect and care in their creation and delivery, and should not be considered second-class presentations.

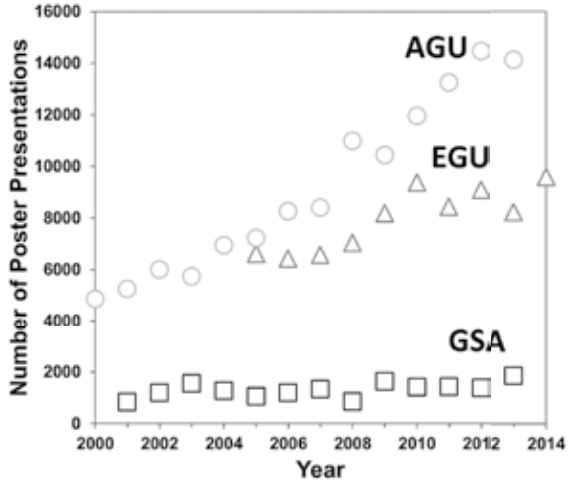

Figure 1. Number of recent poster presentations for three major geoscience conferences: GSA Annual Meeting, AGU Fall Meeting, and EGU General Assembly. Data provided by GSA, AGU, and EGU.

PREPARING TO CREATE THE POSTER

Choose a Meeting Session Carefully

Submit your abstract to an appropriate session by anticipating the audience that you want to attend your poster. Use your knowledge of the topic and your network (peers, colleagues, and mentors) to help you choose a session. This can be achieved by searching for keywords and convener names in the session descriptions of most meetings.

Be Strategic in Choosing a Title

Your presentation title is very important and should be selected carefully. Many people will decide to attend your presentation based upon the title alone. Make sure your title is concise and precise. A title that states the key findings can be a powerful draw

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(Hess et al., 2011). If appropriate, you can enhance your title and make it visible to a broad spectrum of people by using keywords that link your work to major issues or debates in your field of geoscience.

Formulate Your Poster Storyline

Before starting poster design and construction, you should formulate your storyline with the "give and receive" opportunity in mind. For example, include data and findings that you want to discuss because they either support your ideas or perplex you. Although guidelines may vary by meeting, an organized poster in the geosciences usually follows the format of a scientific paper: introduction, methods, results, discussion, conclusions, references, and acknowledgments. Again, remember to anticipate your audience. Make your presentation relevant and tangible to this group of people. For example, if you know that the session audience will be less quantitatively oriented, you should use model schematics instead of systems of equations.

MAKING THE POSTER

Follow the Guidelines

Always know the conference regulations and obey them. Pay particular attention to allowable dimensions, because they vary between GSA, AGU, and EGU. This easily avoidable mistake is probably one of the most frequently made. You do not want to show up and realize your poster is intruding on your neighbor's space.

Use Appropriate Formatting

The layout and formatting of your poster content is immensely important. You must obey guidelines for the inclusion and style of text and figures (e.g., amount of text, minimum font sizes, figure resolution, visualization design, and color selection). This topic is discussed thoroughly in other resources (see these open-access references: Miller et al., 2002; Faulkes, 2011; Hess et al., 2011; Purrington, 2011). Use these resources to avoid the cardinal sins of poster design and formatting (e.g., fonts and figures that are too small). In general, less is more when it comes to posters, especially for text. The most effective posters contain only the most fundamental and interesting material from the study (Hess et al., 2011). Your poster does not need to contain all the details, because you will be at the poster to enhance the presentation.

Create a "Brand" That is Memorable and Visually Appealing

Keep an eye out for engaging and inspiring designs—you do not have to reinvent the wheel, but you do want to find a functional, reproducible design that can become your "brand." There are effective and ineffective posters all around you (e.g., in your institution's hallways), so learn from these examples and Web resources (e.g., Faulkes, 2011, Hess et al., 2011, Purrington, 2011). Rather than copy a specific format, pick and choose pieces of style and design that appeal to you, while avoiding common design pitfalls.

Get Coauthor Support

Make sure all of your coauthors review and approve your poster prior to printing. Build this step into your schedule so that there is time to include their valuable input.

PREPARING TO PRESENT THE POSTER

Practice

Always rehearse the "walk-through presentation"—your 2–3-minute oral presentation of your poster—with your peers and colleagues. Rehearsal will immensely improve your delivery at the conference. Get and incorporate feedback from your peers and colleagues. You are likely to give this walk-through many times during your session; deliver it with enthusiasm every time.

Provide Handouts

Bring "mini-posters"—letter-sized versions of your poster. Make sure your poster content is still legible in this smaller format. If it is not, your text and figures are probably too small on your full-size poster. Make these mini-posters available by your poster and carry some with you so that you can hand them out at opportune times. If applicable, it also helps to have supporting materials on the back of your mini-poster (e.g., additional figures, equations, or a list of your related publications). These mini-poster handouts also serve as valuable reminders for people to follow up with you.

PROMOTING AND PRESENTING YOUR POSTER

Self-Promote and Be Outgoing

Enlist help from peers, colleagues, and advisors to send folks your way before and during your session. Coordinate with colleagues who present before you to advertise your poster during their poster or oral presentation—and then do the same for those presenting after you. Most people wait for you to engage them at your poster, so be outgoing and welcoming. An easy first step to engaging someone is to smile and make eye contact. You do not want to spend many hours standing alone, especially after you have invested the time and money to attend the conference. Science is fundamentally about sharing ideas, and these social interactions are necessary for advancing science.

Hook Your Audience

When new audience members arrive, introduce yourself with your affiliation. Make sure to note their names and briefly learn about their research. Ask them if they would like the "walk-through" or have questions. Connect your research to the interests of the audience quickly so as to "hook" them. During your walk-through, always start broad and work toward specifics, while gauging your audience's level of knowledge on the topic and adjusting your presentation accordingly. It helps to bookend your brief presentation with the motivation for the study, because that is likely the common scientific thread between you and your audience.

Maintain an Audience

Be interactive with your audience and use questions and frequent eye contact. Continually check in with your audience and make sure they are still engaged. This is very important, because a poster with an interested audience will draw other curious attendees from the crowd and give your science more exposure. Be prepared to take notes on feedback and names, but do this during your breaks so you do not disrupt the flow of your presentation or interactions with your audience. As you part ways

with audience members, always thank them for their thoughts and time. With rare exception, stay by your poster during the entire session to maintain your momentum and audience levels—avoid the temptation to leave early for other talks and posters. This also means not wasting time in the complimentary beverage line during your session; have a peer bring you something (*you have earned it!*).

Follow Up

After the conference, make sure to continue your interactions. Follow up with those who had a key question or comment. This will expand the impact of your science and reinforce the connection between you and your scientific community long after the conference is over.

SUMMARY

Here we have provided a road map of strategic steps that will help you create and deliver a poster presentation that is conspicuous, effective, and memorable. These key steps are (1) know and embrace the value of a poster presentation; (2) carefully choose your session and title; (3) create a storyline and format for your poster that facilitates *giving and receiving* information; (4) obey the fundamental published guidelines for formatting the content, text, and visualizations of a poster; (5) practice, practice, practice the presentation and get feedback before the conference; (6) self-promote and be outgoing before, during, and after your presentation; and (7) appreciate, interact with, and maintain your audience. Execute these steps and you will be an effective communicator and your science will be memorable.

ACKNOWLEDGMENTS

We thank our past and present mentors, colleagues, and students for help in developing these strategies, and George Hess and anonymous reviewers for their many constructive suggestions.

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John W. (Jack) Hess, *GSA Foundation President*

Focus: GeoStar

It is probable that many of you reading this article benefited from a GSA Research Grant early in your geoscience career. The GSA Research Grants Program has distributed more than US$10 million to thousands of GSA members since being established in 1933. I'm writing with good news about the program and asking for your help to make it even better.

GSA research grants provide partial support for master's and doctoral thesis research in the geological sciences for students enrolled in universities in the United States, Canada, Mexico, and Central America.

In 2014, US$683,535 was awarded to 401 graduate students. Funding comes from an NSF matching grant, endowed funds, contributions, and corporate sponsorships.

Our Challenge: Increased Demand for Research Grants

There has been a sharp increase in the number of applications received (18%) and grants awarded (24%) by the Research Grants Committee in the past two years. The number of applications this year (784) indicates a continued upward trend in the level of demand for research grants.

GSA Research Grant Program 2012–2015: Applications, Grants, Average Grant

YEAR	APPLICATIONS	GRANTS	AVG. GRANT AMOUNT
2012	636	303	US$1,829
2013	615	307	US$1,897
2014	774	401	US$1,680
2015	784	391	US$1,851

The Foundation has effectively worked with generous GSA members, their families, and corporate sponsors to increase funding for specialized awards and Division grants. However, these grants benefit a fraction of the pool of applicants considered by the Research Grants Committee. Because GSA Council instructs the Research Grants Committee to limit grants to ~50% of applicants, the committee must divide a fixed amount of funding across an increasing number of qualified student proposals.

"Pound for pound, I doubt any group has a greater impact on the course of geological research than GSA's Committee on Research Grants." — ***Bruce Simonson,*** *Past Chair, GSA Committee on Research Grants*

The GeoStar Fund

The GeoStar Fund is a permanent endowment that provides support for research grants not funded by specialized awards. Over the years, GeoStar has received funds via small annual donations. With your help and that of thousands of past research grant recipients, we will build GeoStar so it provides more robust funding for research grants.

A Final Consideration

The average research grant in 1975 was US$657. That equates to US$2,891 in 2015 with inflation (based on the U.S. Inflation Calculator, www.usinflationcalculator.com). Our goal is to build the GeoStar Fund to support grants of at least US$2,000. The GSA Foundation welcomes your participation in this effort that supports talented emerging geoscientists, honors the efforts of Research Grants Committee volunteers, and strengthens the geosciences.

The 2011 Mineral, Virginia, Earthquake, and Its Significance for Seismic Hazards in Eastern North America

edited by J. Wright Horton Jr., Martin C. Chapman, and Russell A. Green

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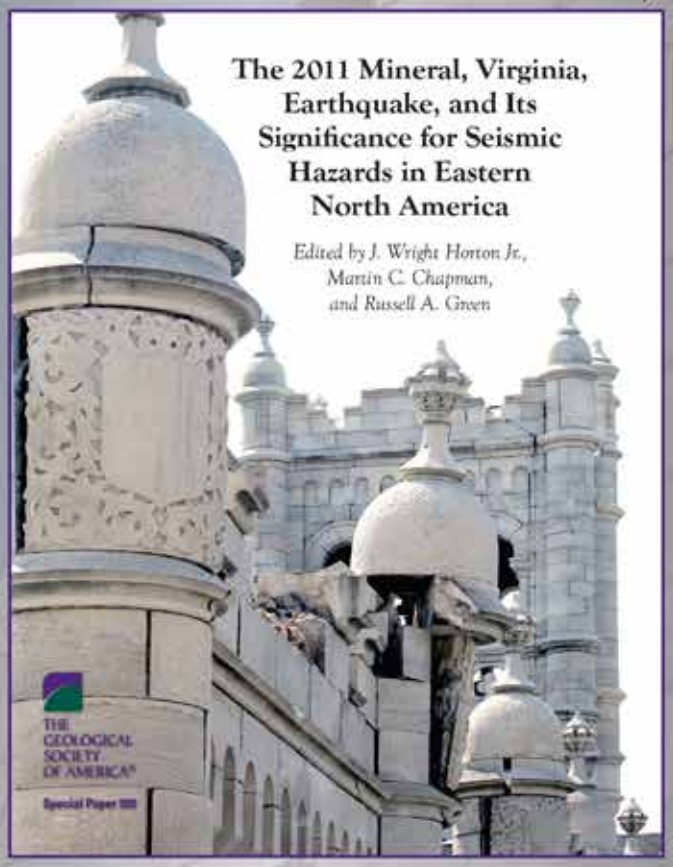

The magnitude ~5.8 Mineral, Virginia, earthquake of 2011 was the largest to occur in the Appalachian region in more than 100 years. It was felt over much of the eastern United States and southeastern Canada, caused significant damage from central Virginia to the National Capital Region, and was responsible for the automatic safe shutdown of a nuclear power station. It invigorated interest in earthquake processes, hazards, and preparedness along the Eastern Seaboard, and responses of the science and engineering communities to this rare event serve as models for responding to future events. The earthquake provided important new seismologic, engineering, geologic, hydrologic, and geophysical data that contribute to the understanding of earthquakes in eastern North America and to better assessment and mitigation of seismic hazards. This collection of 23 chapters makes these results available for geoscientists, engineers, and decision makers interested in understanding earthquakes and seismic hazards in eastern North America and other intraplate settings.

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