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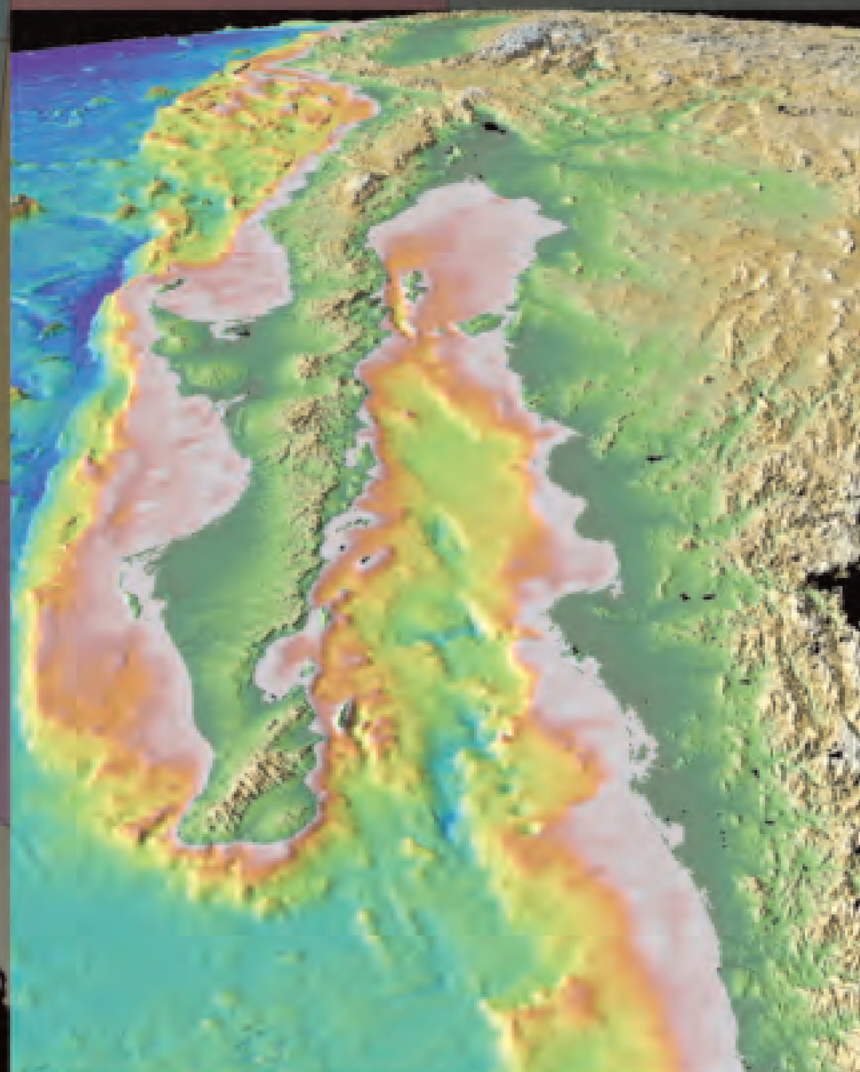
—Oblique divergence across hot, weak lithosphere along a tectonically active margin



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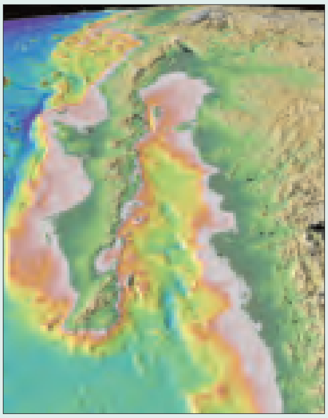

Cover: Oblique view northwest up the Gulf of California with the Baja California peninsula on the left and mainland Mexico and Southwestern United States on the right. Note the WNW-trending transform faults and short spreading centers in the southern Gulf of California and the shallow northern Gulf of California and low elevation Salton trough regions through which faults link to the San Andreas fault. Mountains on the mainland are the Sierra Madre Occidental and smaller ranges of the Basin and Range province. Image courtesy geomapapp.org. See related article, p. 4–10.

ERRATUM: A reference to GSA Special Paper 308 (SPE308) in the Sept. 2011 *GSA Today* science article by S. Stein et al. (v. 21, no. 9, p. 5) lists W.R. Van Schmus, M.E. Bickford, and A. Turek as volume editors. This is incorrect. The volume editors for SPE308 are Ben A. van der Pluijm and Paul A. Catacosinos. *GSA Today* regrets this error.

Why did the Southern Gulf of California rupture so rapidly?—Oblique divergence across hot, weak lithosphere along a tectonically active margin

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ABSTRACT

Rifts in the interior of continents that evolve to form large oceans typically last for 30 to 80 m.y. and longer before complete rupture of the continent and onset of sea-floor spreading. A distinct style of rifts form along the active tectonic margins of continents, and these rifts more commonly form marginal seas and terranes or continental blocks or slivers that are ruptured away from their home continent. The Gulf of California and the Baja California microplate make up one of the best examples of the latter setting and processes. In the southern Gulf of California, sea-floor spreading commenced only ~6–10 m.y. after the formation of the oblique-divergent plate boundary at ca. 12.5 Ma. Three main factors caused this rapid rupture: (1) an inherited long, narrow belt of hot, weak crust from a volcanic arc that was active immediately before formation of the oblique-divergent plate boundary and that lay between two strong batholith belts; (2) relatively rapid plate motion resulting in high strain rates; and (3) a dominant role of strike-slip faulting in the highly oblique-divergent setting that formed large pull-apart basins with rapid and focused crustal thinning in a linked en-echelon system. Accentuating factor 1 is that the formation of slab windows associated with microplate capture west of the Baja California peninsula may have further weakened the crust. These causes of rapid rupture of continental lithosphere are mostly linked to the fact that the Gulf of California developed along a long-lived tectonically active margin of a continent with a convergent or oblique-convergent setting since at least the Jurassic, but not a margin that was thickened in a major contractional orogen. This combination of causes and factors suggests that rifts that form at active margins are fundamentally different than continental interior rifts, and that these differences can produce vastly different rifting histories. The formation and northwestward motion of the Baja California microplate also show that "terranes" formed in an oblique-divergent setting can form and move long distances over relatively short geologic time intervals.

INTRODUCTION

The rupture of continental lithosphere is one of the most fundamental tectonic processes. Complete rupture of a continent requires the familiar progression from early rifting to extreme continental lithosphere thinning to continental breakup that forms oceanic spreading in a nascent ocean (e.g., Veevers, 1981). The development of a rift, and whether it progresses to breakup, is mainly dependent on the thermal structure, crustal thickness, and crustal strength of the lithosphere when rifting begins (e.g., Buck, 2007), as well as forces at the base of the lithosphere and far-field plate interactions (Ziegler and Cloetingh, 2004).

Continental rupture at its two extremes creates either large ocean basins or small and narrow marginal seas depending largely on the tectonic setting of the rift. Rupture of a continent that creates large oceans most commonly initiates as rifts in old, cold continental lithosphere or within former large collisional belts in the interior of large continents, part of the process known as the Wilson Cycle (Wilson, 1966). Rupture to create narrow marginal seas commonly occurs in active continental margins and results in the formation of micro-continents or continental terranes. Examples of these marginal sea settings are the modern Andaman Sea and Gulf of California and the Mesozoic of the Alps (Kelts, 1981; Weissert and Bernoulli, 1985; Channell and Kozur, 1997). The creation and later translation and accretion of terranes is one of the processes that leads to the formation of so-called accretionary or Cordilleran-type orogens (Helwig, 1974; Coney et al., 1980; Moores and Twiss, 1995).

The process of rifting active continental margins can occur in two distinctly different settings that create vastly different results. Most attention and research has been done in rifts within active margins that were previously contractional orogens, such as the Basin and Range or Aegean Sea, in which the crust was thickened before rifting. In the western United States, before the Basin and Range extensional event, the crust was ~70 km thick in the Sierra Nevada arc (Ducea, 2001) and >50 km thick in the hinterland of the thrust belt (Coney and Harms, 1984). In both of these examples, after tens of millions of years of extension, continental crust has not fully ruptured, but it has thinned appreciably to 20–30 km (Thompson and Burke, 1974; Wernicke, 1992; Klemperer and Ernst, 2003; Sodoudi et al., 2006).

The Aegean Sea is also an example of slab rollback that drove extension in the backarc but has not resulted in continental rupture after a few tens of millions of years. Slab rollback in the Tyrrhenian Sea did produce continental rupture and formation of oceanic crust (Nicolosi et al., 2006), but only after extension occurred for ~30 m.y. (Malinverno and Ryan, 1986). Therefore, from the Mediterranean region, it appears that slab rollback is an alternative process to the oblique divergence explored in this paper, which may produce rupture of continental lithosphere—but in these examples rupture was a slow process. However, there may be conditions in which slab rollback produces more rapid rupture of continental lithosphere.

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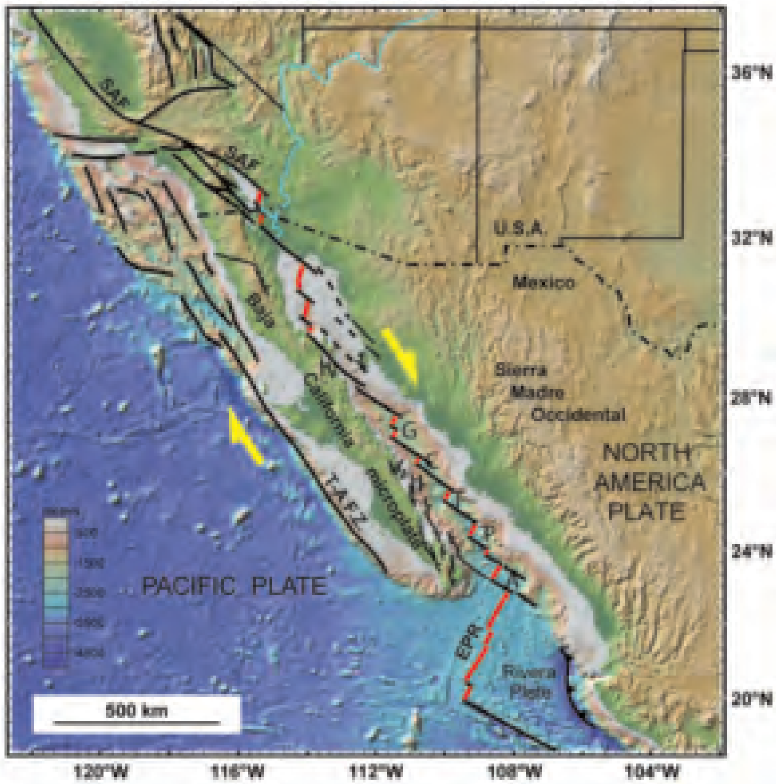

Figure 1. Tectonic map of the Pacific–North America plate boundary of the Gulf of California–Salton trough region (modified from Dorsey and Umhoefer, 2011). Thin black lines are faults; red lines are spreading centers in the southern Gulf of California and complex pull-apart basins in the northern Gulf of California and Salton trough. Abbreviations from north to south: SAF—San Andreas fault; G—Guaymas spreading center; C—Carmen spreading center; F—Farallon spreading center; P—Pescadero spreading center; A—Alarcón spreading center; T-A F.Z.—Tosco-Abreajos fault zone; EPR—East Pacific Rise. Normal faults on the Baja California peninsula and islands are selected young and active faults.

In contrast to these rifts formed on ancient contractional orogens, other rifts along active continental margins form on volcanic arcs in regions with previous neutral or extensional tectonics, such as the Gulf of California. The Gulf of California is an example of a region in which a young oblique rift formed on a volcanic arc with an extensional backarc. The Pacific–North America plate boundary in the Gulf of California (Fig. 1) is one of the best modern examples of rupture of continental lithosphere to form a narrow continental fragment or terrane outboard of a narrow sea (Wilson, 1966; Lonsdale, 1989; Umhoefer and Dorsey, 1997). Among rifts and passive margins worldwide, one of the distinguishing traits of the Gulf of California is how rapidly it evolved to active sea-floor spreading and formation of oceanic crust. In the past decade, new research has started to quantify the style and the timing of that rupture process (e.g., Lizarralde et al., 2007). In the southern Gulf of California, sea-floor spreading commenced ~6–10 m.y. after the formation of the oblique-divergent plate boundary at 12–12.5 Ma (Lonsdale, 1989; Stock and Hodges, 1989; Stock and Lee, 1994). This contrasts greatly to rifts in the interior of continents that develop into large oceans and have a typical duration of 30–80 m.y. and longer.

This paper summarizes recent advances in understanding when and where the southern Gulf of California plate boundary developed to the stage of sea-floor spreading and explores possible reasons for this rapid rupture of the continental lithosphere. This example of continental rupture and formation of a terrane (the Baja California microplate; Fig. 1) shows the critical role of the history of the inherited lithosphere upon which a rift develops, rapid plate divergence, and strike-slip faulting in the rapid rupture of continents. This paper also highlights the stark difference between rifting of continent interiors versus rifting of tectonically active continental margins. The formation of the Baja California microplate also demonstrates how rapidly terranes or microplates can form and translate long distances along their mother continent; in 20–25 m.y., Baja California will likely have translated 1000 km.

TECTONIC SETTING AND RAPID RUPTURE OF SOUTHERN GULF OF CALIFORNIA

The Gulf of California and the Salton Trough form the oblique-divergent boundary between the Pacific and North America plates from 22° to 34°N latitude (Fig. 1). Most of the plate motion in the southern Gulf of California is accommodated in the gulf axis system by linked transform faults and short spreading centers (Lonsdale, 1989). Relative plate motion between the Baja California microplate and North America in the southern gulf is ~45–47 mm/yr (Plattner et al., 2007). An additional 4–6 mm/yr is accommodated on the offshore Tosco-Abreojos fault zone (borderland fault system) southwest of the Baja California peninsula (Fig. 1) (Dixon et al., 2000; Plattner et al., 2007). Regional transtensional faulting has rifted Baja California obliquely away from mainland Mexico over the past ~12.5 m.y. (e.g., Atwater and Stock, 1998). Pacific–North America plate motion became localized along the axis of the present-day plate boundary by at least 6 Ma (Oskin et al., 2001; Oskin and Stock, 2003a and 2003b), but the distribution of plate-boundary deformation between 12.5 and 6 Ma is uncertain and debated. In one model, Miocene plate motion was partitioned into strike-slip faulting in the borderland system and east-west extension in the Gulf of California (Spencer and Normark, 1979; Stock and Hodges, 1989); Pliocene to Recent faulting became more transtensional as the main oblique-divergent plate boundary moved into the Gulf of California. This

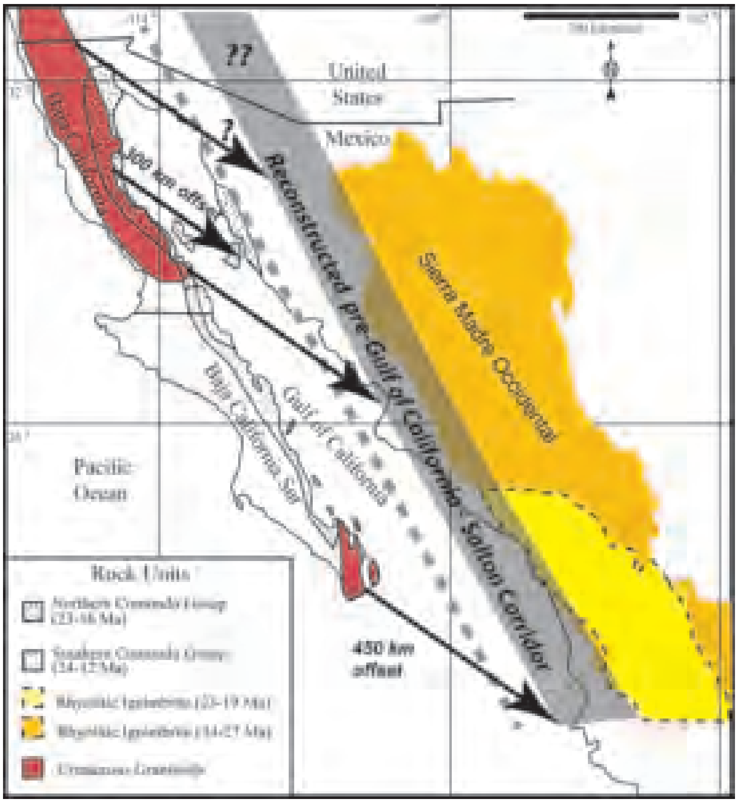

Figure 2. A simple cartoon of the narrow corridor (gray) between the Baja California peninsula and the Sierra Madre Occidental middle Cenozoic volcanic belt that results if there was a total of ~450 km offset across the Gulf of California since 12–14 Ma (Gans, 1997; Sutherland, 2006; Fletcher et al., 2007; Lizarralde et al., 2007). Note that with that 450 km of offset the lower to middle Miocene volcanic arc of the Comondú Group, and the early oblique-divergent plate boundary, formed along the reconstructed gray corridor. The dashed gray line is the width of the Gulf of California–Salton trough corridor if the total offset was the more modest 300 km as indicated by the shorter arrow across the northern Gulf (Stock and Hodges, 1989; Oskin and Stock, 2003b). Smaller granite exposures in mainland Mexico, on the islands in the Gulf, and in the gap between the northern and southern Baja California granites are not shown.

model results in ~300 km of northwesterly motion of the Baja California microplate relative to North America mainly since 6 Ma (Oskin et al., 2001). A second model proposes that Miocene dextral-oblique shear has separated the Baja California microplate from mainland Mexico since ca. 12.5 Ma, producing a total of ~450–500 km offset across the Gulf of California between the Baja California microplate and North America (= mainland Mexico) (Gans, 1997; Fletcher et al., 2007). This model results in the same ~300 km of northwesterly motion of the Baja California microplate relative to North America mainly since 6 Ma, but requires an additional northwest-directed offset of ~150–200 km before 6 Ma. These contradictory models remain unresolved, but evidence from a crustal scale seismic survey in the southern gulf favors the larger offset model for that region (Sutherland, 2006; Lizarralde et al., 2007).

The spreading centers in the southern gulf (Fig. 1) formed at variable times from ca. 6 Ma to ca. 2 Ma. The Guaymas spreading center in the central gulf formed ca. 6 Ma based on the width of the new igneous crust as determined from a seismic refraction profile from Lizarralde et al. (2007). In the mouth of the gulf, the northern East Pacific Rise has a more complex history in which part of that system formed a spreading center ca. 5.5 Ma (Lonsdale, 1989; Brown, 2007). The Alarcón spreading center began forming proto-oceanic crust ca. 3–3.5 Ma (DeMets, 1995), and true sea-floor spreading at present rates started at 2.4 Ma (Sutherland, 2006; Umhoefer et al., 2008). The East Pacific Rise and Alarcon Rise both have magnetic anomalies on the oceanic crust (Lonsdale, 1989; DeMets, 1995), while the Guaymas basin is a complex of sills and sediment cover that obscures simple magnetic anomalies (Lizarralde et al., 2007). The Pescador, Farallon, and Carmen(?) spreading centers may have formed ca. 2 Ma based on a proposed link to the Loreto basin (Dorsey and Umhoefer, 2000; Mortimer et al., 2005) and the width of the bathymetrically low basin surrounding the spreading centers (Lonsdale, 1989). By comparing these ages of initiation of sea-floor spreading to the estimate of 12.5 Ma for commencement of the Pacific–North America oblique-divergent plate boundary in this region (Stock and Lee, 1994; Atwater and Stock, 1998), it is clear that the time from onset of rifting to complete rupture of continental lithosphere (referred to below as "time-to-rupture") in the southern gulf was only ~6–10 m.y.

DURATION OF TYPICAL RIFT STAGES FOR LARGE OCEANS

The time-to-rupture for the Gulf of California was much more rapid than rupture of continent interiors to form large oceans. Rifts in the interior of continents that evolve to form oceans typically last for 30 to 80 m.y. before complete rupture of the continent and onset of sea-floor spreading, and some rift stages last much longer (Ziegler and Cloetingh, 2004). For example, the Newark rift basin in the eastern United States records >30 m.y. of sedimentation that began rifting before ca. 230 Ma (Olsen et al. 1996, 2004) and has the Central Atlantic Magmatic Province basalts dated at 201 Ma (Schoene et al., 2010) in its upper parts. The oldest documented true oceanic crust and sea-floor spreading in the east-central Atlantic is ca. 185 Ma (Withjack et al., 1998; Bird et al., 2007), while there was a proto-Atlantic stage from 200–185 Ma, during which sea-floor spreading may have initiated (Schettino and Turco, 2011). Therefore, the rift stage in the central Atlantic lasted ~35–45 m.y. The southern Atlantic had a rift stage that lasted for ~30 m.y. Rifting in the southernmost ocean north of the Falkland plateau and Scotia Sea started ca. 155 Ma (Jokat et al., 2003), whereas sea-floor spreading started ca. 125 Ma (Müller et al., 1997). The rifting stage between Africa and Antarctica lasted at least 30 m.y. before breakup (Jokat et al., 2003). Likewise, the Australian margins have rift stages that lasted 30–40 m.y. (Brown et al., 2003). Rifting in the southern Red Sea occurred over 20–25 m.y.; extension in Yemen and Ethiopia started ca. 28–26 Ma (Menzies et al., 1997; Garfunkel and Beyth, 2006), and the oldest ocean crust is 4–6 Ma (Cochrane, 1983). The eastern Gulf of Aden had a shorter rifting stage of 17 m.y.; rifting started at 35 Ma, and initial sea-floor spreading occurred at 18 Ma (d'Acremont et al., 2006).

WHY DID THE SOUTHERN GULF OF CALIFORNIA RUPTURE RAPIDLY?

The factors that affect rift localization and the subsequent rupture of continental lithosphere include the thermal structure, crustal thickness, and strength of the lithosphere (e.g., Buck, 2007), as well as forces near the asthenosphere-lithosphere boundary and far-field plate interactions (Ziegler and Cloetingh, 2004). These factors have been investigated largely from numerical and analog modeling. Here I will explore the main factors that may have created rapid rupture in the Gulf of California, and in the following section, I will discuss a paradox of this history compared to recent modeling results.

It is clear that the southern Gulf of California developed from initial rifting to sea-floor spreading much more rapidly than typical continental rifts. There appear to be three major factors that caused this rapid time-to-rupture: (1) the presence of a narrow zone of hot, weak crust between belts of strong crust because of the long history as an active tectonic margin; (2) moderately rapid relative plate motion; and (3) obliquity of plate motion with a major role of strike-slip faulting.

The first factor that favors rapid rupture is the inherited crustal structure when oblique divergence commenced. An older arc with presumed hot, weak crust formed between two strong, older batholith belts. When Baja California is reconstructed in a simple fashion 450 km back to the southeast (the large-offset model), there remains a long, narrow belt (1800 × 150 km) that was occupied by the pre-gulf volcanic arc from ca. 20–12 Ma (gray belt, Fig. 2) (Hausback, 1984; Sawlan, 1991; Ferrari et al., 2007). The eastern part of this belt west of the Sierra Madre Occidental underwent widespread extension during this time before the oblique-divergent plate boundary formed in the future Gulf of California (Henry, 1989; Gans, 1997; Ferrari et al., 2007) and arguably thinned the crust. Arc volcanism was active in the southern gulf until immediately before the change to oblique divergence at 12.5 Ma (Umhoefer et al., 2001). The volcanic arc and extension formed between two provinces underlain by strong batholithic crust. In the west, a Cretaceous batholith occupies the length of the Baja California peninsula (Fig. 2; small exposures are discontinuous between the large northern and southern belts). In the east, the Sierra Madre Occidental is a vast 34–27 Ma rhyolitic caldera province with an axial zone that has a thick crust of 55 km and is likely underlain by a silicic batholith and mafic lower crust (Ferrari et al., 2007). These initial conditions of a thermally weak arc crust of normal thickness would greatly promote rifting, but the weak crust may also delay localization and rupture (after Buck, 2007). Intuitively, the two relatively strong batholith belts on either side of the narrow arc would work against the rift widening past the batholith margins, and indeed the present boundaries of the gulf extensional province lie along the edges of the batholiths (Figs. 1 and 2). Therefore, I suggest it is the combination of the narrow, weak arc crust between the strong batholiths that was the first key factor in rapid rupture.

McCrory et al. (2009) suggested another factor that may have further thermally weakened the arc crust in the few million years before oblique convergence. They proposed that the slab window related to the capture of microplates west of southern Baja California during the volcanic arc (Stock and Lee, 1994) would have heated the region from the accretionary prism to the arc, further decreasing the strength of the crust within the arc.

The second cause of rapid rupture is suggested to be the moderately rapid relative motion across this plate boundary. The Pacific and North America plates have moved 630 km since 12.5 Ma at a rate of 51 km/m.y. (Atwater and Stock, 1998; Plattner et al., 2007). The Late Cenozoic history of separation across the gulf itself is debated as summarized in the "Tectonic Setting" section. Using the model for 450 km offset across the southern gulf and a rate of 47 mm/yr since 6 Ma (present rate between the southernmost Baja California microplate and North America [Plattner et al., 2007] extrapolated back to 6 Ma [Oskin et al., 2001]) gives 282 km of offset since 6 Ma. That yields a remainder of 170 km of offset from 12.5 to 6 Ma at a rate of 26 mm/yr of plate motion across the gulf. Much is uncertain in these estimates of plate motion for the early gulf, but most viable options result in moderately fast rates of relative plate motion, and a substantial increase in across-gulf offset rates at ca. 6 Ma. These rates of plate motion compare to rates of 3 to 6 mm/yr across the East Africa Rift system (Stamps et al., 2008). The key second conclusion is that these rates of motion across the Gulf of California are much higher than those across most active rifts and may have promoted efficient magma generation and strain localization in the axial region of the plate boundary.

The third cause of rapid rupture is suggested to be the obliquity of motion across the plate boundary. Highly oblique divergence can be defined in terms of the rift angle, or the angle between the azimuth of the axis of the plate boundary and the azimuth of the relative plate motion. The southern gulf has a rift angle of ~20°, which results in a transtensional deformation style and means that strike-slip faulting played a major role in divergence before the modern plate boundary formed with its long transform faults and short spreading centers (e.g., Lonsdale, 1989; Umhoefer et al., 2007). The large-offset (450–500 km) and long-lived transtensional model suggests that strike-slip and transtensional faulting were dominant for the whole history of the gulf. The smaller-offset (300 km) model suggests that there was little or no strike-slip faulting from 12.5 to 6 Ma and then an abrupt change to dominantly strike-slip faulting at 6 to 0 Ma.

In the large-offset model, the likely pre-seafloor spreading fault patterns were dominated by en-echelon strike-slip faults that were linked to transtensional systems of normal and strike-slip faults at the gulf margin (Dorsey and Umhoefer, 2000; Umhoefer et al., 2007). Along the gulf axis, the en-echelon strike-slip faults likely produced large pull-apart basins (Lonsdale, 1989). These fault and basin patterns are locally known along the margin; the patterns are hypothetical in the gulf axis, but modern bathymetry supports rhomboid shaped basins (Figs. 1 and 2), and limited seismic lines support rift and transtensional basins (Sutherland, 2006). The key point for the causes of rapid rupture of lithosphere is that pull-apart basins are the most efficient basin type at localizing rapid thinning of the crust and the most rapidly subsiding basins (Christie-Blick and Biddle, 1985; Pitman and Andrews, 1985; Allen and Allen, 2005; Xie and Heller, 2009).

DISCUSSION AND CONCLUSIONS

Gulf of California as an End-Member Example

The oblique-divergent plate boundary in the southern Gulf of California localized ~90% of plate motion to develop seafloor spreading by 6–2.4 Ma. This produced an unusually rapid rupture of continental lithosphere that took only 6–10 m.y. Evidence summarized in this paper suggests that three main factors caused this rapid rupture: (1) an inherited long, narrow belt of hot, weak crust from a volcanic arc that was active immediately before formation of the oblique-divergent plate boundary and formed between two strong batholith belts (Fig. 2); (2) relatively rapid plate motion resulting in high strain rates; and (3) a dominant role of strike-slip faulting with highly oblique divergence that likely formed large pull-apart basins with rapid crustal thinning in a linked en-echelon system.

These causes of rapid rupture are mostly linked to the fact that the Gulf of California developed along the tectonically active margin of a continent that experienced multiple episodes of magmatism (and deformation) through much of Phanerozoic time. The precursor volcanic arc clearly demonstrates this case, and the two batholiths on either side of the Gulf of California are products of earlier Tertiary and Cretaceous convergent margin episodes. Moreover, relatively rapid plate motion as seen in this example is unlikely for a rift in a continental interior. This combination of causes and factors suggests that rifts that form at active margins are fundamentally different than continental interior rifts, and that these differences produce vastly different rifting histories. The difference in rifts in these two settings is not just in the setting itself, but in the series of processes that occur in each setting before and during rifting, and the rates of extension across the rift. I suggest that the Gulf of California represents the end member along an active margin where a previous arc existed with an extensional backarc and along which many features developed before the rift started that led to the key factors that favor a short time-to-rupture. The rifting of active margins in which the previous tectonics were a long-lived contractional orogen (Basin and Range or Aegean Sea) that produced thickened continental crust have many factors that work against rapid localization and rupturing of continental lithosphere, especially the initially thick crust across a wide zone.

Gulf of California and Modeling Results

One apparent paradox arises when comparing recent models for extension at the crustal scale and the Gulf of California. As one example, Huismans and Beaumont (2007) used finite-element modeling to explore the effects of the strength of the crust and fate of extension on the symmetry and mode (narrow versus wide) of the rift. At high rifting velocities it was found that strong viscous coupling in the lower crust suppresses localization and produces a distributed, symmetric style of extension. In addition, weak lower crust appears to result in delayed rupture. These results appear to contradict the observations from the Gulf of California for rapid rupture. But it is important to note that modeling to date involves extension of uniform layers across a relatively wide region as the initial condition. The initial conditions in the Gulf of California were much different than these models. I would suggest that it was this narrow, weak arc lying between strong batholiths, together with the moderately rapid plate motion and strike-slip faulting, that was the critical combination of factors that led to the rapid lithosphere rupture in the Gulf of California.

Implications for Terrane Formation and Translation

The rapid rupture of the southern Gulf of California and formation of the Baja California microplate also has implications for terrane formation and translation. This young and modern example demonstrates that terranes composed of fragments of their former continent can form rapidly and translate long distances in relatively short geologic time spans. For the Baja California terrane, the large-offset model suggests it has moved 450–500 km northwest relative to stable North America in 12.5 m.y. Assuming that the Baja California terrane either continues to move at the present rate (47 km/m.y.) or Pacific–North America plate motion fully localizes in the Gulf of California (51 km/m.y.), the terrane will move a total of 1000 km in ~22–25 m.y. For the smaller-offset model with 300 km offset across the Gulf of California, the Baja California terrane will move 1000 km in ~27 m.y.

If this process of rapid rupture along highly oblique plate boundaries occurs along a plate boundary with rates of plate motion at the high end of current relative plate motions, one can reasonably suggest shorter times for terrane formation and translation of 1000 km. The modern Pacific basin has examples of Nazca–South American relative motion of ~70–75 km/m.y. and Pacific-Australia (north of Australia) highly oblique relative motion of 110–115 km/m.y. (DeMets et al., 2010). Given these rates, one could envision the formation and translation of a terrane like Baja California moving 1000 km in 10–15 m.y. For example, if a terrane formed in 5 m.y. at a rate of motion of about 80 km/m.y. (the same percentage of total relative motion that is localized in the Gulf of California since its inception), it would move 400 km. If the plate motion was then fully localized along the main plate boundary at 115 km/m.y., the terrane would move a total of 1000 km in ~10 m.y. This possibility of the formation and translation of terranes these large distances over relatively short time periods is a challenge for those studying ancient orogens because it demands understanding of the orogenic processes to a few-million-year resolution in order to detect large terrane translations.

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2011–2012 Richard Jahns Distinguished Lecturer

Scott F. Burns

GSA Fellow Scott Burns has been named the 2011–2012 Richard H. Jahns Distinguished Lecturer in Engineering Geology. Burns is a professor of geology at Portland State University (PSU), where he specializes in engineering and environmental geology, soils, geomorphology, Quaternary geology, and terroir. He just finished his 21st year of teaching at PSU and his 41st year of teaching at the university level (including in Switzerland, New Zealand, Washington, Colorado, and Louisiana).

Burns received his B.S. and M.S. degrees from Stanford University, and earned his Ph.D. at the University of Colorado. He holds registrations in Oregon (RG & CEG) and a license in Washington (LG) and is a consultant and expert witness for legal cases. Burns has authored or co-authored more than 80 articles and 200 published abstracts as well as two books. His diverse research topics include landslide debris flows; radon and earthquake hazard mapping; heavy metals and trace elements in soils; loess stratigraphy; slope stability; the Missoula Floods; biogeomorphology; alpine soil development; and terroir.

Burns' accolades include the 2011 GSA Public Service Award and the 2006 GSA Environmental and Engineering Geology Division Meritorious Service Award. He has served as chair of the Environmental and Engineering Geology Division and as treasurer for 12 years of GSA's Quaternary Geology and Geomorphology Division. Burns was 2002–2003 president of AEG and vice president of IAEG (North America) from 2006 to 2010.

Burns has also won many awards for outstanding teaching, with the most significant being the Faculty Senate Chair Award at Louisiana Tech University in 1987; the Distinguished Faculty Award from the PSU Alumni Association in 2001; and the George Hoffmann Award from PSU in 2007. He actively helps local TV and radio stations and newspapers bring important geological news to the public.

The main talk being offered by Burns is "Urban Landslides—Challenges to Forensic Engineering Geologists."

Other talks on the following topics can also be arranged: "Cataclysms on the Columbia, the Great Missoula Floods"; "Engineering Geology Challenges on the Cascadia Margin, Pacific Northwest, USA"; and "The Mystery of Terroir—The Relationship of Geology, Soils, and Climate to Wine." All talks are suitable for technical/professional and general audiences.

To make arrangements for talks, please contact Scott Burns directly at burnss@pdx.edu or +1-503-725-3389. Descriptions of these talks are posted on the AEG website (www.aegweb.org) and the GSA Environmental and Engineering Geology Division website (http://rock.geosociety.org/egd/index.html).

Scott F. Burns

The Jahns lectureship, established in 1988, is sponsored by the Association of Environmental and Engineering Geologists and GSA's Environmental and Engineering Geology Division. Its purpose is to provide funding for distinguished engineering geologists to present lectures at colleges and universities in order to increase student awareness of careers in engineering geology. The lectureship is named in honor of Richard H. Jahns (1915–1983), an engineering geologist who had a diverse and distinguished career in academia, consulting, and government.

UPCOMING AWARD, RECOGNITION & GRANT DEADLINES

For details on the following awards and grants, see the October *GSA Today* or go to
www.geosociety.org/awards/nominations.htm.
Information and nomination forms can also be obtained from GSA Grants, Awards, and Recognition,
P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, +1-303-357-1028, awards@geosociety.org.

2012 GSA MEDALS AND AWARDS

Nomination deadline: 1 Feb. 2012

- Penrose Medal
- Day Medal
- Young Scientist Award (Donath Medal)
- GSA Public Service Award
- The Bromery Award for the Minorities
- GSA Distinguished Service Award
- Subaru Outstanding Woman in Science Award

GSA FELLOWSHIP

Nomination deadline: 1 Feb. 2012

Elevation to GSA Fellowship is an honor bestowed on the best of our profession at each spring GSA Council meeting. **GSA Fellows** may support two nominees each year but only one as a primary nominator. **GSA members** who are not Fellows may be secondary nominators for up to two nominees.

AGI MEDAL IN MEMORY OF IAN CAMPBELL

Nomination deadline: 1 Feb. 2012

The AGI Medal in Memory of Ian Campbell recognizes singular performance in and contributions to the profession of geology. To submit a nomination, go to www.agiweb.org/direct/awards.html.

AGI MARCUS MILLING LEGENDARY GEOSCIENTIST MEDAL

Nomination deadline: 1 Feb. 2012

This award recognizes consistent, high-quality scientific achievements and service to the Earth sciences of lasting, historic value. The recipient should be a senior scientist nearing completion or having completed full-time regular employment who has been recognized for accomplishments in his or her field(s) of expertise by professional societies, universities, or other organizations. To submit a nomination, go to www.agiweb.org/direct/awards.html.

2012 NATIONAL AWARDS

- **William T. Pecora Award:** http://remotesensing.usgs.gov/pecora.php.
- **National Medal of Science:** www.nsf.gov/od/nms/medal.jsp.
- **Vannevar Bush Award:** www.nsf.gov/nsb/awards/bush.jsp.
- **Alan T. Waterman Award:** www.nsf.gov/od/waterman/waterman.jsp.
- **G.K. Warren Prize:** www.nasonline.org/site/PageServer?pagename=AWARDS_warren.

2012 STUDENT RESEARCH GRANTS

Applications will be accepted online *only* beginning in late November. Paper applications or letters will not be accepted. **Submission deadline:** 1 Feb. 2012 at 11:59 p.m. (MST) to www.geosociety.org/grants/gradgrants.htm.

2012 POST-DOCTORAL RESEARCH AWARDS

Application deadline: 1 Feb. 2012

The following post-doctoral research awards are managed by the GSA Foundation. Learn more at www.geosociety.org/grants/postdoc.htm.

- The **Gladys W. Cole Memorial Research Award** for research on the geomorphology of semiarid and arid terrains in the United States and Mexico is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on geomorphology.
- The **W. Storrs Cole Memorial Research Award** for research on invertebrate micropaleontology is awarded annually to a GSA member or Fellow between 30 and 65 years of age who has published one or more significant papers on micropaleontology.

JOHN C. FRYE ENVIRONMENTAL GEOLOGY AWARD

Nomination deadline: 31 Mar. 2012

In cooperation with the Association of American State Geologists and supported by endowment income from the GSA Foundation's John C. Frye Memorial Fund, GSA makes an annual award for the best paper on environmental geology published either by GSA or by a state geological survey.

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Help ensure that your area of research and expertise is represented in next year's technical program. Individuals, groups, and geosciences organization are welcome to suggest topics and submit proposals for both Topical Sessions and Pardee Keynote Symposia. Pardee Symposia are high-profile sessions on significant scientific developments, with invited speakers only. Topical Sessions are a combination of invited and volunteered papers. Unique formats are allowed, but they must be outlined in the proposal, along with the technical support needs. Sessions that promote discussion are encouraged.

FIELD TRIPS

Deadline: 1 Dec. 2011

Know of a great geoscience excursion near Charlotte, North Carolina, USA? Teach your colleagues and peers about the ground-breaking research in this region. Submit your idea for a fun, interesting, and educational field trip for the 2012 Annual Meeting online at **http://gsa.confex.com/gsa/2012AM/fieldtrip.htm.** Trips can be anywhere from a half day to 5 days long. **Questions?** Please contact Beth Engle, +1-303-357-1006, bengle@geosociety.org.

SHORT COURSES

Deadline: 1 Feb. 2012

Have something that your peers need to know? Then lead a Short Course at the 2012 GSA Annual Meeting in Charlotte! Proposals for Short Courses are now being accepted. Courses can be run to develop professional, teaching, and research skills at all levels. Proposal guidelines are available online or by contacting Jennifer Nocerino at jnocerino@geosociety.org.

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Looking ahead to 2012

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■ The **Archaeological Geology Division** (est. 1977) provides a forum for the presentation and discussion of papers on archaeological geology in order to stimulate and promote research and teaching within this field. Division awards include the *Rip Rapp Archaeological Geology Award*, the *Richard Hay Student Paper/Poster Award*, and the *Claude C. Albritton, Jr., Award* memorial fund.

■ The purpose of the **Coal Geology Division** (est. 1954) is to encourage coal research and disseminate coal geology information to all interested parties by actively participating in thought-provoking symposia and technical sessions at GSA's meetings and through scientifically pertinent publications. The Division sponsors a major award for outstanding contributions to the field of coal geology, the *Gilbert H. Cady Award*, and also recognizes the volunteered contributions of its members through its *Distinguished Service Award*. For students, the Division offers the *Antoinette Lierman Medlin Scholarship*, the *Antoinette Lierman Medlin Laboratory* and *Field Awards* and a *Best Student Paper Award*.

■ The **Environmental and Engineering Geology Division** (est. 1947 as the Engineering Geology Division) promotes education, research, outreach, and application of engineering geologic knowledge to the betterment of society by adopting sound design of buildings, structures, and facilities that assure public safety and a healthy environment. Each year, this Division honors geologists with the *E.B. Burwell, Jr., Award* and, along with the Assoc. of Environmental and Engineering Geologists, commissions the *Richard H. Jahns Distinguished Lecturer*. Other Division awards include the *Meritorious Service Award*, the *Distinguished Practice Award*, and the *Roy J. Shlemon Scholarship* and *Meeting Student Awards*.

■ The purpose of the **Geobiology & Geomicrobiology Division** (est. 2001) is to bring together scientists working at the interface of biology and geology and to encompass the integration of these disciplines by simultaneously promoting both the broad scope and detailed disciplinary work demanded of rigorous interdisciplinary research. Fields represented within this Division include biogeochemistry, biomineralogy, geochemical ecology, paleontology, micropaleontology, origins of life and co-evolution of planets and life, paleobiology and paleoecology, molecular paleontology and ecology, systems modeling and informatics, and astrobiology. This Division sponsors an *Outstanding Contributions to Geobiology & Geomicrobiology Award* and an *Outstanding Student Research Poster Award*.

■ The mission of the **Geoinformatics Division** (est. 2006) is to advance "Data to Knowledge," providing GSA members with an opportunity to participate in the emerging field of cyberinfrastructure. The Division actively promotes and sponsors short courses, symposia, and books that emphasize information technology–supported discovery and integration of geoscience data leading to a more comprehensive understanding of Earth and the planets as complex systems.

■ The **Geology and Health Division** (est. 2005) focuses on the intersection of natural or anthropogenic geological conditions with health, disease, pathology, and death in modern and fossil humans, animals, and plants. This GSA Division fosters communication and collaboration among scientists and health practitioners with an emphasis on the interdisciplinary relationship of geology to medicine, biology, chemistry, and other sciences.

■ The motto of the **Geology and Society Division** (est. 2003) is "Geology Working for Society." By increasing the geoscience community's knowledge of societal issues and improving the community's overall communication skills, this Division works to ensure accurate and intelligent dissemination of geologic information to society. This Division sponsors a *Best Student Presentation Award*.

■ The **Geophysics Division** (est. 1971) facilitates the presentation and discussion of the challenges and ideas of scientists interested in geophysics, fosters communication among geophysicists and other earth scientists, and promotes research and publication. This Division sponsors the *George P. Woollard Award* and lecture for outstanding contributions to geology through the application of the principles and techniques of geophysics. For students, the Division offers the *Allan V. Cox Student Research Award* and the *GSA Geophysics Division Student Research Award*.

■ The purpose of the **Geoscience Education Division** (est. 1991) is to foster the active participation of GSA members in all aspects of earth-science education. The Division complements and expands on the contributions of GSA's Education & Outreach group, the National Earth Science Teachers Assoc. (NESTA), the National Assoc. of Geology Teachers (NAGT), the National Science Teachers Assoc. (NSTA), and other similar organizations. This Division sponsors the *Biggs Earth Science Teaching Award* and a *Distinguished Service Award*.

■ The **History and Philosophy of Geology Division** (est. in 1976 as the History of Geology Division) works to encourage the study and communication of the history and philosophy of geology. The Division sponsors technical sessions at GSA meetings and honors geologists for their research, writing, and historical work through the *Mary C. Rabbitt History of Geology*

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Award, the *Gerald M. and Sue T. Friedman Distinguished Service Award*, and the *History & Philosophy of Geology Student Award*. The Division provides “Rock Stars” articles to *GSA Today*, highlighting the life and work of “giants in geology.”

■ The **Hydrogeology Division** (est. 1959) focuses on the geologic aspects of hydrogeology, the role of geology in the hydrologic cycle, and the importance of hydrogeology to society and science. The Division has a well-established mentor program for students looking at careers in hydrology or hydrogeology through the John Mann Mentors in Applied Hydrogeology Program. The *Birdsall-Dreiss Distinguished Lecturer* honorees are named by this Division, along with the *O.E. Meinzer Award*, the *Division’s Distinguished Service Award*, the *Hydrogeology Division Student Research Grant Awards,* and the *Diodato Student Travel Grants*.

■ The **Limnogeology Division** (est. 2002) encourages research on both ancient and modern lakes around the world, the collaboration of scientists from all disciplines on lake research, and the fostering of student research and careers in lake studies. The Division sponsors the *Israel C. Russell Award* and the *Kerry Kelts Student Research Award*.

■ GSA’s newest Division (est. 2009), **Mineralogy, Geochemistry, Petrology, Volcanology** (MGPV), provides a mechanism whereby GSA members who share these common interests can organize to partner with adhering Associated Societies with the same interests; promotes awareness, teaching, study, and research of the relevant areas; stimulates and facilitates the presentation and discussion of problems, ideas, knowledge, and results of work and research in the relevant areas; and cooperates with other GSA Divisions and Sections and with GSA’s Associated Societies and other scientific organizations to foster, aid, and promote the relevant areas. The Division sponsors the *Distinguished Geologic Career Award* and the *MGPV Student Research Grant Awards*.

■ The two mottos of the **Planetary Geology Division** (est. 1981) are “One planet just isn’t enough!” and “The GSA Division with the biggest field area!” Awards sponsored by the Division include the *G.K. Gilbert Award*, the *Distinguished Sevice Award*, the *Eugene M. Shoemaker Impact Cratering Award* for students, the *Stephen E. Dwornik Student Awards*, and (jointly with the Meteoritical Society) the *Pellas-Ryder Award* for the best student paper in planetary science.

■ The **Quaternary Geology and Geomorphology Division** (est. 1955) facilitates communication among scientists in these fields and the presentation of their research and ideas to the wider scientific community. Several awards are given by this Division: the *Distinguished Career Award*, the *Kirk Bryan Award*, the *Gladys W. Cole Memorial Award*, the *Farouk El-Baz Award for Desert Research*, and the *J. Hoover Mackin*, *Arthur D. Howard*, and *Marie Morisawa* student research awards.

■ The **Sedimentary Geology Division** (est. 1985) works to ensure the presentation of sedimentary-related topics and sessions at GSA meetings and actively nurtures the work of students by offering the *Sedimentary Geology Division Student Research Grant Award*, *Student Poster Awards*, and by providing financial aid for students to attend Division-sponsored short courses and field trips. Additionally, the Division sponsors the *Stephen E. Laubach Research in Structural Diagenesis Award* (alternating with the Structural Geology and Tectonics Division) and the *Laurence L. Sloss Award* for outstanding accomplishments in sedimentary geology and contributions to GSA.

■ The **Structural Geology and Tectonics Division** (est. 1980) focuses on the geometry and mechanisms of natural and experimental deformation at all scales and works to promote the research of scientists in these fields and facilitate communication and discussion at all levels of the earth sciences. This Division offers a *Career Contribution Award* for advancement of the science of structural geology and tectonics, an *Outstanding Publication Award,* and the *Division Student Research Grant Awards*. Additionally, the Division sponsors the *Stephen E. Laubach Research in Structural Diagenesis Award* (alternating with the Sedimentary Geology Division).

Thank You 2011 GeoCorps™ America Participants, Partners, and Donors!

Katherine Jepson, Bureau of Land Management, Craters of the Moon National Monument.

GeoCorps™ America places geoscientists of all levels—university students, teachers, professionals, and retirees—in short-term geoscience projects on public lands throughout the United States. GeoCorps projects are hosted by three major federal partners—the National Park Service (NPS), the U.S. Dept. of Agriculture (USDA) Forest Service, and the Bureau of Land Management (BLM). Projects cover a wide variety of subjects related to the geosciences, including geology, hydrology, paleontology, soils, geohazards, mapping, GIS, education, and interpretation. GeoCorps positions funded by GSA, its federal partners, the GSA Foundation, and the organizations and individuals listed herein.

Most GeoCorps jobs are during the spring and summer, but we now have some in the fall and winter, and the program now includes diversity and American Indian internships.

GeoCorps is also sponsored by the following organizations that support public lands:

Badlands Natural History Association
Bryce Canyon Natural History Association
Canyonlands Natural History Association
Discover Your Northwest
Friends of the Florissant Fossil Beds
Glacier Natural History Association
Grand Canyon Association
Pinchot Institute for Conservation
Rocky Mountain Nature Association

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Federal Partners

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U.S. Dept. of Agriculture (USDA) Forest Service
Bureau of Land Management (BLM)

Major Donors

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Association for Women Geoscientists (AWG)
ENVIRON Foundation

Special thanks to Sally Newcomb for supporting multiple GeoCorps positions in Alaska's parks, and to **Liz Lovelock** for supporting GeoCorps work at John Day Fossil Beds National Monument in memory of Christopher Lovelock.

Positions for spring/summer 2012 will be posted 1 Dec. 2011.
Positions for fall/winter 2012 will be posted 1 May 2012.

www.geosociety.org/geocorps/

FALL/WINTER 2010–2011 GEOCORPS PARTICIPANTS

Bureau of Land Management

Jason Frels, BLM Public Lands, Washington D.C. Office

National Park Service

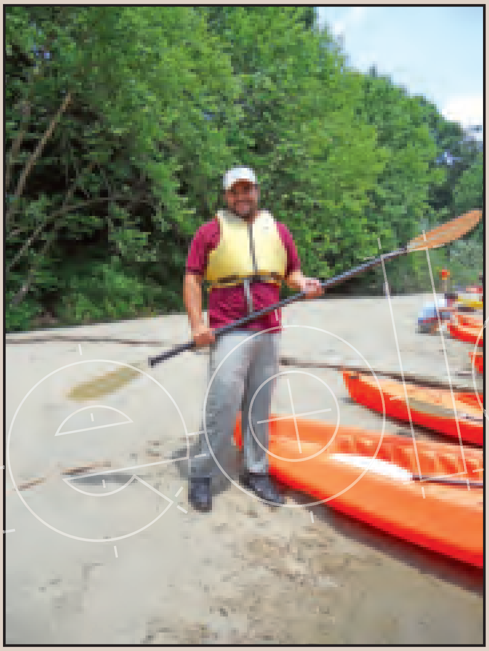
Kate Dallas, NPS Geologic Resources Division
Liz Dengler, Rocky Mountain National Park
Kim Elson, Big Thicket National Preserve
David Santaniello, Yosemite National Park
Elena Sipe, Mount Rainier National Park
Zoe Vulgaropulos, Catoctin Mountain Park
Laura Walkup, Mount Rainier National Park

Julia Schwarz, National Park Service, Chesapeake and Ohio Canal National Historical Park.

SPRING/SUMMER 2011 GEOCORPS PARTICIPANTS

Bureau of Land Management

Victoria Barnsbee, National Historic Oregon Trail Interpretive Center
Vanessa Calder, McInnis Canyons National Conservation Area
Gayle Eisner, Upper Missouri River Breaks National Monument
David Eitelberg, National Landscape Conservation System (NLCS)
Bryan Escamilla, Fairbanks (Alaska) District Office
Kathryn Estes-Smargiassi, Price (Utah) Field Office
Alyssa Ferraro, Craters of the Moon National Monument
Shane Folk, Royal Gorge (Colo.) Field Office
Ovidiu Frantescu, Gunnison Gorge National Conservation Area & Wilderness
Zane Havens, Dominguez-Escalante National Conservation Area
Katherine Jepson, Craters of the Moon National Monument
Karen Lloyd, Royal Gorge (Colo.) Field Office
Maxine Paul, National Historic Trails, New Mexico State Office
Mitra Sartipi, Arizona Strip District (Utah)



Ruben Cano, National Park Service, Delaware Water Gap National Recreation Area.

National Park Service

Hani Al-Twaijri, Oregon Caves National Monument
Jane Barnes, Cape Cod National Seashore
Eleanor Bash, Glacier National Park
Diane Butler, Craters of the Moon National Monument and Preserve
Ruben Cano, Delaware Water Gap National Recreation Area
Molly Chamberlin, Grand Teton National Park
Scott Cherba, Grand Canyon National Park (North Rim)
Devin Cherry, Fossil Butte National Monument
Laura Clarke, Florissant Fossil Beds National Monument
Ryan Doucette, Mammoth Cave National Park
Andrew Farrar, Delaware Water Gap National Recreation Area
Lee Finley-Blasi, Grand Teton National Park
Corrie Floyd, Mount Rainier National Park

Participants continued on p. 18

GeoCorps participants continued from p. 17

John Gagnon, Statue of Liberty National Monument, Governors Island National Monument, and Ellis Island
Drew Gentry, White Sands National Monument
John Ghist, NPS Geologic Resources Division
Leah Hall, Oregon Caves National Monument
William Hudacek, Fire Island National Seashore, Sagamore Hill National Historic Site, and Gateway National Recreation Area
Christopher Hughes, Bryce Canyon National Park
Jamie Kendall, Oregon Caves National Monument
Rachel King, Oregon Caves National Monument
Brandin Krempasky, Death Valley National Park
Taormina Lepore, Fossil Butte National Monument
Katharine Loughney, Chesapeake and Ohio Canal National Historical Park
Eva Lyon, NPS/AGI offices (Alexandria, Va.)
Kaitlin Maguire, John Day Fossil Beds National Monument
Pamela Marsh, Gulf Islands National Seashore
Adrian Maxwell, Florissant Fossil Beds National Monument
Jacob McDermott, Gateway National Recreation Area
Kelly McElwaine, NPS Natural Resource Program Center
Win McLaughlin, John Day Fossil Beds National Monument
Keegan Melstrom, Dinosaur National Monument
Allison Mills, Oregon Caves National Monument
Levi Moxness, Badlands National Park
Jonathan Munnikhuis, Bryce Canyon National Park
Chelsea Neill, Mount Rainier National Park
Karen Neumaier, Valley Forge National Historical Park
John Niles, Craters of the Moon National Monument and Preserve
Joanna Panosky, Dinosaur National Monument
Heather Parker, Mount Rainier National Park
Nancy Parker, Denali National Park
Rebecca Port, NPS Geologic Resources Division
Mariah Richards, Denali National Park
Janelle Rohweller, Grand Canyon National Park
Jeffrey Rosenthal, Grand Portage National Monument and Pipestone National Monument
Julie Rozen, Dinosaur National Monument
Nikole Rutters, Mount Rainier National Park
Julia Schwarz, Chesapeake and Ohio Canal National Historical Park
Alisa Scott, Mount Rainier National Park
Carolyn Sexton, Canyonlands National Park
Mandy Toong, Katmai National Park and Preserve
Jennifer Trout, Guadalupe Mountains National Park
Cynthia Valle, Grand Canyon National Park
Phil Varela, Chaco Culture National Historical Park
Lindsay Walker, Florissant Fossil Beds National Monument
Jeremy Wei, Glacier National Park
Delphine Woodman, Assateague Island National Seashore

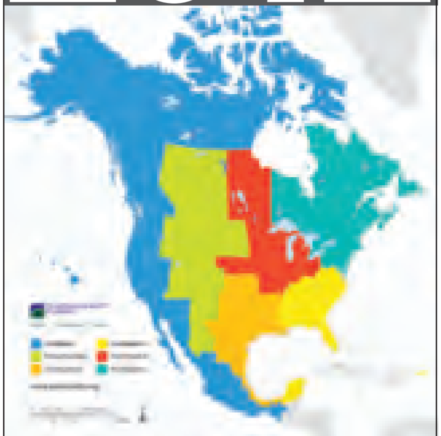
USDA Forest Service

Kathryn Carlson, Huron-Manistee National Forest
Taylor Crist, Beaverhead-Deerlodge National Forest
Paul Doss, Huron-Mansitee National Forest
Edgar Gelabert, Gila National Forest
Sarra Guisse, Shasta-Trinity National Forest
Joel Harrington, Klamath National Forest
Bethany Ladd, Medicine Bow-Routt National Forests
Erik Larson, Hiawatha National Forest
Erin Lynch, Tongass National Forest
Kelly McElwaine, Fraser Experimental Forest, Arapaho-Roosevelt and Medicine Bow National Forests
Natalie Rossington, Sierra National Forest
Elizabeth Rozar, Plumas National Forest
Jon Sanfilippo, Willamette National Forest
Brittany Smith, Fraser Experimental Forest, Arapaho-Roosevelt and Medicine Bow National Forests
Daniel Solway, Custer, Shoshone, and Gallatin National Forests
Brynne Storsved, Huron-Manistee National Forest
Abeje Temesgen, Shasta-Trinity National Forest
Paul Wilcox, Tongass National Forest

Erin Lynch and Paul Wilcox, USDA Forest Service, Tongass National Forest.

Paul Wilcox, USDA Forest Service, Tongass National Forest.

2012



SOUTH-CENTRAL
7–9 March 2012
Alpine, Texas, USA
Local Committee Chair: Kevin Urbanczyk
Abstracts deadline: 6 Dec. 2011
Early reg. deadline: 6 Feb. 2012

NORTHEASTERN
18–20 March 2012
Hartford, Connecticut, USA
Local Committee Chair: Jean Crespi
Abstracts deadline: 13 Dec. 2011
Early reg. deadline: 13 Feb. 2012

CORDILLERAN
29–31 March 2012
Querétaro, Mexico
Local Committee Chair: Luca Ferrari
Abstracts deadline: 10 Jan. 2012
Early reg. deadline: 27 Feb. 2012

SOUTHEASTERN
1–2 April 2012
Asheville, North Carolina, USA
Local Committee Co-Chairs: Blair Tormey; Cheryl Waters-Tormey
Abstracts deadline: 17 Jan. 2012
Early reg. deadline: 27 Feb. 2012

NORTH-CENTRAL
23–24 April 2012
Dayton, Ohio, USA
Local Committee Co-Chairs: Charles Ciampaglio; Angie Clayton
Abstracts deadline: 24 Jan. 2012
Early reg. deadline: 19 Mar. 2012

ROCKY MOUNTAIN
9–11 May 2012
Albuquerque, New Mexico, USA
Local Committee Chair: Laura Crossey
Abstracts deadline: 14 Feb. 2012
Early reg. deadline: 2 Apr. 2012

GSA Section Meeting Schedule

GSA Section Mentor Programs

STUDENTS

Are you interested in a career in the applied geosciences?

Plan now to attend a Roy J. Shlemon Mentor Program in Applied Geoscience and/or a John Mann Mentors in Applied Hydrogeology Program at your 2012 Section Meeting to chat one-on-one with practicing geoscientists. These volunteers will answer your questions and share insights on how to get a job after graduation. Learn more at **www.geosociety.org/mentors/.**

PROFESSIONALS

Are you interested in sharing information about your applied geoscience career with students?

Being a mentor is a rewarding experience. If you are interested in serving as a mentor at one of the GSA Section Meetings, please contact Jennifer Nocerino at jnocerino@geosociety.org.

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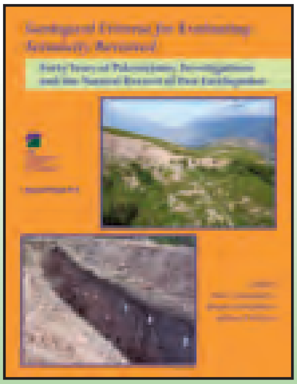
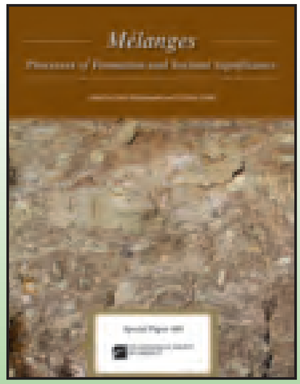
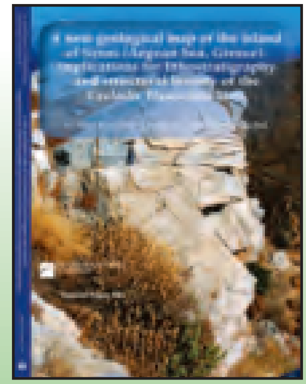


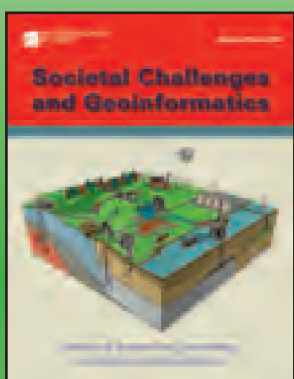
Geological Criteria for Evaluating Seismicity Revisited: Forty Years of Paleoseismic Investigations and the Natural Record of Past Earthquakes
edited by Franck A. Audemard M., Alessandro Maria Michetti, and James P. McCalpin
SPE479, 204 p., ISBN 9780813724799
$80.00 | **member price $56.00**



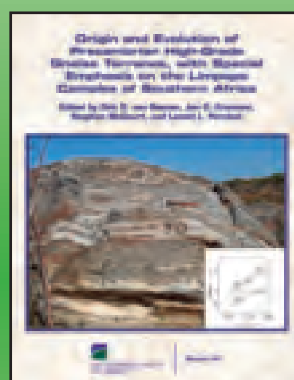
Mélanges: Processes of Formation and Societal Significance
edited by John Wakabayashi and Yildirim Dilek
SPE480, 277 p., ISBN 9780813724805
$90.00 | **member price $63.00**



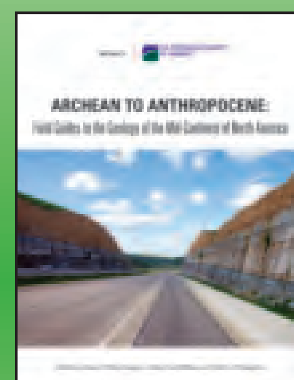
A new geological map of the Island of Syros (Aegean Sea, Greece): Implications for lithostratigraphy and structural history of the Cycladic Blueschist Unit
by Mark Keiter, Chris Ballhaus, and Frank Tomaschek
SPE481, 43 p. plus CD-ROM, ISBN 9780813724812
$40.00 | **member price $32.00**



Societal Challenges and Geoinformatics
edited by A. Krishna Sinha, David Arctur, Ian Jackson, and Linda Gundersen
SPE482, 191 p., ISBN 9780813724829
$90.00 | **member price $63.00**



Origin and Evolution of Precambrian High-Grade Gneiss Terranes, with Special Emphasis on the Limpopo Complex of Southern Africa
edited by Dirk D. van Reenen, Jan D. Kramers, Stephen McCourt, and Leonid L. Perchuk
MWR207, 324 p., ISBN 9780813712079
$99.00 | **member price $73.00**



Archean to Anthropocene: Field Guides to the Geology of the Mid-Continent of North America
edited by James D. Miller, George J. Hudak, Chad Wittkop, and Patrick I. McLaughlin
FLD024, 544 p., ISBN 9780813700243
$60.00 | **member price $45.00**

Field Guide to Samos and the Menderes Massif: Along-Strike Variations in the Mediterranean Tethyan Orogen
by Klaus Gessner, Uwe Ring, and Talip Güngör
FLD023, 52 p., ISBN 9780813700236
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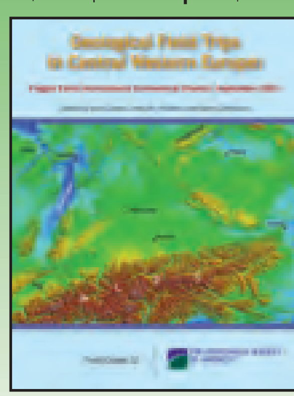
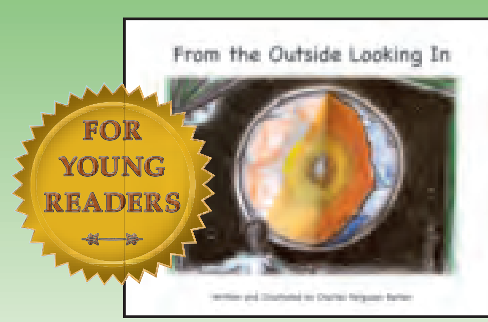


Geological Field Trips in Central Western Europe: Fragile Earth International Conference, Munich, September 2011
edited by Sara Carena, Anke M. Friedrich, and Bernd Lammerer
FLD022, 125 p., ISBN 9780813700229
$40.00 | **member price $35.00**



From the Outside Looking In
written and illustrated by Charles Ferguson Barker
OUTSIDE, 28 p., 9.75″ × 7.75″ paperback with black-and-white illustrations,
ISBN 9780813760339
$9.95 (sorry, no additional discounts)

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NORTH-CENTRAL

46th Annual Meeting of the North-Central Section, GSA
Dayton, Ohio, USA
23–24 April 2012

www.geosociety.org/Sections/nc/2012mtg/

Change through Time

LOCATION

Located centrally within the Cincinnati Arch, where I-75 meets I-70, Dayton, Ohio, USA, is surrounded by “world-class” late Ordovician strata and within driving distance of the famous Devonian Silica Shale, which has produced many prized trilobites, fish, and crinoids.

CALL FOR PAPERS

Abstract deadline: 24 Jan. 2012

Please submit your abstract online at **www.geosociety.org/sections/nc/2012mtg/.** An abstract submission fee of US$12 for students and US$15 for all others will be charged. If you cannot submit an abstract online, please contact Nancy Wright, +1-303-357-1061, nwright@geosociety.org.

Theme Sessions

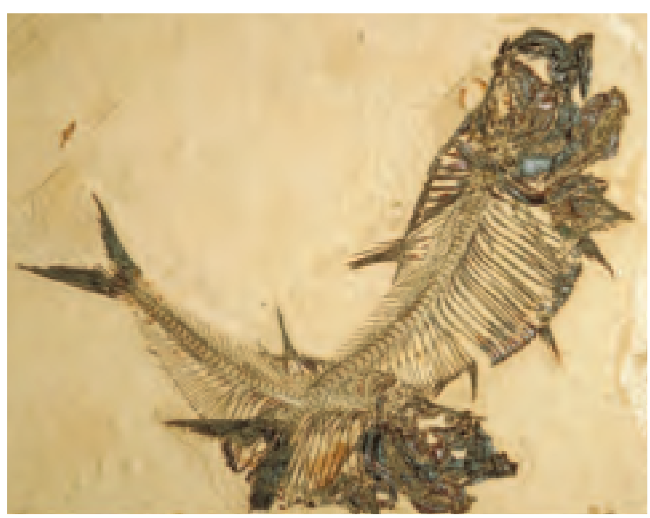
1. **Applications of Remote Sensing to the Geological and Environmental Sciences.** Doyle Watts, Wright State Univ., doyle.watts@wright.edu; Umesh Haritashya, Univ. of Dayton, Umesh.Haritashya@notes.udayton.edu.
2. **Mercury Biogeochemistry.** Chad R. Hammerschmidt, Wright State Univ., chad.hammerschmidt@wright.edu; Gary Conley, Ohio Univ., conleyg@ohio.edu.
3. **Special Poster Session on Undergraduate Research.** *Cosponsored by the Council on Undergraduate Research Geoscience Division.* Robert D. Shuster, Univ. of Nebraska, rshuster@unomaha.edu.
4. **Critical Thinking in Geoscience Education: Theory, Pedagogy, and Best Practices for K–16 Classrooms.** K.M. Bower Eastern Illinois Univ., kmbower@eiu.edu.
5. **Geoscience Student Engagement: Innovations in Labs, Activities, Field Trips, and In-Class Pedagogy for K–16 Classrooms.** Carrie L. Wright, Univ. of Southern Indiana, clwright@usi.edu.
6. **Issues in Geoscience Education.** Solomon Isiorho, Indiana Univ.–Purdue Univ. Fort Wayne, isiorho@ipfw.edu.
7. **Geoscience Education and Outreach: Bringing Cutting-Edge Science and Technology to Undergraduates, K–12 Teachers, and the Public.** *Cosponsored by National Assoc. of Geoscience Teachers North-Central Section.* Katherine Johnson, Eastern Illinois Univ., kjohnson4@eiu.edu; Shelley Judge, College of Wooster, sjudge@wooster.edu.
8. **Vertebrate Paleontology.** Jeremy L. Green, Kent State Univ. at Tuscarawas, jgreen72@kent.edu.
9. **Bridging the Gap between the Great Ordovician Biodiversification Event and Late Carboniferous Life: Conodonts, Climate Change, and Biodiversity Patterns.** *Cosponsored by Pander Society and IGCP Projects 591 and 596.* Mark Kleffner, The Ohio State Univ., mkleffner@lima.ohio-state.edu; Jeff Bauer, Shawnee State Univ., jbauer@shawnee.edu.
10. **Navigating Ancient Midwestern Seas: The Geologic Record of Flooding and Emergence on a Large Paleozoic Platform.** *Cosponsored by Great Lakes Section SEPM.* Don Mikulic, Illinois Geological Survey, mikulic@isgs.illinois.edu.
11. **Dimensions of Biodiversity: A Paleontological Perspective.** Alycia L Stigall, Ohio Univ., stigall@ohio.edu; Daniel I. Hembree, Ohio Univ., Hembree@ohio.edu.
12. **New Methods in Stratigraphic Analysis.** Daniel Goldman, Univ. of Dayton, dan.goldman@notes.udayton.edu.
13. **New Frontiers in Planetary Geology.** Keith A. Milam, Ohio Univ., milamk@ohio.edu.
14. **Applications, Quantification, and Modeling of Groundwater–Surface-Water Interactions.** Jonathan Levy, Miami Univ., levyj@mouhio.edu.
15. **Watersheds, Hydrogeology, and Environmental Site Investigation in the Midwest Basin and Arches Region.** E. Scott Bair, The Ohio State Univ., bair.1@osu.edu; Robert W. Ritzi Jr., Wright State Univ., robert.ritzi@wright.edu.

16. **Climate Change: Past, Present and Future.** Shuang-Ye Wu, Univ. of Dayton, swu526@gmail.com.
17. **Issues in Geology and Public Policy: A Clash of Cultures/An Intersection of Interests.** *Cosponsored by GSA Geology and Society Division; GSA Geology and Public Policy Committee.* Mike Phillips, Illinois Valley Community College, mike_phillips@ivcc.edu.
18. **Economic Development and State Geological Surveys.** Larry Wickstrom, Ohio Geological Survey, Larry.Wickstrom@dnr.state.oh.us.
19. **Geothermal Resources of the Central United States—An Important Source of Renewable Energy.** Mike Angle, Ohio Division of Natural Resources Geologic Mapping & Industrial Minerals Section, mike.angle@dnr.state.oh.us.
20. **The Museum as Geological Muse: Outreach, Online Catalogs, Blogs, Student Internships, and More.** Joe Hannibal, Cleveland Museum of Natural History, jhanniba@cmnh.org; Brenda Hunda, Cincinnati Museum Center, BHunda@cincymuseum.org.
21. **Geoarchaeology and Cultural Geology: Exploring the Geological Aspects of Archaeological and Cultural Materials and Settings.** Andrew Bauer, DePauw Univ., andrewbauer@depauw.edu; Joe Hannibal, Cleveland Museum of Natural History, jhanniba@cmnh.org.
22. **Shales during the Devonian: Facies Observed through New Stratigraphic, Sedimentologic, and Paleoenvironmental Perspectives.** Gordon Baird, SUNY Fredonia, baird@fredonia.edu; Jeff Over, SUNY Geneseo, over@geneseo.edu; Charles Ver Straeten, New York State Geological Survey, cverstra@mail.nysed.gov.
23. **Near-Surface Geophysics.** Ernie Hauser, Wright State Univ., ernest.hauser@wright.edu.
24. **Below the Mount Simon Sandstone of Ohio, Indiana, and Kentucky.** Ernie Hauser, Wright State Univ., ernest.hauser@wright.edu.
25. **Explorations in Mineralogy and Petrology: The View from the Midcontinent.** Andrea Koziol, Univ. of Dayton, Andrea.Koziol@notes.udayton.edu; Allen J. McGrew, Univ. of Dayton, Allen.Mcgrew@notes.udayton.edu.
26. **Constructed Wetlands: Boom or Bust?** Michael Enright, Five Rivers MetroParks, Michael.Enright@metroparks.org; Donald Geiger, Univ. of Dayton, Don.Geiger@notes.udayton.edu; James Amon, Wright State Univ.
27. **Biogeochemistry of Natural and Restored Wetlands and Their Role in Treatment of Contaminated Water and Wastewater.** Abinash Agrawal, Wright State Univ., abinash.agrawal@wright.edu.
28. **CO_2 Sequestration.** Neeraj Gupta, Batelle Labs, gupta@battelle.org.

FIELD TRIPS

Premeeting

1. **The Serpent Mound Impact Crater and Paleozoic Stratigraphy of Southern Ohio.** Two-day trip; departs Fri., 20 Apr., 5 p.m.; returns Sat., 21 Apr., 9 p.m. US$177. Max.: 22. Keith A. Milam, Ohio Univ.
2. **Lower Silurian of West-Central Ohio and the Case of the Disappearing Dayton.** One-day trip, Sat., 21 Apr.; departs 8 a.m.; returns 5 p.m. US$81. Max.: 16. Mark Kleffner, The Ohio State Univ. at Lima; Bradley Cramer, Kansas Geological Survey/Univ. of Kansas; Carlton Brett, Univ. of Cincinnati.
3. **Bourbon and Springs in the Bluegrass Region of Kentucky.** One-day trip, Sat., 21 Apr.; departs 6:45 a.m.; returns 6:45 p.m. US$81. Max.: 22. Alan Fryar, Univ. of Kentucky; Ashley Barton, Univ. of Kentucky.
4. **Introduction to the Geology of Dayton and Environs for Earth-Science Teachers.** One-day trip, Sat., 21 Apr.; departs 9 a.m.; returns 5 p.m. US$66. Max.: 20. Michael R. Sandy, Univ. of Dayton.
5. **Upper Ordovician Strata of Southern Ohio-Indiana: Shales, Shell Beds, Storms, Sediment Starvation, and Cycles.** One-day trip, Sun., 22 Apr.; departs 9 a.m.; returns 8 p.m. (includes evening meal). US$83. Max.: 27. Benjamin Datillo, Indiana Univ.–Purdue Univ. Fort Wayne; Carlton Brett, Univ. of Cincinnati; Thomas Schramm, Louisiana State Univ.
6. **Scales of Stream Study in West-Central Ohio.** One-day trip, Sun., 22 Apr.; departs 8 a.m.; returns 5 p.m. US$76. Max.: 18. John Ritter, Wittenberg Univ.
7. **Dayton Region Geology in Core and Outcrop—A Field Guide for Citizens, Environmental Investigators, Geologists, and Educators.** One-day trip (morning workshop and afternoon field trip), Sun., 22 Apr.; begins 9 a.m.; returns 5 p.m. US$71. Max.: 22. Gregory A. Schumacher, Michael P. Angle, Douglas J. Aden, Ohio Dept. of Natural Resources Division of Geological Survey; Brian E. Mott, DLZ Ohio Inc.



8. **The First Fossil-Vertebrate Locality in North America—"Big Bone Lick," Kentucky.** One-day trip, Sun., 22 Apr.; departs 8 a.m.; returns 6 p.m. US$134. Max.: 20. Richard Arnold Davis, College of Mount St. Joseph; Stanley Hedeen, Xavier Univ.; H. Gregory McDonald, National Park Service; Kenneth B. Tankersley, Univ. of Cincinnati.
9. **Fossil Collecting from the Middle Devonian Silica Shale, West-Central Ohio.** One-day trip, Sun., 22 Apr.; departs 9 a.m.; returns 5 p.m. US$90. Max.: 20. Dave Mielke, Botkins, Ohio; Alex Fabian, Michigan; Michael R. Sandy, Univ. of Dayton.

During the Meeting

10. **Downtown Dayton Walking Tour: Building Stones, Geology, and Commemorating 99 years since the Dayton Flood of 1913.** Two-hour walking tour, Tues., 24 Apr.; departs 2 p.m.; returns 4 p.m. US$17. Max.: 24. Michael R. Sandy, Univ. of Dayton.

REGISTRATION

Early registration deadline: 19 Mar. 2012
Cancellation deadline: 26 Mar. 2012

Online registration opens Dec. 2011. For further information, or if you need special accommodations, please contact the general chair, Chuck Ciampaglio, at chuck.ciampaglio@wright.edu.

ACCOMMODATIONS

Hotel registration deadline: 30 Mar. 2012

The meeting will take place at the Dayton Convention Center. A block of rooms has been reserved at the Crowne Plaza Hotel, directly across from the convention center at 33 East Fifth Street, Dayton, Ohio 45402, USA. The group rate is US$104/night +13% tax. Please make your reservations by calling +1-888-233-9527 and requesting the 2012 GSA North-Central Section Meeting group rate.

GSA Foundation Update

Donna L. Russell, Director of Operations

If GSA & GSAF Had All the Money in the World…

Several years ago the Foundation asked several GSA members what they would do "If GSA/GSAF had all the money in the world." The following are some of the comments the Foundation (GSAF) has received over the years.

- "Spend our ill-gotten gains on education, for every level but mostly for the young (primary and secondary students) and lay people (via museums perhaps) to let them know about geology and the 'new' look of the field as the base on which we have to conduct our lives from personal to global health and for all those 'things' we enjoy."
- "I would suggest that we help students, particularly those making presentations at the meetings, to go to the meetings, with a travel subsidy for both annual and section meetings. I would also increase the amount of money available for research grants and fund several more mentor meetings for students."
- "To build a facility and provide service at minimal fees in training in 'field geology' and to establish a GSA sponsored Field Geology Institute!"
- "Create a national repository for all core, rock, and mineral samples that no longer have available storage space. This facility should be able to accept material as well as loan it out to researchers. So, it will need a 'rock librarian'."
- "Set up a nationwide program to help train and retrain elementary, middle school, and high school teachers in geology and geophysics to be able to raise the awareness of our science. An integral part of this program should incorporate either an abbreviated field camp or field trip to famous geologic sites. This will allow those teachers to teach to the National Science Standards. It may also help train them to be able to teach an Advanced Placement test level geology course."
- "Provide funds for undergraduate field and laboratory research similar to the current program available for graduate thesis research."
- "Be able to publish and make accessible all maps that are done for student research. This should include funds to make them accessible digitally as well as print versions."
- "Be able to subsidize the costs for all participants in Penrose and field conferences."
- "Enable the GSA to develop much more 'outreach,' particularly to other geological professionals who are not now members. For example, provide funds to non-Ph.D. professionals working in the applied sciences. Set up sabbaticals for them, either at major universities, or at a series of seminars, preferably hosted by the GSA."
- "Permit full-time academic members to take jobs in industry, at least for a short time, and not jeopardize their tenure or academic standing. How wonderful for them to return to the classroom and describe 'real world' problems to students. Both academia and industry will greatly benefit."
- "I would increase the student grants program to make more available, increase stipends available to bring more foreign scholars to GSA meetings, including Penrose Conferences, and make sure that there are adequate funds for operation of the Foundation."

What would be your suggestion? You can e-mail the GSA Foundation at drussell@geosociety.org, or go to our website at gsafweb.org.

Digging Up the Past

Most memorable early geologic experience:

Growing up on the shores of Lake Erie, I marveled at the storm waves that thundered against the shale cliffs yet painted intricate patterns in the heavy mineral sands on the beach. I think this is the reason I became a geologist!

—James Ebert

About People

Learn more about these accomplished GSA members and Fellows and find more member news at **www.geosociety.org/news/memberNews.htm.**

15 Sept.: GSA Fellow **Paul Hsieh**, a research hydrologist for the U.S. Geological Survey, has earned the Federal Employee of the Year medal for providing critical scientific information during the Deepwater Horizon oil spill.

14 Sept.: GSA Member **Joan Kleypas**, a marine ecologist and geologist at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, USA, has been named the 2011 recipient of the Heinz Award for her work studying the effects of climate change on coral reefs. The Heinz Award recognizes excellence in “individuals creating and implementing workable solutions to the problems the world faces through invention, research, and education, while inspiring the next generation of modern thinkers.”

31 Aug.: GSA Fellow **Philip Christensen**, principal investigator for numerous instruments of Mars exploration carried on NASA spacecraft, has been named the 2011 Eugene Shoemaker Memorial Award recipient by Arizona State University in honor of his life’s work on “Unlocking the Mysteries of the Red Planet.”

30 June: GSA member **Alfred McEwen**, professor of planetary science at the University of Arizona’s Lunar and Planetary Laboratory, has been awarded NASA’s Distinguished Public Service Medal for his work as principal investigator on the High Resolution Imaging Science Experiment (HiRISE) for the Mars Reconnaissance Orbiter.

THE GEOLOGICAL SOCIETY OF AMERICA®

In Memoriam

The Society notes with regret the deaths of the following members

(notifications received between 26 May and 28 July 2011).

Carey Brent Miller
Oklahoma City, Oklahoma, USA
Notified 26 May 2011

Russell R. Dutcher
Carbondale, Illinois, USA
Notified 3 June 2011

W.N. McKinney Jr.
Spring, Texas, USA
1 Aug. 2010

George R. Harlow
Paoli, Pennsylvania, USA
27 Apr. 2011

James V. Taranik
Reno, Nevada, USA
21 June 2011

David W. McDonald
Plano, Texas, USA
15 Mar. 2011

Edward J. Combs
Newburgh, Indiana, USA
1 Sept. 2009

GSA FOUNDATION

To honor one of these colleagues with a memorial, please go to www.geosociety.org/pubs/memorials/. This page also lists completed memorials, some of which are available for download.

If you would like to contribute to the GSA Memorial Fund, please contact the GSA Foundation at drussell@geosociety.org, +1-303-357-1054, gsafweb.org.

Penrose Conference Report

Deformation Localization in Rocks: New Advances

Cadaqués and Cap de Creus Peninsula, Catalonia, Spain
27 June–2 July 2011

CONVENERS

Elena Druguet, *Depto. de Geologia, Universitat Autónoma de Barcelona, Spain; Elena.druguet@uab.cat*

Jordi Carreras, *Depto. de Geologia, Universitat Autónoma de Barcelona, Spain; jordi.carreras@uab.cat*

G. Ian Alsop, *Dept. of Geology & Petroleum Geology, School of Geosciences, University of Aberdeen, UK; ian.alsop@abdn.ac.uk*

Paul D. Bons, *Institut für Geowissenschaften, Eberhard Karls Universität Tübingen, Germany; paul.bons@uni-tuebingen.de*

Dyanna M. Czeck, *Dept. of Geosciences, University of Wisconsin, Milwaukee, Wisconsin 53201, USA; dyanna@uwm.edu*

Peter J. Hudleston, *Dept. of Geology and Geophysics, University of Minnesota, Minneapolis, Minnesota 55455-0213, USA; hudle001@umn.edu*

Christine S. Siddoway, *Geology Dept., Colorado College, Colorado Springs, Colorado 80903, USA; csiddoway@coloradocollege.edu*

OVERVIEW

The past few decades have seen an intense interest in the localization of deformation in rocks, and the conference on "Shear Zones in Rocks" held in Barcelona in 1979 was a milestone marking this interest. A key part of that conference was the field trip to the extraordinary outcrops at the Cap de Creus peninsula. The interest in shear zones and localization of deformation has not abated since 1979 and perhaps has even intensified. There has been significant increase in our knowledge of the processes associated with deformation localization, from field and laboratory study, from physical and computer modeling, and from theoretical considerations. We know more about the chemical and physical influence of fluids on deformation, and we recognize that deformation in many shear zones departs significantly from simple shear and that flow may be channeled in the crust. Criteria have been developed to establish the degree of non-coaxiality or vorticity of deformation. The ability to determine the pressure, temperature, and timing of flow in various tectonic settings has improved dramatically. It was highly appropriate to return to Cadaqués for this conference, which allowed the participants to discuss new ideas on deformation localization in the lecture room and poster hall, and in the field in the wonderful natural laboratory at Cap de Creus.

Field Trips and Presentations

The papers presented at this conference reflected the multifaceted work being carried out on deformation localization and do not lend themselves to easy characterization.

The conference began with a field trip on Monday, 27 June, to visit classic outcrops of shear zones in granitoids and the complex high-temperature–high strain zone at Puig de Culip. This set the stage for the first lecture sessions on Tuesday in Cadaqués on the geometry and kinematics of shear zones. Keynote lectures were given by Jordi Carreras, who discussed some problems of coupling strain, kinematics, and tectonic regimes; and Cees Passchier, who presented a typology of complex shear zones. An afternoon session was dedicated to further aspects of shear zone initiation and development, starting with a keynote lecture by Laurel B. Goodwin on the controls on deformation localization. Wednesday was spent examining the classic outstanding outcrops along the Cala Serena–Cala Prona shear zone, which encouraged active discussion among participants. On Thursday, the topic switched to strain localization with regard to fluids, melts, and metamorphism. Neil Mancktelow presented a keynote lecture on brittle precursors, fluid-rock interaction, and the localization or spreading of shear zones. The topic moved to structures and fabrics that are found in shear zones, beginning with a talk by John W. Cosgrove on rock anisotropy, buckling, and strain localization. In the evening, a boat cruise highlighted the magnificent outcrops along the rocky coastal cliffs of Cap de Creus. On Friday, conference participants visited the Tudela area to examine complex shear zones in areas of strong rheological contrast between different rocks and the Cap de Creus Lighthouse to view the effects of deformation on partial melts and pegmatite intrusions. Saturday marked a return to the lecture room for a session on physical and numerical experiments on strain localization and a final session on localization on a large scale, which included keynote lectures by Scott Johnson on the effects of strain localization on elastic anisotropy and John Watkinson on deformation localization in orogens.

The total number of oral presentations during the conference was 44; 25 posters covering the range of topics presented in the lectures were the focus of attention in the evenings and during breaks between lecture sessions.

Concluding Remarks

Ideas and discussions resulting from the field trips and presentations were significant, and the outcome of the conference will likely have great repercussions on the fields of structural geology and tectonics as well as on the importance of linking multiple research approaches to understand the processes that lead to strain localization in rocks. A special issue of papers on the conference topics is being prepared in *Journal of Structural Geology*.

Participants: Domingo G.A.M. Aerden, Joseph L. Allen, G. Ian Alsop, Uwe Altenberger, Sayandeep Banerjee, Whitney M. Behr, Paul D. Bons, Michael Brown, Giovanni Capponi, Sharon Carr, Jordi Carreras, Vasilios Chatzaras, Moonsup Cho, John W. Cosgrove, Juliet G. Crider, Laura Crispini, Dyanna M. Czeck, George H. Davis, Elena Druguet, Gregory Dumond, Åke Fagereng, Elisa Fitz-Díaz, Anne-Céline Ganzhorn, Christopher Gerbi, Amanda Getsinger, Scott Giorgis, Eric T. Goergen, Philippe Goncalves, Laurel B. Goodwin, Lars Hansen, Tekla A. Harms, Katherine Higgie, Mary Louise Hill, Peter J. Hudleston, David Iacopini, Micah J. Jessup, Dazhi Jiang, Scott E. Johnson, Daniel S.H. King, Keith Klepeis, Hemin Koyi, Seth C. Kruckenberg, Yvette Kuiper, Loic Labrousse, Richard J. Lisle, M.-Gema Llorens, Manish Mamtani, Neil Mancktelow, Laurent G.J. Montési, Emilien Oliot, Cees W. Passchier, Giorgio Pennacchioni, Emily M. Peterman, John P. Platt, Carlos Ponce, Nancy A. Price, Jacqueline Reber, Stefan M. Schmalholz, Dani W. Schmid, José Sellés-Martínez, Christine S. Siddoway, Manuel Sintubin, Emma Soldevila, Walter A. Sullivan, Christopher Talbot, Ingrid Terricabres, Sarah Titus, Andréa Tommasi, Virginia G. Toy, José María Tubía, Alain Vauchez, A. John Watkinson, Paris Xypolias, Adolph Yonkee.

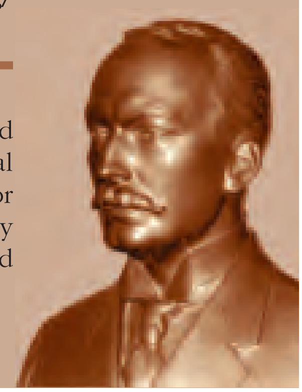
Penrose Conference and Field Forum Proposals Encouraged

PENROSE CONFERENCES

GSA's Penrose Conferences were established in 1969 to provide opportunities for the exchange of current information and exciting ideas in geology and related fields and to stimulate and enhance individual and collaborative research. Go to **www.geosociety.org/Penrose/** for guidelines and a proposal form.

FIELD FORUMS

Have a great idea for a Penrose Conference that would be much more effective in a field setting or a field trip idea that captures the essence of new discoveries or a controversial topic? Then submit a Field Forum proposal! Field Forums provide an opportunity for the exchange of current knowledge and ideas that are well expressed by the geology of a specific area. Go to **www.geosociety.org/fieldforums/** for proposal guidelines and more information.



QUESTIONS? Contact Becky Sundeen, +1-303-357-1041, bsundeen@geosociety.org.

Positions Open

TENURE TRACK FACULTY POSITION LOW-TEMPERATURE/ ENVIRONMENTAL GEOCHEMISTRY GEORGIA SOUTHERN UNIVERSITY

Georgia Southern University's Dept. of Geology and Geography invites applications for an Assistant Professor of Geology in with expertise in low-temperature or environmental geochemistry. The full text advertisement, including information about the department, faculty, and the complete position announcement with all qualifications and application instructions, is available at http://cost.georgiasouthern.edu/geo/. Screening of applications begins 21 Nov. 2011 and continues until the position is filled. Georgia is an open records state. Georgia Southern is an AA/EO institution. Individuals who need reasonable accommodations under the ADA to participate in the search process should contact the Associate Provost.

ENVIRONMENTAL STUDIES PROGRAM TENURE-TRACK, ASSISTANT PROFESSOR ADELPHI UNIVERSITY

The Environmental Studies Program at Adelphi University invites applications for a tenure-track position at the Assistant Professor level beginning August 2012. We seek an environmental scientist with research expertise in the coastal or estuarine system and the ability to teach courses in his/her specialty at the undergraduate and graduate level. The ideal candidate would have a strong field component to his/her research and provide an additional quantitative aspect to our interdisciplinary curriculum, possibly in water quality/ storm water, geochemistry, or some other aspect of marine environmental science. The candidate would be expected to join the Environmental Studies research group currently working on anthropogenic changes to the South Shore Estuary Reserve, and in collaboration with other Adelphi faculty, lead undergraduate and graduate research projects locally as well as at his/her study area. The candidate may be able to participate in our research course to Australia's Great Barrier Reef and rainforests. The successful candidate is expected to develop an active, externally funded research program at the undergraduate and graduate levels.

Applicants should have demonstrated teaching and research expertise in environmental science. Teaching responsibilities will include introductory Environmental Studies courses, Environmental Science, and the ability to develop new courses in his/her area of expertise for our interdisciplinary undergraduate and master's degree programs. The ability to teach GIS is a plus. A Ph.D. in a related field is required at the time of appointment. Post-doctoral research experience is preferred. To ensure full consideration, applications must be received by 15 Dec. 2011. Apply online at: www.adelphi.edu/positions/faculty.

For further information about the Dept. of Environmental Studies, go to academics.adelphi.edu/artsci/env/

Adelphi University is an AA/EOE Employer.

AFFILIATE PROFESSOR OF GEOLOGY GRAND VALLEY STATE UNIVERSITY

The Geology Dept. invites applicants for a full-time, non-tenure-track Affiliate faculty position, starting in the 2012–2013 academic year. We seek a creative and dynamic educator who can model effective pedagogy in geoscience content courses for K–8 preservice teachers and teach introductory geology courses as part of the general education program. We require at least a M.S. in Geosciences or Geoscience Education with demonstrated interest and experience with K–12 science education and a strong earth science background.

The teaching load will vary, drawing from geoscience content courses for K–8 preservice science teachers (GEO 201, 202, 203), elementary education majors (SCI 225: integrated life/earth science), and introductory geology courses, some with labs and/or large lectures (GEO 100, 105, 111). Many of these courses involve field trips or field experiences. The teaching load is typically 15 hours per semester. The position requires coordination and collaboration with Geology and Integrated Science faculty. This is a renewable position with an initial contract for one year.

We are particularly interested in creative educators who will contribute new activities and field experiences to those already developed by department faculty. We will encourage the successful candidate to work or form partnerships with local schools, participate in local or regional informal education activities, or participate in professional activities with students.

The Geology Dept. includes 11 tenure-track faculty and ~100 majors (Geology, Geology-Chemistry, Earth Science) and serves ~200 Integrated Science majors. The department values field experiences and collegial faculty-student interactions (see www.gvsu.edu/geology and www.gvsu.edu/isci).

Candidates should apply online at www.gvsujobs.org. Attach a letter of application, vitae, statements of teaching philosophy, and the names and contact information for at least three references familiar with your teaching and experience. Questions can be directed to Dr. Ginny Peterson, Dept. of Geology, Grand Valley State University, Allendale, MI 49401 (petersvi@gvsu.edu) (616-331-3728). Applications will be accepted until the position is filled. Review of applications will begin on 9 Jan. 2012. We strive to build a diverse and equitable community of scholars and teachers in our department and encourage all qualified applicants to apply regardless of gender, race, sexual orientation, disability and/or national origin. Grand Valley is an affirmative action, equal opportunity institution.

GEOPHYSICIST UNIVERSITY OF WISCONSIN–MILWAUKEE

The Dept. of Geosciences at the University of Wisconsin–Milwaukee welcomes applications for a tenure-track faculty position in geophysics at the rank of Assistant Professor with a start date of August 2012. Applicants must hold a Ph.D. in geology/geophysics or related field at the time of appointment, and have demonstrated research experience in geophysics.

Post-doctoral and teaching experience (TA and/or lecture) experience are desirable. Scientific publications, conference publications, and funding experience are preferred but not necessary. The successful candidate is expected to conduct an active, internationally recognized, externally funded research program. The successful candidate will teach a required introductory survey course in geophysics to undergraduate majors, upper level undergraduate and graduate level courses in their field of expertise, an introductory service course, and advise graduate student thesis projects. A standard teaching load is three 3-credit courses per academic year. This job posting is available online along with information regarding the Dept. of Geosciences and the College of Letters and Sciences at www4.uwm.edu/letsci/geosciences/dept_life/job_ad.cfm.

Review of applications will begin 23 Jan. 2012. Priority will be given to applications received by that date, but the position will remain open until filled. To apply, please go to http://jobs.uwm.edu/postings/7222. Candidates should upload a cover letter, curriculum vitae, statement of teaching philosophy, research interests, and examples of published works with the online application. Published works may be uploaded with the application as "Other Document." In addition, three letters of recommendation are required and should be mailed to: Lisa Alzalde, Search & Screen Support, Dept. of Geosciences, University of Wisconsin–Milwaukee, P.O. Box 413, Milwaukee, WI 53201 or emailed to: lalzalde@uwm.edu.

The University of Wisconsin–Milwaukee is a large, research-oriented institution located on the northeast side of Milwaukee, five blocks from Lake Michigan. The Dept. of Geosciences offers B.S./B.A., M.S., and Ph.D. degree programs and is staffed by 12 full-time faculty. UWM is an AA/EEO employer.

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

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

For additional information or nominations please contact Dr. Jonathan B. Martin, Thompson Chair Search Committee, Dept. of Geological Sciences, University of Florida, P.O. Box 112120, Gainesville, FL 32611-2120 (jbmartin@ufl.edu). Review of applications will begin immediately and will continue until the position is filled. To ensure full consideration please apply online at http://jobs.ufl.edu (requisition # 0806180). For full consideration, the application should include: (1) cover letter, (2) curriculum vitae, (3) statement of research, teaching, vision, and goals; (4) reprints of no more than three publications, and (5) the names of three colleagues who might be contacted for letters of recommendation. The University of Florida is an Equal Opportunity Institution. If an accommodation due to a disability is needed to apply for this position, please call (352) 392-2477 or the Florida Relay System at (800) 955-8771 (TDD). The selection process will be conducted under the provisions of Florida's "Government in the Sunshine" and Public Records laws.

SEDIMENTARY GEOLOGIST CALIFORNIA STATE UNIVERSITY–FRESNO

The Dept of Earth & Environmental Sciences at California State University–Fresno seeks a broadly trained, field-oriented geologist for a tenure-track assistant professor position in Sedimentary Geology or closely related field. Duties include teaching undergraduate and graduate level courses, mentoring students, conducting research in the area of expertise, and engaging in university service. Candidates are expected to demonstrate a commitment to and potential for teaching excellence, research, and scholarly activities, including successful grantsmanship and research publications. Applicants must hold an earned Ph.D. in geology or a related earth sciences field. Further information about the position and how to apply can be found at **http://apptrkr.com/207869** (vacancy # 11723). Individuals must submit an online application, including a letter of application, curriculum vitae, statements of teaching philosophy and research interests, and the names and contact information of five references. Three letters of recommendation should also be mailed directly to the search committee chair. For more information, please contact the search committee chair, Dr. Robert Dundas at rdundas@csufresno.edu. Information about the department can be found at http://csufresno.edu/geology. The position will remain open until filled. Full consideration will be given to those applications received by 5 Jan. 2012. We plan to conduct phone interviews of short-listed candidates during the first three weeks of January. We encourage applications from minorities, women, and other underrepresented groups. The University is actively committed to diversity, see www.csufresno.edu/diversity.

STRUCTURAL GEOLOGY, MARSHALL UNIVERSITY

The Geology Dept. at Marshall University is seeking to fill a tenure-track position at the Assistant or Associate Professor level for the 2012-2013 academic year. A Ph.D. is required at the time of appointment but outstanding A.B.D. candidates will also be considered. Primary responsibility is teaching undergraduate courses in structural geology, geologic mapping, and computer methods as well as introductory labs and lectures in physical geology. Additionally, ability to develop and teach a class in geophysics is desirable. The department also seeks candidates who will contribute to the university's general education curriculum, with its emphasis on a common first-year seminar and core curriculum courses that enhance student's critical thinking and the college's support of interdisciplinary programs of study.

Candidates must send a current curriculum vitae, statements of research plans and teaching philosophy, and copies of all transcripts. Candidates who are invited to campus for interviews must have official transcripts undergraduate and graduate sent by their degree-granting institutions prior to the interview date. Letters of recommendation will be requested at a later date from qualified candidates. Preferably, applications should be submitted electronically to niemann@marshall.edu as single PDF file, but may be mailed to Geology Search Committee, Dept. of Geology, One John Marshall Drive, Huntington, WV 25755, USA.

Applications are due 15 Nov. 2011. Marshall University is the recipient of an NSF ADVANCE grant and the U. S. Labor Dept.'s EVE Award for its Affirmative Action Employment Opportunity Programs. Potential applicants may visit www.marshall.edu/mu-advance/candidates.asp for additional information about Marshall University and Huntington.

ASSISTANT PROFESSOR, GEOLOGY DEPT. OF GEOGRAPHY AND GEOLOGY WESTERN KENTUCKY UNIVERSITY

The Dept. of Geography and Geology at Western Kentucky University (WKU) invites applications for a tenure-track position at the Assistant Professor rank in the general areas of structural geology, tectonics, geophysics, or related discipline, effective August 2012. An earned Ph.D. in geology or geophysics is required. The successful applicant is expected to develop a strong externally funded research program, teach high-quality undergraduate and graduate courses, encourage and supervise undergraduate and graduate research projects, and contribute to the growth of the department's M.S. program in Geosciences. Teaching duties include general education courses, structural geology, as well as upper-level undergraduate and graduate courses in the specialization. Other responsibilities include scholarly research leading to publication, university and public services, and attention to professional development. For more information about the Geology program can be found at www.wku.edu/geology. Information about the department can be found at www.wku.edu/geoweb.

Interested candidates must submit a letter of application, curriculum vita, unofficial transcripts, the names of four references, and separate statements of (1) teaching and (2) research philosophy to Dept. of Geography and Geology, Dr. Aaron Celestian, Western Kentucky University, 1906 College Heights Blvd #31066, Bowling Green, KY 42101-1066, aaron.celestian@wku.edu.

Review of applicants will begin **15 Dec. 2011**. Position will remain open until filled.

Western Kentucky University does not discriminate on the basis of race, color, national origin, sex, sexual orientation, disability, age, religion, or marital status in admission to career and technical education programs and/or activities, or employment practices in accordance with Title VI and VII of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, Revised 1992, and the Americans with Disabilities Act of 1990.

GEORGE MASON UNIVERSITY

ASSISTANT PROFESSOR

The George Mason University, Department of Atmospheric, Oceanic and Earth Sciences (AOES) invites applications for a full-time, tenure-track faculty position. The position is at the level of Assistant Professor to begin in the fall of 2012.

We seek a dynamic person with broad expertise in the areas of structural geology, tectonics and/or seismology. Experience with field-based research and incorporation of Appalachian geology into future teaching and research are a plus. Preference will be given to candidates whose expertise complements existing departmental teaching and research areas.

The successful candidate will be expected to pursue a vigorous externally-funded research program, aspire to teaching excellence, and engage in interdisciplinary collaboration. Teaching will be primarily at the undergraduate level including structural geology. A Ph.D. is required for this position.

AOES offers undergraduate degrees in Geology and Earth Science, and a Ph.D. in Climate Dynamics. Faculty includes geologists, atmospheric scientists and oceanographers. Additional information about the department may be found at **http://aoes.gmu.edu/.**

For full consideration, applicants must apply online at http://jobs.gmu.edu for position F6855z; complete the faculty application; and upload a cover letter/letter of intent, curriculum vitae, list of publications, contact information (including e-mail address) of three professional references, and teaching evaluations (if available).

Review of applications will begin November 15, 2011. Questions about this position may be addressed to Dr. David Straus, dstraus@gmu.edu, 703-993-9587.

EOE

GEORGE MASON UNIVERSITY

ASSISTANT PROFESSOR OF EARTH SCIENCE CARROLL COLLEGE

Carroll College, a Catholic, coeducational and comprehensive liberal arts college in Helena, Montana, invites applications for a full-time, tenure-track ASSISTANT PROFESSOR, to begin in August 2012. We seek a candidate with a strong commitment to teaching at an undergraduate institution. Primary responsibilities include a one-semester course in earth science, a one-semester course in physical geography, and an upper-level geology or related course in an area of interest, and participation in advising/administration of the Environmental Studies Program. Area of specialization is open, but demonstrated knowledge and ability to teach physical or environmental geology and physical geography is essential. The ability to develop an externally funded undergraduate research program is expected; a Ph.D. by August 2012 is required. Applicants should submit curriculum vitae, three letters of recommendation, a statement responding to Carroll's mission, and a statement of teaching and scholarly philosophy to: Natural Sciences Search Committee, Office of Human Resources, Carroll College, 1601 North Benton Avenue, Helena, MT 59625, USA, or electronically submitted to employment@carroll.edu. Priority will be given to application materials received by 15 Dec. 2011. To learn more about Carroll College, please visit our web site: www.carroll.edu. EOE. Women and minorities encouraged to apply.

TWO TENURE-TRACK ASSISTANT PROFESSOR POSITIONS IN MARINE GEOLOGY VIRGINIA INSTITUTE OF MARINE SCIENCE OF THE COLLEGE OF WILLIAM & MARY

The Dept. of Physical Sciences at the Virginia Institute of Marine Science of the College of William & Mary, located in Gloucester Point, Virginia, seeks applicants for tenure-track faculty positions to begin July 2012. Successful candidates will join a department that includes chemical, geological, and physical oceanography, a union which facilitates the synergy needed to address today's interdisciplinary research problems, environmental issues, and challenges. These hires are part of a larger strategic expansion within the institute, including multiple positions in the areas of Marine Geology, Physical Oceanography and Microbial Ecology.

Applicants with research interests in the broad areas of sedimentology, stratigraphy and climate change studies in the context of estuarine, coastal and continental margin environments are especially encouraged to apply, with a preference for those who employ quantitative approaches for understanding the geologic record of natural and anthropogenic processes affecting these environments. Such approaches may include, but are not limited to: geophysical data acquisition and processing, geospatial analysis, geochemistry, and analytical or numerical modeling. The successful candidates will be poised to take advantage of opportunities for interdisciplinary collaborations that abound at VIMS and the College of William & Mary.

The successful candidates will be expected to build exemplary research and publication programs, participate in the educational program, and provide service to the Commonwealth of Virginia. The successful candidates should be capable of teaching geological oceanography at the introductory graduate level, advanced graduate courses in their specialty, and ideally courses emphasizing cross-disciplinary approaches and quantitative methods.

For more information see the department web page: www.vims.edu/research/departments/physical/ or contact the search committee chairperson Steven A. Kuehl (Kuehl@vims.edu). The department web-page includes links to detailed job descriptions and the electronic application site at jobs.wm.edu, where requirements for the application package can be found. For full consideration, submit application materials by 1 Dec. 2011. Applications will be accepted until the positions are filled, however.

The employer is an equal opportunity/affirmative action university. Applications by persons from underrepresented groups are strongly encouraged.

STRUCTURE/TECTONICS/PETROLEUM SYSTEMS COLORADO STATE UNIVERSITY

The Dept. of Geosciences at Colorado State University seeks to fill a position in Structural Geology at the Assistant Professor level. The position is a 9-month tenure-track appointment with a preferred start date of 16 Aug. 2012. Requirements are a Ph.D. in geology or related discipline, a strong research record in structural geology focused on crustal deformation, and research and teaching interests that complement and enhance existing departmental strengths. Preference will be given to applicants with strong field skills, experience with petroleum systems, strong publication and external research funding records, and an ability to establish research and teaching programs that enhance department strengths in petroleum and mineral resources. The successful applicant is expected to teach at all levels and develop a vigorous externally funded research program supporting graduate students. Teaching assignments include an undergraduate course in structural geology, graduate courses in the hire's specialty, team-teaching undergraduate field course(s), and, on a rotational basis, an introductory geology course.

To apply and view a complete position description, please visit: http://warnercnr.colostate.edu/employment-opportunities.html by 5 p.m. on 1 Dec. 2011.
CSU is an EO/EA/AA employer. CSU conducts background checks on all final candidates.

TENURE-TRACK PIONEER NATURAL RESOURCES PROFESSOR IN STRATIGRAPHY UNIVERSITY OF KENTUCKY

The Dept. of Earth and Environmental Sciences at the University of Kentucky invites applications for the ***Pioneer Natural Resources Professor in Stratigraphy*** beginning August 2012. We are seeking to hire at the assistant professor level (tenure-track), but candidates at a more senior level will be considered. Applicants are expected to complement our existing programs in tectonics, geophysics, geochemistry and hydrogeology. We seek a field- and modeling-oriented candidate with expertise in basin analysis, and who is capable of using a variety of methods such as seismic stratigraphy, sequence stratigraphy, sedimentology, sedimentary geochemistry, organic petrology, scanning electron microscopy, clay mineralogy, and geostatistics. Multiple opportunities exist for cooperation with other academic units, including the Kentucky Geological Survey, the UK Center for Applied Energy Research, the Tracy Farmer Institute for Sustainability and the Environment, and the Kentucky Water Resources Research Institute. In addition to maintaining a productive externally funded research program, the new faculty member will teach courses at the introductory, major, and graduate levels, as well as mentor and direct graduate students. The successful candidate will have demonstrated a track record of publication and potential for developing an externally funded, nationally recognized research program; relevant experience beyond the Ph.D. is desirable. Interested applicants should submit via e-mail (merged pdf document): cover letter, curriculum vitae, brief statements of research and teaching interests, copies of relevant research publications, and contact information for at least three references to Edward Woolery (woolery@uky.edu), Stratigraphy Search Committee Chair. We will begin review of applications on 31 Oct. 2011; however, applications will be accepted until the position is filled. The University of Kentucky is an Affirmative Action/Equal Opportunity university that values diversity and is located in an increasingly diverse geographical region. As a land-grant institution and Kentucky's flagship university, UK is committed to becoming one of the top public institutions in the country. Women, persons with disabilities, and members of other under-represented groups are encouraged to apply. The University also supports family-friendly policies. Additional details of the Dept. of Earth and Environmental Sciences (faculty, research clusters, facilities) and University of Kentucky may be viewed at our web pages: www.as.uky.edu/ees and www.uky.edu.

LITHOSPHERIC SYSTEM DYNAMICS
UNIVERSITY OF SOUTHERN CALIFORNIA

The Dept. of Earth Sciences in the Dana and David Dornsife College of Letters, Arts and Sciences of the University of Southern California (ZHS, 3651 Trousdale Pkwy Los Angeles, CA 90089-0740) seeks applications for a full-time tenure-track faculty appointment at the Assistant Professor level from applicants with research interests in the dynamics of Earth's crust and lithosphere, for an anticipated start date in the 2012–2013 academic year. The appointee will be expected to establish a vigorous research program supported by extramural funding and to contribute to the department's overall research effort in Lithospheric System Dynamics. The successful appointee will have expertise in the chemistry or physics of earth materials, geochronology, and/or related areas. They will also be expected to contribute to undergraduate and graduate teaching, particularly in the areas of mineralogy, petrology, and geochemistry. Candidates must hold a Ph.D. in Earth Sciences or a related field, and have the ability to develop and support laboratory facilities in their research area. Applications should include a curriculum vitae, publication list, statement of teaching and research interests, and three or more names of individuals familiar with the applicant's work who could be contacted for letters of reference. Applications should be directed to: Chair, Search Committee, c/o Karen Young (kayoung@usc.edu). Review of complete applications will begin 1 Dec. 2011. In order to be considered for this position, applicants are also required to submit an electronic USC application; follow this job link or paste in a browser: https://jobs.usc.edu/applicants/Central?quickFind=61196. USC strongly values diversity and is committed to equal opportunity in employment. Women and men, and members of all racial and ethnic groups are encouraged to apply.

TENURE-TRACK ASSISTANT PROFESSOR
OHIO UNIVERSITY

The Dept. of Geological Sciences at Ohio University invites applications for a tenure-track Assistant Professor to begin in August 2012. We are seeking an individual whose research interests are in igneous petrology, or a closely allied field, and who is qualified to teach courses such as petrology, earth materials, and petrography. The successful applicant will possess a Ph.D. in geology, be committed to excellence in teaching at both the undergraduate and graduate level, develop a strong research program supported by external funding, and augment our planetary and structural / metamorphic expertise. Candidates must have outstanding leadership, management, and interpersonal skills to relate to a wide diversity of faculty, staff, students and community members.

Ohio University is a Research-Extensive institution, enrolling 19,500 students on the Athens campus and more than 8,000 students on five regional campuses. The College of Arts and Sciences includes 340 tenured and tenure-track faculty members and contains 19 departments, 8 of which offer the doctoral degree. Further information about Ohio University may be found at the university's web site: www.ohio.edu.

Applicants must apply online (www.ohiouniversityjobs.com/postings/1048) and attach a vita, description of research interests, statement of teaching philosophy, and the names and addresses of three referees. An electronic copy of a proposed course syllabi and a recent paper may be attached.

Position will remain open until filled; for full consideration apply by 15 Dec. 2011. For further information concerning the department and its faculty, visit www.ohiou.edu/geology.

Department of Geosciences
University of Arkansas
Maurice F. Storm
Endowed Chair in Petroleum Geology

We are seeking applicants for the inaugural appointment with tenure to be filled at the level of Associate Professor or Professor. We seek a motivated individual with an outstanding research record in geology and geophysics related to petroleum. The successful individual will serve as the nucleus of an energy related program of international caliber that liaises with the petroleum industry through the development of an externally funded research program. A commitment to excellence in teaching and supervising students at both the MS and PhD level is critical. The appointment will begin in August, 2012. Additional detailed information about the department and the position can be found at *http://hr.uark.edu/jobdetails.asp?ListingID=6616* and *http://geosciences.uark.edu.*

Applicants should submit curriculum vitae, statements of research and teaching interests, and the names and addresses of at least four professional references to Doy Zachry, Department of Geosciences, University of Arkansas, Fayetteville, AR, 72701. An electronic application in one PDF file is also welcome. Review of applicants will begin January 5, 2012, and will continue until the position is filled.

The University of Arkansas is an Affirmative Action/Equal Opportunity Employer and applications will be accepted without regard to age, race, color, sex or national origin. Applicants must have proof of legal authority to work in the United States as well as all PhD requirements completed at the time of the appointment. Women and minorities are encouraged to apply.

Ohio University is an affirmative action /equal opportunity employer.

PETROGRAPHER/CONSULTANT, WALTHAM, MASS.
SIMPSON GUMPERTZ & HEGER (SGH)

Simpson Gumpertz & Heger (SGH) is actively recruiting an experienced candidate for a position as Petrographer/Consultant in our Waltham, MA office. SGH is a nationally known civil and structural engineering firm that works in all aspects of design, investigation, and rehabilitation of structures. At SGH, petrographers provide front-line collaborative support to our investigative teams as well as for external clients, including other engineering firms. The successful candidate will work on investigations of concrete, masonry, stone, and related construction materials.

Applicants should have at least 10 years of experience with stone and concrete petrography; meet the requirements of ASTM C856 and C295; and understand the use of supplemental testing and analytical techniques such as XRD, IR, SEM/EDS, and chemical testing. Exceptional communication skills, experience in research and investigations, and a demonstrated ability for managing and developing staff are also required skills.

To learn more about SGH and to apply for this position, please visit our website at www.sgh.com or email your resume to Stella Mereves-Carolan, Corporate Recruiter at smereves-carolan@sgh.com or Apply online at www.sgh.com.

Equal Employment Opportunities Employer

HYDROGEOLOGY TENURE-TRACK POSITION
AUSTIN PEAY STATE UNIVERSITY

The Dept. of Geosciences at Austin Peay State University invites applications for a tenure-track position in hydrogeology beginning Fall 2012. For details about the positions and information on how to apply please visit www.apsu.edu/human-resources/faculty/CurrentJobOpenings Review of applications will begin 31 Oct. 2011 and will continue until the position is filled. Information about the department can be found at www.apsu.edu/geosciences.

Austin Peay State University, a TBR institution, is an AA/EEO employer and does not discriminate on the basis of race, color, national origin, sex, disability or age in its program and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies: Director, Affirmative Action, P.O. Box 4457, Browning Building Room 7A, Clarksville, TN 37044, USA; phone: (931) 221-7178.

HYDROGEOLOGIST, BRIGHAM YOUNG UNIVERSITY

The Dept. of Geological Sciences at Brigham Young University invites applications for a continuing status track (BYU's equivalent of "tenure track") Professorial Faculty position in the area of hydrogeology to be filled as soon as Sept. 2012. A Ph.D. at the time of appointment is required. The department has a long history of expertise in physical and chemical hydrogeology, and a candidate is sought who can help maintain and expand existing programs. Implementation of a vigorous, externally funded research program is required. The successful candidate also must be able to teach hydrogeology to advanced undergraduates, graduate courses within his or her area of expertise, and introductory geology courses as assigned.

Excellent research infrastructure exists within the department. Relevant instrumentation supports solute, stable isotope, ^{3}H, and ^{14}C analysis. Shallow geophysical equipment enables ground penetrating radar, and high-resolution seismic reflection surveys.

The department consists of 13 professorial faculty and three professional faculty, and offers B.S. and M.S. degrees. In addition to hydrogeology, major research areas include petroleum geology, continental magmatism, shallow and deep geophysics, structure and tectonics, stratigraphy, paleontology, planetary geology, and mineral surface chemistry.

Applicants should complete an online faculty application and attach a current curriculum vita at https://yjobs.byu.edu (faculty position #110618) Graduate transcripts, a statement of research and instrument experience, a statement of teaching philosophy, and the names and contact information for 3 references should be sent to: Chair, Search Committee, Dept. of Geological Sciences, S-389 ESC, Brigham Young University, Provo, UT, 84602. The application deadline is 31 Jan. 2012. You may obtain instructions for completing the online faculty application from Kris at kris_mortenson@byu.edu.

Brigham Young University, an equal opportunity employer, does not discriminate on the basis of race, color, gender, age, national origin, veteran status, or against qualified individuals with disabilities. All faculty are required to abide by the university's honor code and dress and grooming standards. Preference is given to qualified candidates who are members in good standing of the affiliated church, The Church of Jesus Christ of Latter-day Saints.

ASSISTANT PROFESSOR
AQUEOUS GEOCHEMISTRY/BIOGEOCHEMISTRY
UNIVERSITY OF SOUTH CAROLINA

The Dept. of Earth and Ocean Sciences invites applications for a tenure-track, assistant professor position in aqueous geochemistry or biogeochemistry. We seek an individual with outstanding research and teaching capabilities and broad interests related to the ways in which geochemical and biogeochemical processes mediate chemical exchange between the hydrosphere, lithosphere, and biosphere. Areas of interest may include characterization of natural systems over long (geologic) and short (environmental) time scales and the influences of climate change and human activity on elemental cycling.

The successful candidate is expected to teach undergraduate and graduate courses in earth science and to direct an active externally funded research program. Potential collaborative interactions exist within the department (www.geol.sc.edu); with other interdisciplinary programs housed within the School of the Earth, Ocean and Environment (www.cas.sc.edu/seoe/), including the Environment and Sustainability Program and the Marine Science Program; and with other departments, including Civil and Environmental Engineering, Geography, and Biological Sciences. Teaching responsibilities will likely include introductory earth or environmental science courses as well as upper-level undergraduate and graduate level courses related to the candidate's specialty. A Ph.D. is required at the time of appointment, and post-doctoral experience is desirable. Applicants should submit a vita, statements of research and teaching interests, and the names, addresses and phone numbers of at least three references (in a single pdf file) to geochem@geol.sc.edu. For more information please contact: Alicia M. Wilson, Geochemistry Search Committee Chair, Dept. of Earth and Ocean Sciences, University of South Carolina, Columbia, SC 29208, USA.

To ensure full consideration, applications should be received by 15 Nov. 2011. We will review files until a candidate is selected. The University of South Carolina is an affirmative action, equal opportunity employer. Women and minorities are encouraged to apply. The University of South Carolina does not discriminate in educational or employment opportunities or decisions for qualified persons on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation or veteran status.

Penn

UNIVERSITY OF PENNSYLVANIA
EARTH AND ENVIRONMENTAL SCIENCE

Professorship in Earth and Environmental Science

The Department of Earth and Environmental Science at the University of Pennsylvania invites applications for a tenured professorship at the Associate or Full Professor level. We seek an individual with research interests that complement or augment our existing strengths in Earth history and surficial processes. The Department especially invites applicants with research emphasis in: (1) the properties and interactions of Earth materials, and their formative physical, chemical and biological processes; and/or (2) the basic science of natural hazards associated with geologic, hydrologic, climatic and atmospheric processes.

The successful candidate is expected to have developed an internationally recognized, externally funded, multi-disciplinary research program, and will be required to actively participate in our core undergraduate and graduate teaching and in the administration of the Department. Individuals who can further increase interactions with other departments within the School of Arts and Sciences are strongly encouraged to apply. Further information about the Department is available at www.sas.upenn.edu/earth/. Applicants apply online at https://facultysearches.provost.upenn.edu/applicants/Central?quickFind=50979 with a cover letter, CV, statements of research and teaching interests, and three publications. The Search Committee will begin to evaluate applications on January 6, 2012. The University of Pennsylvania is an affirmative action/equal opportunity employer.

TENURE-TRACK POSITION, ASSISTANT PROFESSOR AND CURATOR OF PALEONTOLOGY
CALIFORNIA STATE UNIVERSITY–FULLERTON

The Dept. of Geological Sciences at California State University–Fullerton seeks a full-time, tenure-track Assistant Professor with expertise in vertebrate paleontology to join the faculty in Fall 2012 and serve as the Curator of Paleontology for the newly established John D. Cooper Archaeology and Paleontology Curation Center. The successful candidate will have the following credentials and capabilities:

- a Ph.D. in Geology or a related field with emphasis in Vertebrate Paleontology;
  experience in vertebrate fossil curation, accession, and management;
- a vigorous, research program in vertebrate paleontology that can involve undergraduate and graduate students;
- a strong interest in teaching and achieving excellence in teaching; and
- the interest and ability to interact effectively with an ethnically and culturally diverse campus community.

An important responsibility of the successful candidate's will be performing and directing research and curation of the paleontology collection at the Cooper Center, including oversight of an Associate Curator of Paleontology, interns, students, and volunteers. The Collection contains fossils in various stages of curation, from large jacketed specimens to fully curated fossils. Known strengths of the collection include Miocene marine mammals and reptiles, many from previously unrecognized taxa; numerous unprepared, jacketed blocks from an Eocene non-marine bone bed; and a paleobotanical collection of unknown extent. More information on the Cooper Center can be found at http://coopercenter.fullerton.edu/.

The successful candidate is expected to develop an externally funded research program focusing on specimens curated at the Cooper Center and resulting in peer-reviewed publications in refereed journals. Teaching responsibilities may include some of the following: physical geology, historical geology, paleontology, and upper-division and graduate courses in the new faculty member's area of expertise. Expected service activities include promotion of the Collection within the scientific community and outreach to the regional educational community.

CSU Fullerton is a large urban university dedicated to the preeminence of learning. A designated Hispanic-Serving Institution, Cal State Fullerton is noted both for the diversity of its student body and its engagement of undergraduate students in research. Located 22 miles southeast of metropolitan Los Angeles, Fullerton is a full-service city renowned for its unique mix of residential, commercial and industrial, educational, and cultural environments that provide residents with an outstanding quality of life. The department has thirteen full-time faculty members with expertise in traditional and applied areas of the geological sciences. The nearby geological provinces provide abundant opportunities for field-based research, which the department emphasizes in its curriculum. There are over 100 undergraduate geology majors and approximately 20 MS students in the department. Additional information is available from our web page at http://geology.fullerton.edu/.

To apply, please send the following:

1. Detailed curriculum vita including a record of your past external funding;
2. Letter of application that explains how you meet the qualifications outlined above and specifically addressing your qualifications as Curator of Paleontology for the Cooper Center;
3. Statement of your future research plans and goals as they relate to the collections in the Cooper Center;
4. Statement of your teaching philosophy including a list of courses you would feel comfortable teaching;
5. Letters of recommendation from at least three references familiar with your research, curation, and teaching experience—referees should send their letters directly to the address below.

Send application to: Dr. Nicole Bonuso, Search Committee Chair, Dept. of Geological Sciences, California State University, P.O. Box 6850, Fullerton, California 92834-6850, USA. Review of completed applications will begin on 18 Nov. 2011. Applications received after this date will be reviewed only if the position is not filled from the original pool of applicants.

California State University, Fullerton is an Affirmative Action/Equal Opportunity Employer. All personnel policies conform to the requirements of Executive Order 11246, the Americans with Disabilities Act (ADA) of 1990, Title IX of the Higher Education Amendments of 1972 and other federal regulations regarding nondiscrimination.

ASSISTANT PROFESSOR OF GEOLOGY,
UNIVERSITY OF ARKANSAS AT LITTLE ROCK

The University of Arkansas at Little Rock Dept. of Earth Sciences invites applications for a tenure-track assistant professor position in either Mineralogy/Petrology or Environmental Geology/Geochemistry. We seek a broadly trained scientist who will complement existing faculty strengths.

We expect faculty to develop and maintain an innovative, extramurally funded research program, to supervise student research projects, and to publish results in refereed journals. The successful applicant should have a Ph.D. at the time of employment and demonstrated potential to perform teaching duties. Teaching duties will include introductory geology and courses in the candidate's specialty.

The Dept. of Earth Sciences, with over 70 undergraduate geology majors, offers a B.S. in Geology, a Graduate Certificate in Geospatial Technology, and participates in college graduate programs. Research facilities include geochemical instrumentation, mineral separation equipment, and a state-of-the-art spectroscopy and microscopy facility (http://ualr.edu/nanotechnology/).

Submit applications electronically in PDF format to jbconnelly@ualr.edu. Please use the subject line Assistant Professor Geology-R97703-01. Applications should include a cover letter, curriculum vitae, statement of teaching and research interests and goals, and contact information for at least three professional references. The position begins 15 Aug. 2012. Review of applications will begin 1 Dec. 2011 and will continue until the position is filled. For more information, please contact Dr. Jeffrey Connelly, Chair, Dept. of Earth Sciences, jbconnelly@ualr.edu.

The University of Arkansas at Little Rock is an equal opportunity, affirmative action employer and actively seeks candidacy of women, minorities and individuals with disabilities. Persons hired must provide proof of legal authority to work in the United States. Under Arkansas law, all applications are subject to disclosure.

TENURE TRACK POSITION INDIANA UNIVERSITY–PURDUE UNIVERSITY AT INDIANAPOLIS (IUPUI)

The Dept. of Earth Sciences (ES) at IUPUI invites applicants for a tenure track position in Water Resources, starting Fall 2012. Candidates with research interests in one or more of the following areas are encouraged to apply: hydroclimatology, urban hydrology, ecohydrology, deep groundwater hydrology, vadose zone hydrology, fluvial sedimentology, and fluvial geomorphology.

Candidates should have a Ph.D., strong research record, an interest in multidisciplinary research and commitment to undergraduate and graduate education. A Ph.D., received prior to August 2012 in earth sciences, geology, hydrology, water resources engineering, or a closely related field, is required. Earth Sciences is a growing and evolving department that embraces an Earth Systems approach to research and teaching as we adopt a new interdisciplinary Ph.D. program in Applied Earth Sciences. This new program is built on the research strengths of two centers that reside in the department: the Center for Earth and Environmental Science, recognized for excellence in water resources research, and the Center for Urban Health with a focus on earth science-based solutions for improving human health. Efforts will be supported by a number of existing interdisciplinary programs, state-of-the-art laboratories, instrumented field research stations and information technology resources. Research instrumentation within the department includes Nutrient Analyzer, ICP-ES, CHN, and new mass spectrometers for compound, elemental, and stable isotope ratio analyses (GS-MS/MS, HR-ICP-MS, IRMS). Field-based research and teaching programs are important to the program and preference will be given to individuals who can collaborate with interdisciplinary research teams, including faculty in other departments at IUPUI, Indiana University and Purdue University.

Applicants should submit a letter of application, curriculum vitae, statement of research interests, statement of teaching interests and philosophy, and the names and contact information (including e-mail) of at least four (4) references. Review of applications will begin 15 Dec. 2011 but the position will remain open until filled. Interested individuals are encouraged to submit their application electronically to search committee chair, Dr. Gabriel Filippelli, at gfilippe@iupui.edu, Dept. of Earth Sciences, IUPUI, 723 West Michigan Street, SL118, Indianapolis, IN 46202-5132, USA.

IUPUI is Indiana's urban research and academic Health Sciences campus, and the focal point of IU's Life Sciences Initiative. IUPUI is an equal opportunity, affirmative-action employer.

Opportunities for Students

IGERT Ph.D. Fellowships in Watershed Science at SIU. Southern Illinois University (SIU) is offering 6–8 Ph.D. fellowships as part of NSF's Integrative Graduate Education Research and Training (IGERT) program. Fellowships are available to U.S. citizens and permanent residents (only) in any water-, river- or watershed-related field of study, including Geology, Hydrology, Geography, Engineering, Plant Biology, Zoology, Ecology, and other areas.

Applicants should have a MS-level degree at the time of enrollment (direct Ph.D. possible in cases of exceptional merit) and should have grades, test scores, and research records commensurate with one of NSF's most coveted fellowship awards. Fellowship benefits include US$30,000/year stipends, US$10,500/year education allowances, student laptops, annual international river basin tours (Panama, Costa Rica, China, Brazil, Paraguay, and see below), and support for research, conference travel, etc.

The 2012 entering IGERT class will have a particularly strong international component, with a targeted research project in the Tisza River Basin of Central Europe involving 4–6 months initial fieldwork in Austria, Slovakia, Hungary, Ukraine, Romania, and/or Serbia.

Application deadline is 15 Jan. 2012. For more information, please see www.igert.siuc.edu or contact igert@siu.edu.

Graduate Student Opportunities at Case Western Reserve University. Students with backgrounds in geology, physics, chemistry, biology, engineering and related fields are encouraged to apply for our Ph.D. and MS programs in Earth, environmental and planetary sciences. Areas of active research in the department include planetary geology and geophysics, igneous geochemistry, mineral physics, sediment transport, aqueous geochemistry and carbon sequestration. For more information, see http://geology.case.edu or write to geo-gradinfo@case.edu. Financial assistance is available. Application deadline: 1/15/2012.

Graduate Assistantships, University of South Carolina. The newly established School of the Earth, Ocean & Environment anticipates offering at least 12 graduate assistantships for students wishing to pursue Ph.D. or MS degrees in Geological Sciences or Marine Science beginning Fall 2012. With annual support packages worth approximately US$30,000, these competitive teaching and research assistantships offer opportunities in all fields of geology, oceanography, geophysics & geochemistry. In addition to standard support levels, exceptional candidates may be eligible for additional support through our Stephen F. Taber and F. John Vernberg funds. Further information and application instructions can be found at www.cas.sc.edu/seoe/graduate or by contacting Dr. David Barbeau (dbarbeau@geol.sc.edu).

GROUNDWORK
Furthering the Influence of Earth Science

Killer waves on the airwaves: New media, traditional media, and student conceptualization of tsunamis

Cinzia Cervato, *Iowa State University, Dept. of Geological and Atmospheric Sciences, Ames, Iowa 50011, USA, cinzia@iastate.edu*

INTRODUCTION

This paper addresses the hypothesis that, after 26 Dec. 2004, media coverage, and more specifically "new media," affected students' understanding of, and interest in, tsunamis. To test this hypothesis, 13 years of media reports on tsunamis were reviewed and 146 students surveyed regarding their knowledge of the phenomenon in the aftermath of the 11 March 2011 Japan earthquake and tsunami.

BACKGROUND

The overarching goal of science educators is the achievement of scientific literacy (National Research Council, 1996). The means for achieving it vary, but it has been suggested that covering material relevant to students' lives (Cervato et al., 2009, and references therein) and leveraging students' fascination about natural disasters help them develop deeper understandings of these phenomena (e.g., Welch, 2006). Lee (1999) studied Florida children's conception of hurricanes after they experienced Hurricane Andrew in 1992. She argued that since learning through personal experience may lead to understanding that is not compatible with the nature of science or scientific knowledge, it is important to be aware of students' ways of knowing and thinking about science.

Students who do not live in areas impacted by natural disasters learn about these events through news media, movies, or in school (e.g., Parham et al., 2011). A study of the impact of news media on students' understanding of earthquakes (Barrow and Haskins, 1996) suggests that while mass media expose them to the cause and effects of earthquakes more than direct experience, the focus of media on large, devastating events can fuel the misconception that tectonic plates move only rarely.

Since Barrow and Haskins's (1996) study, the spectrum of mass media has expanded from print and TV and radio broadcasting to include "new media," such as YouTube and other Internet sources. Houston et al. (2008) found that while reports of Hurricane Katrina and other disasters represent teachable moments for youth, their portrayal in the media has been so influential as to cause post-traumatic stress symptoms in younger viewers.

TSUNAMI IN NEW AND TRADITIONAL MEDIA

To test whether the media deserve credit for the sudden increase in worldwide concern regarding tsunami, the occurrence of the term "tsunami" in major world publications since December 1997 using the LexisNexis Academic news database was collected. The major world publications file of LexisNexis includes more than 700 news sources known for their content reliability. The search protocol for this study approximates the method used in a more general study of occurrences of geoscience terms in the news (Cervato et al., 2009), though the search was restricted to the topic "natural disasters" to exclude non-geologic usages of *tsunami*. Out of 309 occurrences in a random 14-day period in February 2011, 87 (28%) were categorized under "natural disasters"; others were in categories as varied as "elections" and "health and medicine."

Pre–December 2004 data were collected for one-year intervals. Beyond 26 Dec. 2004, daily averages were computed within three-month bins (Fig. 1). To capture the effect of the 11 Mar. 2011 tsunami, the Dec. 2010 to Mar. 2011 period is plotted twice: once from 11 Dec. 2010 to 10 Mar. 2011 and once from 29 Dec. 2010 to 28 Mar. 2011.

Prior to 2004, the most recent significant tsunami event occurred on 17 July 1998 in Papua New Guinea, sparking 1.38 average daily news reports over one year. Afterward, tsunami reports averaged <1 per day until 26 Dec. 2004. In the two weeks thereafter, the term occurred 12,530 times (835 daily average occurrences). The daily occurrence until Mar. 2005 was 161. In the following year, this gradually declined to ~30. After the one-year anniversary of the Sumatra event, coverage stayed at ~15 reports per day, rising slightly when three other tsunamis hit the news. The M9.0 earthquake near Japan on 11 Mar. 2011 generated a tsunami wave across the Pacific Ocean and a wave of media interest comparable yet smaller than the one at the end of 2004: 9194 news reports in the 14 days following the event—an average of 656 daily reports.

The 2004 event coincided with the birth of YouTube, which made its official debut in November 2004, meaning dozens of amateur videos taken by tourists who witnessed the event were suddenly readily available on the Internet.

Google Earth, another new media source released in 2005, allows people to visualize the effects of natural disasters with unprecedented speed and detail. While "before and after" satellite images of areas affected by the 2004 tsunami were posted on the NASA site 15 days after the event (http://tinyurl.com/3sxhuwg), Google Earth released higher resolution pre- and post-event images of the 2011 Japan tsunami less than two days after the event (http://tinyurl.com/49arhx9).

Widespread coverage of tsunamis in the media coincided with deeper coverage of tsunamis in many introductory geoscience curricula, as suggested by the jump from two pages in the first edition of an introductory geology textbook (Marshak, 2001) to five pages in the third edition (Marshak, 2008).

GSA Today, v. 21, no. 11, doi: 10.1130/G127GW.1.

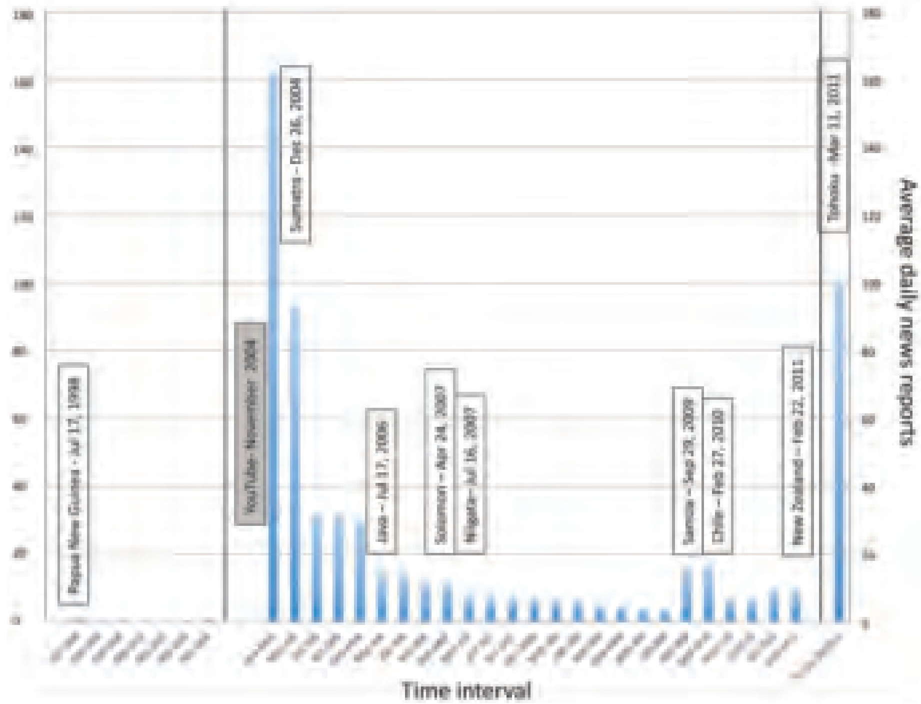


Figure 1. Average daily news reports with term "tsunami" since December 1997. Data in the left part of the figure were calculated over yearly intervals, the remainder over three-month periods. The public unveiling of YouTube and major tsunami events are identified. M—March; J—June; S—September; D—December. Years are identified by their last two digits.

The impacts of the 2004 Indian Ocean tsunami go beyond the huge loss in human lives and the far-reaching environmental and economic consequences. The event initiated a "lexical shift" in media reports from the incorrect popular term "tidal wave" to the scientifically accepted "tsunami" (Clark, 2010). Further, media have also popularized the term "tsunami" beyond its original scientific usage: the political "tsunami" sweeping through North African countries this winter (J. Githongo, *The East African*, 14 Feb. 2011) causing a potential "human tsunami" to hit Italy (Italian PM Berlusconi quoted in *Corriere della Sera*, 2 Apr. 2011).

TSUNAMIS AND STUDENTS' CONCEPTIONS

Given the intensity of coverage from multiple media sources, one might expect students' understanding of tsunamis to be better now than prior to 2004. However, a 14-question survey (http://tinyurl.com/6g7jxlp) of 146 students (73% of the class) enrolled in an introductory meteorology course taught by the author and administered online between 29 March and 2 April 2011 shows that significant misconceptions remain. Tsunamis were not part of the course curriculum, and students received a small amount of extra credit for completing the survey.

The vast majority of students surveyed were between 18 and 22 years old. While 77.4% had taken an Earth science class in middle or high school and 44.5% had taken one in college, 47.3% declared that they first heard of tsunamis in the news, 40.4% in school, and 12.3% from a Hollywood movie. Most students surveyed (84.9%) knew the correct possible causes of tsunami. However, 54.8% believed that tsunamis are affected by climate change.

Two thirds of students surveyed identified a tsunami as a single wall of water (28.8%) or several long waves in the ocean (35.6%); 28.1% believed they are related to tides. On the other hand, 32.9% of them identified "harbor wave" as the correct meaning of the Japanese word "tsunami." Finally, 23.3% of students thought that tsunamis are about as frequent now as in the geologic past, while the majority (73.6%) thought that tsunamis are somewhat or much more frequent now.

These results suggest that most students know a lot about tsunamis, perhaps due to heavy media coverage. However, there are no data to prove this beyond the perception of a marked difference in students' interest before and after 2004 as suggested by their questions in class.

Many students hold two significant misconceptions: (1) that tsunamis are affected by climate change, and (2) that tsunamis are becoming more frequent. This suggests that the true causal mechanism of tsunamis remains unclear, and that students may be erroneously assuming, in reaction to the increased visibility of tsunamis in the media, that their rate of occurrence has increased.

CONCLUSIONS

New visual media, such as YouTube and Google Earth, present geoscience educators with an opportunity to engage students in the understanding of dynamic Earth processes in powerful new ways. However, after 2004, traditional and new media have transformed the term "tsunami" into a household word that is now commonly used by people all over the world and in a broad range of nongeologic contexts. In spite of this popularity, students still hold challenging misconceptions about why, and how often, tsunamis occur.

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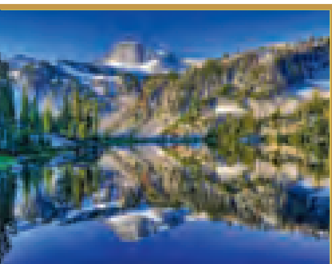
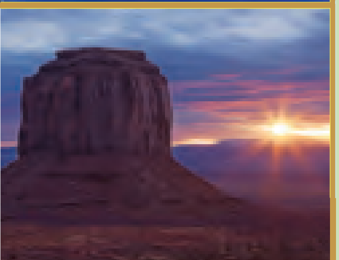
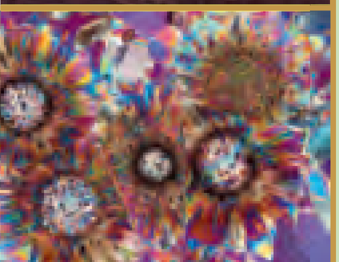
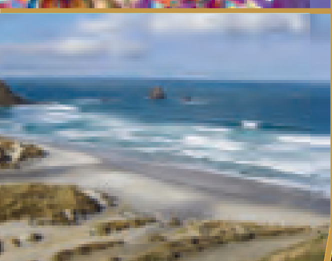
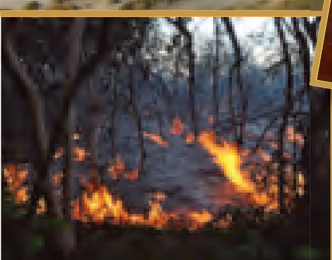
2012 Calendar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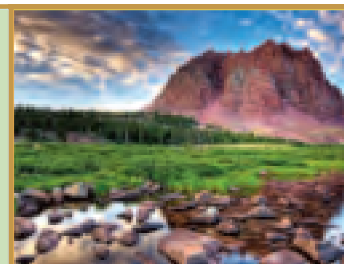
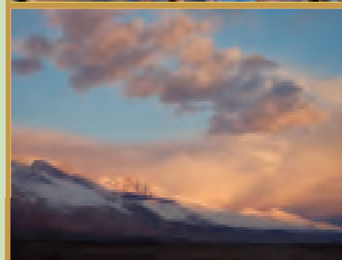
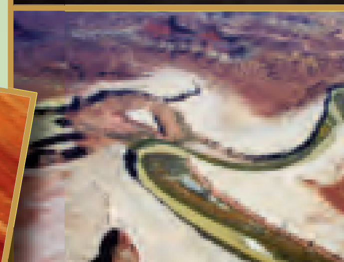

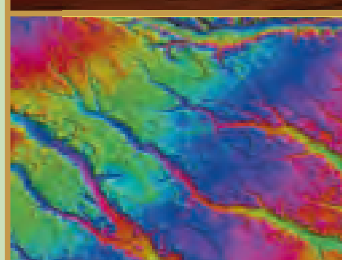
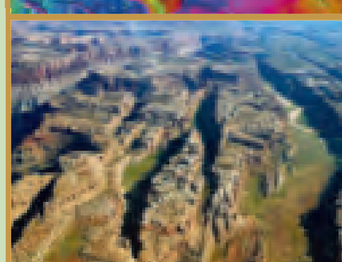

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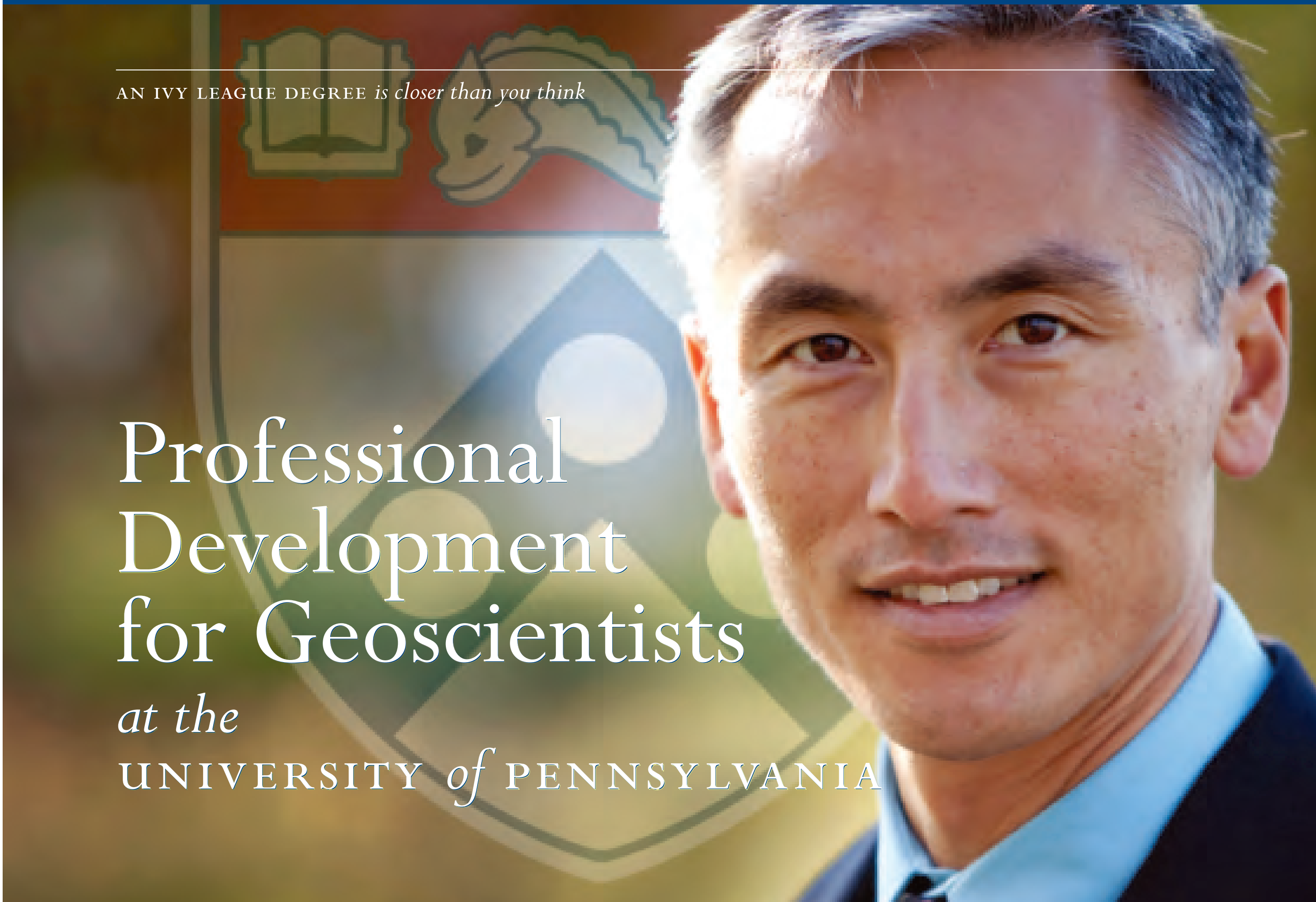

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