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4 The Rheic Ocean: Origin, Evolution, and Significance
R. Damian Nance and Ulf Linnemann

Cover: Recumbent chevron folds in Early Pennsylvanian graywacke and shale of the Bude Formation at Millook Haven on the north coast of Cornwall, southwestern Britain, record the development and deformation of the Varsican foreland basin—testifying to the closure of the Rheic Ocean during the mid- to Late Pennsylvanian Variscan orogeny. See “The Rheic Ocean: Origin, Evolution, and Significance” by R.D. Nance and U. Linnemann, p. 4–12.
The Rheic Ocean: Origin, Evolution, and Significance

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ABSTRACT

The Rheic Ocean, which separated Laurussia from Gondwana after the closure of Iapetus, was one of the principal oceans of the Paleozoic. Its suture extends over 10,000 km from Middle America to Eastern Europe, and its closure assembled the greater part of Pangea with the formation of the Ouachita-Alleghanian-Variscan orogen.

The Rheic Ocean opened in the Early Ordovician, following protracted Cambrian rifting that represented a continuum of Neoproterozoic orogenic processes, with the separation of several Neoproterozoic arc terranes from the continental margin of northern Gondwana. Separation likely occurred along a former Neoproterozoic suture in response to slab pull in the outboard Iapetus Ocean. The Rheic Ocean broadened at the expense of Iapetus and attained its greatest width (>4000 km) in the Silurian, by which time Baltica had sutured to Laurentia and the Neoproterozoic arc terranes had accreted to Laurussia, closing Iapetus in the process. Closure of the Rheic Ocean began in the Devonian and was largely complete by the Mississippian as Gondwana and Laurussia sutured to build Pangea. In this process, North Africa collided with southern Europe to create the Variscan orogen in the Devonian–Carboniferous, and West Africa and South America sutured to North America to form the Alleghanian and Ouachita orogens, respectively, during the Permo-Carboniferous.

The Rheic Ocean has long been recognized as the major Paleozoic ocean in southern Europe, where its history dominates the basement geology. In North America, however, the Rheic has historically received less attention than Iapetus because its suture is not exposed. Yet, it was the Rheic Ocean that played the dominant role in creating the Appalachian-Ouachita orogen, and an important record of its history may be preserved in Mexico.

INTRODUCTION

The Rheic Ocean—named for the Titan, Rhea, sister to Iapetus in Greek mythology—is arguably the most important ocean of the Paleozoic. Following the Silurian closure of the Iapetus Ocean, the Rheic Ocean separated the major paleocontinents
of Laurussia (Laurentia-Baltica-Avalonia) from Gondwana (Fig. 1). Subsequent closure of the Rheic Ocean produced the Ouachita-Alleghanian-Variscan orogeny and assembled the supercontinent of Pangea.

The Rheic Ocean’s importance has long been recognized in Europe, where its suture is well constrained and separate from that of the Iapetus Ocean to the north. Hence, in Europe, the Caledonide orogen, created by the closure of Iapetus, is a geographically distinct orogenic belt from the Variscan orogen, created by the closure of the Rheic Ocean. In North America, however, the two sutures follow a similar path, and the importance of the Rheic Ocean is often overlooked. Instead, the history of the Appalachian-Ouachita orogen is traditionally described in terms of the evolution of Iapetus, the opening of which is recorded in the late Neoproterozoic–Early Cambrian rifted margin of eastern and southern Laurentia and whose closure is documented in the accretion of a variety of peri-Gondwanan arc terranes in the Silurian (e.g., van Staal et al., 1998). The Rheic Ocean, in contrast, opened in the Early Ordovician with the separation of these peri-Gondwanan arc terranes from the margin of northern Gondwana and closed with the collision of this margin with Laurussia during the Permo-Carboniferous assembly of Pangea (e.g., Murphy et al., 2006).

The lack of attention to the Rheic Ocean’s role in the development of the Appalachian-Ouachita orogen is largely a function of geography. The orogen contains both the rifted margin and final suture of the Iapetus Ocean, and so preserves a complete record of its opening and closure. But it preserves no such margin of the Rheic Ocean, the suture of which lies buried beneath the sediments of the Coastal Plain outboard of the accreted peri-Gondwanan terranes or was removed with the opening of the Atlantic Ocean and the Gulf of Mexico. Nevertheless, the continent-continent collision that produced the Appalachian-Ouachita orogen in the late Paleozoic was the result of the closure, not of Iapetus, but of the younger Rheic Ocean, important vestiges of which may be preserved in Mexico.

This paper aims to correct this oversight by providing a review of the origin and evolution of the Rheic Ocean that demonstrates its significance to the geological history of both Europe and North America. The time scale used is that of Gradstein et al. (2004).

**EVILOUTION OF THE RHEIC OCEAN**

The initial rifting of the Rheic Ocean forms a continuum with the Neoproterozoic–Early Cambrian accretionary orogenic processes that preceded it. Rifting took place along the northern (African–South American) margin of Gondwana in the mid- to Late Cambrian, by which time Iapetus was already a wide ocean. Prior to this, in the late Neoproterozoic, the northern Gondwanan margin had witnessed a prolonged history of subduction and accretion followed in the Late Ediacaran–Early Cambrian by the diachronous cessation of arc magmatism and the development of a transform continental margin (e.g., Nance et al., 2008). This pre-rift history is analogous to that of the Pacific margin of North America in the Cenozoic, and the transition in tectonic regime along the Gondwanan margin has been similarly attributed to ridge-trench collision (e.g., Nance et al., 2002).

Following protracted rifting, the Rheic Ocean opened in the Early Ordovician with the separation of several Neoproterozoic arc terranes from the margin of northern Gondwana. The micro-continental terranes that separated (e.g., Avalonia and Carolina) were the same terranes that had accreted to this margin in the late Neoproterozoic, leading Murphy et al. (2006) to suggest that separation occurred along the line of a former Neoproterozoic suture (Fig. 2).

In Europe, separation of Avalonia by Arenig time is supported by paleomagnetic data (e.g., Cocks and Torsvik, 2002) and Sm/Nd isotopic studies of the sedimentary record (Thorogood, 1990), and is also recorded in the widespread deposition of the Armorican Quartzite. In Mexico, the onset of passive margin sedimentation occurred in the latest Cambrian (Landing et al., 2007), whereas backstripped subsidence curves in eastern Avalonia suggest that drifting may not have been achieved until the mid-Arenig to Llanvirn (Prigmore et al., 1997). It is therefore likely that the rifting and separation of terranes from northern Gondwana took place diachronously. Also during this time, the Early Ordovician Gondwanan fauna of Avalonia were gradually replaced by endemic forms (Fortey and Cocks, 2003).

Throughout the Ordovician, the Rheic Ocean widened at the expense of Iapetus as Avalonia-Carolina drifted northward toward Baltica and Laurentia (Fig. 3). The endemic fauna of Avalonia were progressively replaced by those of Baltic and Laurentian affinities in the Llandeilo-Ashgillian (Fortey and Cocks, 2003), suggesting increasing proximity to these continents and a widening gap with Gondwana by the mid-Ordovician (ca. 465 Ma). Similarly, paleomagnetic data indicate that
by 460 Ma Avalonia lay at 41°S (Hamilton and Murphy, 2004), some 1700–2000 km south of Laurentia (at ~20°S; Mac Niocaill and Smethurst, 1994) and ~2100 km north of Gondwana (at ~60°S; Cocks and Torsvik, 2002). This requires Avalonia to have drifted northward at the relatively rapid rate of 8–10 cm/yr. This is well in excess of modern ridge-push spreading rates (1–2 cm/yr), which suggests that the opening of the Rheic Ocean was likely driven by slab pull within the closing Iapetus Ocean to the north. Even faster rates may have been attained by Carolina, which was likely attached to, but ~2000 km north of, Avalonia and minimally separated from Laurentia latitudinally by ca. 455 Ma (e.g., Hibbard et al., 2002). European Cadomia (Fig. 1), also part of the active Neo- proterozoic margin of Gondwana, likely remained on the northern Gondwanan margin, forming the southern margin of the Rheic Ocean from Lower Ordovician until at least uppermost Devonian times. This is supported by paleomagnetic data and the southerly paleolatitude of Cadomia in the Late Ordovician, indicated by widespread evidence for glaciation, which is characteristic of Gondwana but absent in Avalonia (e.g., Linnemann et al., 2004).

The Rheic Ocean reached its greatest width (>4000 km) in the Silurian (Fig. 1), by which time Laurentia had collided with Baltica to the north and with Avalonia-Carolina to the south, closing the Iapetus Ocean and creating the Appalachian-Caledonide orogen. Closure of the Rheic began in the Early Devonian and was facilitated by northward subduction beneath the southern margin of Baltica in the Variscan belt, where arc magmatism developed on the previously accreted Avalonian terranes (e.g., Kroner et al., 2007), and by southward subduction beneath the northwestern margin of Gondwana in the Appalachian-Ouachita belt, where Laurentia forms the lower plate (Hatcher, 1989; Viele and Thomas, 1989). Closure was accompanied ca. 395–370 Ma by the emplacement of ophiolites in southern Britain and northwestern and southern Iberia, and may have accelerated as a result of ridge-trench collision along the ocean's northern margin (Woodcock et al., 2007). Closure was essentially complete by the Mississippian as Gondwana and Laurussia collided, a process that continued into the Early Permian. The sequential collision of Gondwana's West African margin with southern Baltic and eastern Laurentia created the Variscan and Alleghanian orogens, respectively, and reactivated the Mauritanides of West Africa (e.g., Piqué and Skehan, 1992), whereas Gondwana’s Amazonian margin collided with southern Laurentia to produce the Ouachita orogen. The resulting Ouachita-Alleghanian-Variscan belt was the largest collisional orogen of the Paleozoic and sutured Gondwana and Laurussia to form Pangea (Fig. 3).
Figure 5. Model for the plate-tectonic transition from Cadomian arc to Rheic Ocean in central Europe based on data derived from the Saxo-Thuringian zone of the Bohemian Massif (from Linnemann et al., 2007). (A) Cadomian back-arc basin development ca. 590–545 Ma. (B) Cadomian retro-arc foreland basin development ca. 545–540 Ma. (C) Early to Middle Cambrian asymmetric rifting ca. 530–500 Ma. (D) Upper Cambrian oceanic ridge incision ca. 500–490 Ma (MOR—mid-ocean ridge). (E) Early Ordovician Rheic rift-drift transition ca. 490–480 Ma. Inset in (A) shows analogous setting illustrated by the opening of the Japan Sea in the Early Miocene (after Jolivet et al., 1992). Insets in (C–E) show analogous settings (circled) illustrated by the Miocene-Pliocene evolution of the Pacific margin of North America (from Nance et al., 2002; modified after Atwater, 1970; Dickinson, 1981).

Figure 6. Simplified tectonic map of Gondwanan Middle America showing location of Mexico’s Oaxacan Complex and Novillo Gneiss (Oaxaquia terrane), Acatlán Complex (Mixteca terrane), and Granjeno Schist (Sierra Madre terrane). Modified after Keppie (2004).
THE RHEIC OCEAN IN CENTRAL EUROPE

The formation of the Rheic Ocean in Europe is closely linked to the termination of the late Neoproterozoic Cadomian orogeny (ca. 700–540 Ma), and its closure caused the Variscan orogeny. This closure, ca. 370–330 Ma, produced a suture (Fig. 4) that runs westward from the Mid-German Crystalline zone in Germany and the Lizard ophiolite in southern Britain to the Pulo do Lobo unit of southern Iberia. To the east, in the Bohemian Massif, the Rheic suture is documented by the Sleza ophiolite (e.g., Floyd et al., 2002) in the Sudetes and may extend to the Moravo-Silesian zone on the massif’s eastern margin (considered part of Avalonia; Finger et al., 2000) and on into Eastern Europe (Bulgaria, Romania, Turkey; e.g., Winchester et al., 2002).

In central and western Europe, the suture separates Cadomia and its Paleozoic passive margin from the southern margin of Laurussia as represented by the eastern part of Avalonia and its overlying Paleozoic strata. Important vestiges of the Rheic Ocean exist (1) in the Cornubian basins and Lizard ophiolite of southern Britain (e.g., Nutman et al., 2001); (2) in the development ca. 500 Ma of a passive margin sequence and emplacement ca. 340 Ma of ophiolitic allochthons in northwestern Iberia (e.g., Sánchez-Martínez et al., 2007); (3) in the well-documented rift succession of the Ossa-Morena Zone (e.g., Sánchez-García et al., 2003) as well as the Pulo do Lobo accretionary prism and Beja-Acebuches ophiolite in southern Iberia (Quesada et al., 1994); and (4) in the evidence of an Early Ordovician breakup unconformity and widespread sub-
Rifting and Opening: Aftermath of the Cadomian Orogeny

In western and central Europe, there is no sharp break between the Cadomian orogeny of the late Neoproterozoic–Early Cambrian and the Cambro-Ordovician rifting that led to the opening of the Rheic Ocean. Hence, the active margin processes that characterize the Cadomian orogeny form an important precursor to the opening of the Rheic. The stages involved for the Saxo-Thuringian zone are summarized in Figure 5 (Linnemann et al., 2007).

The oldest (ca. 570–565 Ma) rocks in the Saxo-Thuringian zone are thought to record late Neoproterozoic backarc basin development on the active West African margin of Gondwana in a manner analogous to the present-day Sea of Japan (Fig. 5A). Subsequent inversion of this basin in the interval ca. 545–540 Ma is attributed to collision of the arc with the West African craton and the development of a short-lived backarc foreland basin (Fig. 5B). Granitoids emplaced ca. 540 Ma were likely derived from melting of the basin fill and are thought to record a pulse of high heat-flow that is attributed to slab break-off as a result of ridge-trench collision.

Following this event, the margin switched from active to transform, leading to the development of asymmetric rifts in the Lower and Middle Cambrian similar to those of the present-day Basin and Range Province (Fig. 5C). Subsequent ridge incision like that currently taking place in the Gulf of California is thought to be recorded in the oceanic rocks of the Upper Cambrian Vesser Complex (Fig. 5D).

Lower Ordovician deposits throughout the Cadomian part of central and western Europe are characterized by the Armorican Quartzite and its equivalents, which, in the Saxo-Thuringian zone, are ~3000 m thick. These deposits overstep Lower to Middle Cambrian strata or lie directly on Cadomian basement (Fig. 5E), indicating significant thermal subsidence. Their deposition follows the final rift-related magmatism ca. 485 Ma and is taken to record the opening of the Rheic Ocean and the separation of Avalonia from the Gondwanan margin.

From the mid-Upper Ordovician to mid-Devonian, the Saxo-Thuringian zone is characterized by relatively quiescent shelf sedimentation, consistent with its position on the southern passive margin of the Rheic Ocean. In places, sedimentation continued into the Lower Carboniferous, but by the Upper Devonian, Rheic Ocean closure had incorporated portions of the shelf into the developing Variscan orogen.

Closure and Collision

In Europe, the Rheic Ocean continued to expand until (1) Avalonia collided with Baltica ca. 450 Ma with the closure of the Tornquist Sea along the Teisseyre-Tornquist Line (Fig. 4); and (2) Baltica-Avalonia collided with Laurentia to form Laurussia with the closure of the Iapetus Ocean. Closure of Iapetus was complete by the latest Silurian (e.g., Pickering, 2008), following which Avalonia became part of the Old Red Continent and was blanketed by Lower Devonian red beds.

The onset of Rheic Ocean closure may be recorded in the Mid-German Crystalline zone by a Late Silurian to Lower Devonian (ca. 418–400 Ma) magmatic event that has been attributed to north-directed subduction beneath Laurussia following the closure of Iapetus (e.g., Kroner et al., 2007). Final closure of the Rheic Ocean in Europe is marked by the Variscan orogeny, which, in the Saxo-Thuringian zone and elsewhere, juxtaposed widespread Late Devonian to Early Carboniferous high-pressure metamorphic units (allochthonous domains) against low-grade Cadomian and Paleozoic terranes (autochthonous domains). Following destruction of the Rheic Ocean floor, oblique subduction of thinned Gondwanan continental crust began in the Early Devonian and persisted until the Early Carboniferous with early exhumation of Gondwanan high-pressure rocks ca. 370 Ma. These rocks were locally subducted to depths at which metamorphic diamond is stable (~120 km). Southeast-directed exhumation was initially accommodated in the subduction channel, after which (ca. 340–330 Ma) regional dextral transpression, rapid exhumation of the rocks of the allochthonous domain, and filling and folding of flysch basins occurred. Related widespread Variscan plutonism occurred in the Bohemian Massif ca. 335–320 Ma. Consistent with this evolution, the Mid-German Crystalline zone, which defines the Rheic suture, records a Late Devonian–Early Carboniferous history of oblique subduction, collision, exhumation, and strike-slip tectonics.

THE RHEIC OCEAN IN NORTH AMERICA

Although the Rheic suture is not exposed in North America, closure of the Rheic Ocean in the late Paleozoic dictated the sedimentary and deformational history of the entire Ouachita-Appalachian orogen. Furthermore, important vestiges of the ocean’s southern (Gondwanan) rifted continental margin and a possible record of its Late Devonian–Mississippian subduction are preserved in the Mixteca, Sierra Madre, and Oaxaquía terranes of southern and eastern Mexico (e.g., Nance et al., 2007).

Rifting and Opening

Within the Appalachians, evidence of the opening of the Rheic Ocean occurs only in those peri-Gondwanan terranes that defined the ocean’s northern margin and that were accreted to Laurentia with the closure of Iapetus. In Avalonia, for example, minor bimodal rift volcanism, predominantly of Middle to Late Cambrian age but locally spanning the entire Cambrian (e.g., Greenough and Papezik, 1986), may record initial rifting.

Faunal data suggest that rifting was a protracted process. Distinct faunal provinciality in the Early Cambrian suggests that Avalonia and Gondwana were separate (e.g., Landing, 1996), although the seaway between the two was narrow because the separation is not detectable paleomagnetically (e.g., Van der Voo, 1988). By the Middle Cambrian, the faunal barrier had broken down and, in the Early Ordovician, the fauna of Avalonia are of Gondwanan affinity. Faunal provinciality and paleomagnetic data following the Early Ordovician reflect
increasing separation of Avalonia from Gondwana (e.g., Cocks and Torsvik, 2002).

In Mexico, vestiges of the Gondwanan continental margin of the Rheic Ocean are preserved in the Oaxacan terrane, and voluminous bimodal magmatism that is interpreted to record rifting along this margin is present in the adjacent Mixteca terrane (Fig. 6). The Oaxacan terrane, the largest exposed portion of which are the Oaxacan Complex and Novillo Gneiss, exposes Mesoproterozoic (ca. 1.0–1.2 Ga) basement (e.g., Keppe, 2004) unconformably overlain by latest Cambrian–Early Ordovician (Tremadocian) and mid-Silurian (early to mid-Wenlock) continental margin siliciclastics containing fauna of Gondwanan affinity (e.g., Boucot et al., 1997; Landing et al., 2007).

To the west, the Mixteca and Sierra Madre terranes are interpreted to contain vestiges of the Rheic Ocean juxtaposed against the Oaxacan terrane along major north-south dextral faults of Early Permian age (Nance et al., 2007, and references therein). These vestiges form a major component of the Acatlán Complex, which constitutes the basement of the Mixteca terrane, as well as the Granjeno Schist of the Sierra Madre terrane to the north. In the Acatlán Complex, megacrystic granitoids and amphibolites of Ordovician age (ca. 440–480 Ma) intrude siliciclastic metasedimentary rocks (Piaxtla Suite) with detrital zircon signatures that closely match those of the early Paleozoic platform overlying the Oaxacan Complex (Gillis et al., 2005). The association is interpreted as a part of a protracted rift–passive margin sequence (e.g., Miller et al., 2007) analogous to the present-day Gulf of California, in which rifting continued well beyond terrane separation. Predominantly low-grade siliciclastic rocks of pre-Carboniferous age are thought to represent either continental rise deposits laid down within the Rheic Ocean or trench deposits associated with its subsequent closure.

**Closure and Collision**

Subduction of the Rheic Ocean in the Late Devonian–Mississippian is thought to be documented in the Piaxtla Suite of the Acatlán Complex by eclogites and decompression metamorphites with ages of ca. 345–350 Ma (Middleton et al., 2007) and by high-pressure rocks (including blueschists) with ages spanning the interval 320–345 Ma (Vega-Granillo et al., 2007). Associated arc rocks are not preserved, nor are they present in the Ouachita orogen, where the arc is most likely to have accreted and where mylonitic detritus and tuffs indicating the approach of an arc occur in rocks of Middle Mississippian age (e.g., Morris, 1989). Boulders of Devonian igneous and metamorphic rocks in strata of Pennsylvania age (Dennison et al., 1977) may also attest to subduction in the outboard Rheic Ocean. The absence of an arc in Mexico has led Keppie et al. (2008) to suggest that, in this segment of the Rheic, the arc may have been removed by subduction erosion beneath the Oaxacan (Gondwana) margin. Evidence of arc-related igneous rocks of Devonian–Mississippian age is likewise absent in the Appalachian orogen (e.g., Hermes and Murray, 1988), indicating that Laurentia, in contrast to Baltica, formed the lower plate during Rheic Ocean closure.

Closure of the Rheic Ocean resulted in the formation of the Ouachita belt and gave rise to the climaxtic phase in Appalachian orogenesis with the development of the Alleghanian orogen. Ocean closure was also responsible for the burial of the Laurentian platform, which was carbonate-dominated in the Mississippian, by thick Pennsylvanian clastic wedges that were shed westward (in the Appalachians) and northward (in the Ouachitas) into developing foreland basins from the rising orogenic front (e.g., Hatcher, 1989; Viele and Thomas, 1989). The onset of this clastic deposition took place in the Middle Mississippian, which, in the southern Appalachians, broadly coincides with the earliest ductile thrusting in the orogenic interior (ca. 335 Ma; Wortman et al., 1998).

Alleghanian deformation brought about by the collision of Gondwana and Laurentia likely involved oblique, rotational and orthogonal components and spanned the Pennsylvanian into the Early Permian (Fig. 7). In the northern Appalachians, Alleghanian orogenesis occurred as the result of oblique convergence between Laurentia and Gondwana and is dominated by dextral strike-slip tectonics on major northeast- and east-trending faults. In Canada, deformation is largely of Late Pennsylvanian age, and deposition was mainly confined to small wrench-related basins (e.g., Marillier, 1993). In New England, deformation was accompanied by Barrovian-style metamorphism that locally reached the sillimanite zone and has yielded cooling ages that span the Permian (e.g., Wintsch et al., 2003). Associated anatectic magmatism took place in the Late Carboniferous (ca. 325–350 Ma) and more locally, in the Early Permian (ca. 275 Ma), presumably as the result of crustal thickening.

In contrast, in the Ouachitas and the central and southern Appalachians, the deformational architecture takes the form of crustal-scale décollement structures that verge north and west, respectively. Seismic profiling across the southern Appalachians (e.g., Cook and Vasudevan, 2006) shows these structures to be orogen-wide, with the Laurentian platform on the lower plate extending almost 100 km beneath the crystalline thrust sheets of the orogenic interior (Fig. 8). In this way, the foreland fold-thrust belts that are the hallmark of Ouachita-Alleghanian orogenesis and that first developed within the exposed Laurentian platform in the Early Pennsylvanian (e.g., Hatcher, 1989; Viele and Thomas, 1989) represent only the supracrustal toes of low-angle structures that originated in the mid-crust and rose in stair-step fashion to progressively higher crustal levels.

Post-Mississippian deformation in the orogenic hinterland of the southern Appalachians is accompanied by dextral strike-slip tectonics on northeast-trending ductile shear zones, and, as in New England, is associated with significant metamorphism and anatectic magmatism (e.g., Horton et al., 1987). Metamorphism locally reached the kyanite zone and records hornblende cooling ages of 320–295 Ma (Dallmeyer et al., 1986). Widespread granitoid magmatism of latest Mississippian–Pennsylvanian age (ca. 321–304 Ma; e.g., Samson, 2001) either accompanied or followed the metamorphism and, again, is probably the result of tectonic thickening of the crust in response to transpressive convergence between Laurentia and Gondwana (e.g., Hatcher, 2002).

In contrast, the Ouachita orogen is distinctive in that metamorphism is essentially absent and there is no associated magmatic activity. Where present, metamorphism is mostly of subgreenschist facies of poorly constrained Pennsylvanian to
mid-Permian age (e.g., Viele and Thomas, 1989). Hence, the exposed portion of the orogen presumably lay well to the north of the Rheic suture. Following cessation of orogenic activity, this suture likely separated Laurentia from the Maya terrane (Fig. 6), which, prior to the opening of the Gulf of Mexico, is thought to have been contiguous with the Florida basement (e.g., Dickinson and Lawton, 2001).

CONCLUSIONS
As the ocean whose closure was responsible for the creation of the >10,000 km Ouauchita-Alleghanian-Variscan orogen and the assembly of the supercontinent of Pangea, the Rheic Ocean is arguably the most important ocean of the Paleozoic. Following the onset of subduction within the older Iapetus Ocean, the Rheic opened in the Early Ordovician as the result of the separation of Avalonia-Carolina from the northern margin of Gondwana along the line of a Neoproterozoic suture, likely in response to Iapetus slab pull. Records of this rifting and subsequent passive-margin development are preserved on the Gondwana margin in the Oaxaquia and Mixteca terranes of southern Mexico, the Ossa-Morena zone of southern Spain, and the northern Bohemian Massif of central Europe. They are also preserved in Avalonia, the faunal and paleomagnetic records of which document the terrane’s rapid northward drift toward Laurentia during the mid- to Late Ordovician.

The Rheic Ocean reached its maximum width (>4000 km) in the Silurian, following the accretion of Avalonia-Carolina to Laurentia and Baltica with the closure of Iapetus and the Tornquist Sea. Rheic Ocean closure began in the Early Devonian with subduction beneath both Baltica and northwestern Gondwana, and is recorded in the mid- to Late Devonian by ophiolite emplacement in southern Britain and northwestern and southern Iberia, and in the Late Devonian–Mississippian by eclogite facies metamorphism in Mexico and Europe. By the Mississippian, closure was essentially complete, but it continued into the Early Permian as Gondwana’s irregular West African margin collided with, and then moved westward and southward relative to, southern Baltica and eastern Laurentia, while its Amazonian margin converged with southern Laurentia. As a result, all three paleocontinents were sutured to form Pangea by the largest collisional orogenic belt of the Paleozoic. Closure of the Rheic Ocean played an unparalleled role in the sedimentary, structural, and tectonothermal record of the late Paleozoic from Central America to the Middle East and, with its completion, brought the Paleozoic era to an end.

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Dear paleontologists and geologists,

Fifty years ago, R.C. Moore established an endowment to support the compilation and publication of the *Treatise on Invertebrate Paleontology*, to be compiled by the Paleontological Institute at the University of Kansas and jointly published with the Geological Society of America, who would also be responsible for marketing and distribution. This has been a beneficial and rewarding relationship that sustained the *Treatise* for most of those 50 years.

Recently, however, the need has become ever more pressing for the *Treatise* to be put into digital form and, perhaps more importantly, to become a living document for students and research paleontologists. There has been a general sense that this must take place quickly.

When we met with leaders in the paleontological community (see below), it became clear that the *Treatise* needs to be reinvented in some very real senses. Because of the urgency and because of the magnitude of the task of reinvention, those of us involved in the business end of the *Treatise* (the co-signers below, plus GSA Executive Director Jack Hess, GSA Director of Publications Jon Olsen, and Jill Hardesty, managing editor of the *Treatise*) concluded that the current relationship between the Paleontological Institute and the Geological Society of America may be more of a hindrance than an advantage at this point in time. Therefore, we have decided that the best way forward, at least for the time being, is for the Paleontological Institute to take over all operations with respect to the *Treatise*.

This should in no way be construed as a lack of commitment on the part of the Geological Society of America to the paleontological community and to the *Treatise*. Indeed, GSA called this leadership meeting, and we note that GSA’s current president, Judith Totman Parrish, has very close ties to the paleontological community, having published numerous papers with paleontological and palaeobiological content, and, finally, some 20% of GSA members are paleontologists. Rather, GSA is assuming the same role as other geological societies and paleontological societies as an interested party to whom the Paleontological Institute might look for intellectual and financial support as appropriate. This change was necessary to allow the Paleontological Institute to proceed unfettered and to perform the reinvention of the *Treatise* with the greatest speed. GSA would like to emphasize that the door remains open for the *Treatise* to utilize GSA’s expertise in publication, distribution, and education and outreach at some future date if such expertise would be beneficial.

We believe that the future of the *Treatise* is bright and are looking forward to seeing its reinvention as a twenty-first-century resource.

Regards,

*Judith Totman Parrish*  
President, The Geological Society of America

*Paul Selden*  
Director; Paleontological Institute

*Robert H. Goldstein*  
Chair and Professor; Dept. of Geology; University of Kansas

**Leadership Group:** Warren Allmon, GSA *Treatise* Committee; Doug Erwin, President, Paleontological Society; Bob Goldstein, Chair and Professor, Dept. of Geology, University of Kansas; Joe Hannibal, GSA *Treatise* Committee; Jill Hardesty, *Treatise* Managing Editor; Howard Harper, Society for Sedimentary Geology (SEPM) Executive Director; Jack Hess, GSA Executive Director; Steve Hasiotis, SEPM; Jon Olsen, GSA Director of Publications; Tim Palmer, Palaeontological Association; Lisa Park, GSA *Treatise* Committee; Judy Parrish, GSA President; Paul Selden, Director, Paleontological Institute; University of Kansas; Paul Taylor, Palaeontographical Society; Roger Thomas, The Paleontological Society; and Richard Twitchett, Palaeontological Association.
CALL FOR NOMINATIONS

2009 GSA Division Awards

Nominations are requested for the following GSA Division awards, listed in order by nomination deadline. These awards will be presented at the 2009 GSA Annual Meeting in Portland, Oregon, USA.

All funds are administered by the GSA Foundation.

BIGGS AWARD FOR EXCELLENCE In Earth Science Teaching Award
Geoscience Education Division
The Biggs Award recognizes innovative and effective teaching in college-level earth science. Earth-science instructors and faculty members from any academic institution engaged in undergraduate education who have been teaching full-time for 10 years or fewer are eligible (part-time teaching is not counted in the 10-years-or-fewer requirement). Both peer- and self-nominations are accepted for this award.

The US$750 award is made possible by support from the Donald and Carolyn Biggs Fund, the GSA Geoscience Education Division, and GSA’s Education and Outreach Program. An additional travel reimbursement of up to US$500 is available to the recipient to enable him or her to attend the award presentation at the GSA Annual Meeting.

Send nominations by 1 February 2009 to Paul Baldauf, Nova Southeastern University, Math, Science, and Technology Division, 3301 College Avenue, Fort Lauderdale, FL 33314, USA, pb501@nova.edu. To access the nomination form, please go to www.geosociety.org/awards/biggs.htm.

MARY C. RABBITT HISTORY OF GEOLOGY AWARD
History of Geology Division
The Mary C. Rabbitt History of Geology Award, established in 1981 and renamed in 2005 to honor Rabbitt, is presented annually for exceptional scholarly contributions of fundamental importance to understanding the history of the geological sciences. Neither the nominator nor the nominee need be members of the Division or of GSA. Achievements deserving of the award include, but are not limited to, publication of papers or books that contribute new and profound insights into the history of geology based on original research or a synthesis of existing knowledge. For more information, please go to http://gsahist.org/HoGaward/awards.htm.

Send nominations by 1 February 2009 to Stephen M. Rowland, University of Nevada, Dept. of Geoscience, Box 454010, Las Vegas, NV 89154-4010, steve.rowland@unlv.edu.

GEORGE P. WOOLLARD AWARD
Geophysics Division
The annual George P. Woollard Award recognizes outstanding contributions to geology through the application of the principles and techniques of geophysics. A highlight of this award’s presentation is the honorary George P. Woollard Technical Lecture by the recipient before the award ceremony. Nominations should include a description of the nominee’s specific contributions and their scientific impact.


LAURENCE L. SLOSS AWARD FOR SEDIMENTARY GEOLOGY
Sedimentary Geology Division
This award is given annually to a sedimentary geologist whose lifetime achievements best exemplify those of Larry Sloss—achievements that contribute widely to the field of sedimentary geology and service to GSA. Nominations, to be considered by the Sedimentary Geology Division’s management board, should include a cover letter describing the nominee’s accomplishments in sedimentary geology and contributions to GSA, along with a curriculum vitae.

Send nominations electronically by 20 February 2009 to Paul Link, Sedimentary Geology Division, linkpaul@isu.edu.
GILBERT H. CADY AWARD

Coal Geology Division

The Gilbert H. Cady Award, established in 1973 in honor of Cady, recognizes outstanding contributions that advance the field of coal geology.

Nominations, which will be evaluated by the Gilbert H. Cady Award Panel, should include the name, office or title, and affiliation of the nominee; date and place of birth; education, degree(s), and honors and awards; major events in his or her professional career; and a brief bibliography noting outstanding achievements and accomplishments that warrant nomination.

Send three copies of the nomination by 28 February 2009 to Glenn Stracher, East Georgia College, Division of Science & Mathematics, 131 College Circle, Swainsboro, GA 30401-3643, USA; +1-478-289-2073; stracher@ega.edu.

DON J. EASTERBROOK DISTINGUISHED SCIENTIST AWARD

Quaternary Geology and Geomorphology Division

The Don J. Easterbrook Distinguished Scientist Award recognizes excellence in published research, as demonstrated by a single paper of exceptional merit or a series of papers that have substantially increased knowledge in Quaternary geology or geomorphology. The recognition is normally extended to an individual, but in the event of particularly significant research, two people may share the award. No time limitations apply to the recognized research.

Although recognition of extraordinary prior research excellence is the principal goal of this award, a second consideration of this award is the opportunity to fund additional research. The Easterbrook Distinguished Scientist is eligible to draw funds for further research from the GSA Easterbrook Fund, administered by the GSA Foundation.

Nominees need not be members of the Quaternary Geology and Geomorphology Division. Because the award primarily recognizes research excellence, self-nomination is not allowed. Nominations must be accompanied by supporting documentation, including a statement of the significance of the nominee's research, a curriculum vitae, letters of support, and any other documents deemed appropriate by the nominating committee.

Send nominations by 2 April 2009 to Marith Reheis, U.S. Geological Survey, MS 980, Federal Center, P.O. Box 25046, Denver, CO 80225-0046, USA; +1-303-277-1843; mreheis@usgs.gov.

FAROUK EL-BAZ AWARD FOR DESERT RESEARCH

Quaternary Geology and Geomorphology Division

The Farouk El-Baz Award for Desert Research rewards excellence in desert geomorphology research worldwide. It is intended to stimulate research in desert environments by recognizing an individual whose research has significantly advanced the understanding of the Quaternary geology and geomorphology of deserts. Although the award primarily recognizes achievement in desert research, the funds that accompany it (US$10,000 anticipated for 2009) may be used for further research. The award is normally given to one person but may be shared by two people if the recognized research was the result of a coequal partnership.

Any scientist from any country may be nominated for this award, and neither nominators nor nominees need be GSA members. Because the award recognizes research excellence, self-nomination is not permitted. Nominations must be accompanied by a statement of the significance of the nominee's research, a curriculum vitae, letters of support, and documentation of published research results that have significantly advanced the knowledge of the Quaternary geology and geomorphology of desert environments.

Send nominations by 2 April 2009 to Paul R. Bierman, University of Vermont, Dept. of Geology, Delahanty Hall, Burlington, VT 05405-0001, USA; +1-802-656-4411; pbierman@zoo.uvm.edu.
GSA is now accepting nominations for the following awards and medals:

- **Penrose Medal**
- **Day Medal**
- **Young Scientist Award (Donath Medal)**
- **Honorary Fellows**
- **GSA Public Service Award**
- **GSA Distinguished Service Award**
- **Bromery Award for the Minorities**
- **Subaru Outstanding Woman in Science Award** *(Sponsored by Subaru of America, Inc.)*

Nomination deadline: **1 February 2009**.

**GSA Fellowship**

The GSA Committee on Membership requests nominations of GSA Members to be elevated to GSA Fellow status. Any GSA Fellow may nominate up to two members per year (only one as a primary nominator), and a **GSA Member** who is not a Fellow may be a secondary nominator for up to **two** nominees per year.

Nomination deadline: **1 February 2009**.

**AGI Medal in Memory of Ian Campbell**

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

**John C. Frye Environmental Geology Award**

*Supported by endowment income from the GSA Foundation’s John C. Frye Memorial Fund.*

In cooperation with the Association of American State Geologists, GSA makes an annual US$1,000 cash prize award for the best paper on environmental geology published either by GSA or by one of the state geological surveys.

Nomination deadline: **31 March 2009**.

**2009 National Awards**

GSA Members are invited to nominate colleagues for the following awards, which are coordinated by the American Geological Institute (AGI).

- **William T. Pecora Award**
- **National Medal of Science**
- **Vannevar Bush Award**
- **Alan T. Waterman Award**

Nomination deadline: **1 February 2009**.

**2009 Student Research Grants**

Grants applications may be made online only; no paper applications or letters will be accepted. Go to www.geosociety.org/grants/gradgrants.htm to apply.

Submission deadline: **11:59 p.m. (MST) on 1 February 2009**.

**2009 Post-Doctoral Research Awards**

The following 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 in geomorphology. 2009 award: US$9,900.
- **The W. Storrs Cole Memorial Research Award** for research in 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. 2009 award: US$9,100.

Application deadline for either award: **1 February 2009**.
Apocalypse brings the latest scientific evidence to bear on biblical accounts, mythology, and the archaeological record to explore how ancient and modern earthquakes have shaped history—and, for some civilizations, seemingly heralded the end of the world.

Through earthquakes the book explores also societal and philosophical issues related to natural disasters and catastrophies. Amos Nur bridges the gap that for too long has separated archaeology and seismology. He examines tantalizing evidence of earthquakes at some of the world's most famous archaeological sites in the Mediterranean and elsewhere, including Troy, Jericho, Knossos, Mycenae, Armageddon, Teotihuacán, and Petra. As Nur shows, recognizing earthquake damage in the shifted foundations and toppled arches of historic ruins is vital today because the scientific record of world earthquake risks is still incomplete. Apocalypse explains where and why ancient earthquakes struck—and could strike again.

**AVAILABLE NOW ONLINE AT AMAZON.COM OR ORDER / BUY FROM YOUR LOCAL BOOKSTORE**

Amos Nur is the Wayne Loel Professor of Earth Sciences and professor of geophysics at Stanford University. Dawn Burgess is a writer and editor based in Bar Harbor, Maine. She earned a PhD in geophysics from Stanford.
If you’re like a lot of people, the very words strategic plan make your eyes glaze over. But hang in here with me for a little bit.

Strategic plans don’t have to be hopeless. A well-written strategic plan can be vital for helping make decisions in resource-limited (read: ALL) environments and can serve as benchmarks for measuring progress.

A few years ago, GSA Council and headquarters staff rewrote GSA’s strategic plan. Mindful that the HQ staff uses the strategic plan explicitly in implementing the vision of Society members through their representatives on Council, we worked to make it a document that pointed in specific directions and could therefore be used in decision making.


For the past four years, GSA’s executive director has been charged with reporting progress on the strategic plan to the Executive Committee and Council, and he has done so with a running documentation of each year’s accomplishments. At the recent annual ExCom retreat, when the executive director made his presentation, it occurred to me that we had indeed written a document that was not only useful but that had guided us remarkably well in reassessments and decisions over the past four years.

With the adoption of a new strategic plan, this seems a good time to make the progress report—in all its lengthy detail—available to the membership at large. For each goal and objective, we have a four-year record of progress and successes, as well as a few failures and reassessments, all of which were examined closely in the formulation of the new strategic plan.

The progress report can be read at www.geosociety.org/aboutus/08stratPlanProgress.pdf. I hope that you will take the time to read at least a portion of this document to see that GSA’s HQ staff and Council, along with myriad other individuals and entities that make up the governance structure of the GSA, have been deliberate and successful in carrying out the vision and mission of the Society. I believe this is a large part of the reason that the health of GSA is outstanding and that we are increasingly recognized as a leading geological society in the world.

GSA Adopts New Strategic Plan

Judith Totman Parrish, President

Applications for GeoCorps™ America 2009 are now being accepted. All geoscientists—from undergraduate students to retirees—are encouraged to participate!

See our Web site for position descriptions and application details.

www.geosociety.org/geocorps

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www.gsaajournals.org
Here is your chance to have real input for next year's annual meeting: Play a key role by proposing a topical session! Get involved starting now to help maximize your meeting experience and that of others. This is your meeting.

Have you ever been frustrated to find that none of the topical sessions at a GSA meeting represent your own current area of research and excitement? If so, there is an easy answer: Propose a session yourself! The topical sessions at GSA meetings are planned entirely by your friends and colleagues. If these sessions do not adequately reflect your own interests, your voice is needed.

The reward is great: You play a direct role in attracting key people to the meeting and in formulating part of the program that will be of direct benefit to you. Yours might even be the session that has everyone talking in the corridors and the bars, or even on the evening news! You may also be well on your way to producing the next GSA Special Paper.

2009 Technical Program Chair: Dick Berg, +1-217-244-2776, berg@isgs.uiuc.edu.

PROGRAM OPPORTUNITIES
Topical Sessions

Please submit your proposals electronically on or before 6 January 2009 via the link at www.geosociety.org. Topical
sessions promote the exchange of timely and/or state-of-the-art information with respect to a focused topic and allow scheduling of interdisciplinary talks that bear specifically on that topic. Organizers (advocates) may request specific papers to ensure a successful session and are encouraged to solicit volunteered contributions. Advocates may invite up to three speakers or poster presenters and are encouraged to solicit volunteered abstracts for the topical session as well, so that a session includes a mixture of requested and volunteered abstracts. Once a topical session is approved, volunteered abstracts will also be solicited in GSA Today. Topical sessions must receive a minimum of 12 abstracts to be part of the technical program. Advocates are encouraged to submit their proposals as poster sessions to accommodate the growing technical program. All session proposals are reviewed by the Joint Technical Program Committee (JTPC).

Pardee Keynote Symposia

Pardee Keynote Symposia, which are special events of broad interest to the geoscience community, are made possible by a grant from the Joseph T. Pardee Memorial Fund.

New this year: The Annual Program Committee (APC) plans to take a proactive role in selecting topics and soliciting conveners for Pardee Keynote Symposia in order to enhance the range and significance of science presented at the annual meeting and to highlight topics of particular relevance to the Portland meeting location.

As always, we expect these topics to be on the leading edge in scientific disciplines or public policy and to address broad, fundamental issues. We want to stress that the ideas will not be limited to those of just the APC; we highly encourage GSA Divisions and Associated Societies to pool their resources and submit ideas related to new breakthroughs and transformative science within their specialty areas. We also encourage members to work with GSA Divisions and Associated Societies to come up with Pardee Keynote Symposia topics.

Also new this year is the opportunity to suggest a different session format for any Pardee Keynote Symposium that you propose. Symposia may include only two or three speakers, or they may revolve around a technical panel discussion. They can follow a typical half-day session format, or you might only want them to fill a two-hour slot. You have the flexibility to create a session that works best for the topic at hand.

We encourage you to suggest topics for Pardee Symposia by writing to Nancy Wright at nwright@geosociety.org. Again, the deadline to submit your ideas is 6 January 2009.

Oral and Poster General Sessions

Consisting entirely of volunteered papers, these sessions are an important component of the GSA Annual Meeting. The number of abstracts received determines the number of general sessions in each discipline. The goal of the Technical Program Chair and JTPC representatives is to provide presenters with the best possible opportunity for communicating new scientific information rather than to dictate what can or will be presented. To allow for well-attended, dynamic sessions, an effort will be made in scheduling to avoid overlap of poster and oral sessions in the same discipline.

Hot Topics

The focus of these popular lunchtime forums, held Sunday through Wednesday, is on discussion—with plenty of audience participation. Depending on the subject, a debate format is recommended; panels are discouraged, and each session must have a moderator. Titles should be catchy and provocative. If you are interested in organizing a hot-topic session, contact Melissa Cummiskey, mcummiskey@geosociety.org.

PORTLAND 2009 DATES AND DEADLINES

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>6 January</td>
<td>Session proposals due by midnight Pacific Standard Time</td>
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<tr>
<td>April</td>
<td>Electronic abstract form posted at <a href="http://www.geosociety.org">www.geosociety.org</a></td>
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<td>First announcement in GSA Today</td>
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<tr>
<td>June</td>
<td>Second announcement in GSA Today</td>
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<tr>
<td>11 August</td>
<td>Abstracts due by midnight, Pacific Standard Time</td>
</tr>
<tr>
<td>31 August</td>
<td>Technical program schedule finalized</td>
</tr>
<tr>
<td>mid-September</td>
<td>Accepted abstracts with links to speakers and titles posted online</td>
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Preliminary Announcement and Call for Papers

CORDILLERAN

105th Annual Meeting
Kelowna, British Columbia, Canada

7–9 May 2009

GSAs Cordilleran Section will meet on the University of British Columbia–Okanagan campus in Kelowna, British Columbia. Kelowna is ~400 km east of Vancouver, situated along Okanagan Lake in the Okanagan Valley. This valley is the northernmost extension of the Sonora Desert, and therefore is known for its unique geology and environment, including mountains, beaches, orchards, and vineyards. Kelowna is also the center of the Canadian diamond industry. Field trips in conjunction with this meeting will observe local geology associated with Cenozoic rifting and volcanism, local mining activity, surface and groundwater research in this semiarid basin, glacial geology at the edge of the Channelled Scablands, and the Burgess Shales area on the 100th anniversary of their discovery.

CALL FOR PAPERS

Abstract Deadline: 3 February 2009
Please submit your abstract online via link at www.geosociety.org/meetings/; an abstract submission fee of US$10 will be charged. For expanded meeting information, check our Web site or contact the local committee chair, Robert Young, at robert.young@ubc.ca.

Registration Deadline: 6 April 2009
Cancellation Deadline: 13 April 2009

Kelowna, British Columbia, Canada. Photo courtesy Tourism Kelowna–SATW.
Plan now to attend one or more of the following mentor luncheons at your 2009 Section Meeting.

MEET YOUR CAREER MENTORS
Chat one-on-one with practicing geoscientists. Our quality group of volunteer mentors will answer your questions and share insights on how to get a job after graduation. Space for these events is limited, so plan to arrive early. If you have questions, please contact Jennifer Nocerino, jnocerino@geosociety.org. Both programs are sponsored by the GSA Foundation.

DESCRIPTIONS
Roy J. Shlemon Mentor Program
in Applied Geoscience
This luncheon provides an occasion for students to discuss career opportunities and challenges with professional geoscientists from multiple disciplines. Students will receive tickets for this FREE lunch in their meeting registration packets.

John Mann Mentors
in Applied Hydrogeology Program
This event presents opportunities for students and recent graduates interested in a career in applied hydrogeology or hydrology to network with practicing professionals. Whether you’ve already decided to head down the hydro career path or would just like to know more about career options, this luncheon is for you! Students will receive a ticket for this focused, small-scale event and FREE lunch in their meeting registration packets.

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<thead>
<tr>
<th>Region</th>
<th>Location</th>
<th>Dates</th>
<th>Times</th>
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<tbody>
<tr>
<td>SOUTHEASTERN</td>
<td>St. Petersburg, Florida, USA</td>
<td>Thurs., 12 March, 11:30 a.m.–12:30 p.m. and 12:30–1:30 p.m.</td>
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<td></td>
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<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Fri., 13 March, 11:30 a.m.–1 p.m.</td>
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<tr>
<td>SOUTH-CENTRAL</td>
<td>Dallas, Texas, USA</td>
<td>Mon., 16 March, 11:30 a.m.–1 p.m.</td>
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<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Tues., 17 March, 11:30 a.m.–1 p.m.</td>
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<tr>
<td>NORTHEASTERN</td>
<td>Portland, Maine, USA</td>
<td>Mon., 23 March, 11:30 a.m.–12:30 p.m. and 12:30–1:30 p.m.</td>
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<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Tues., 24 March, 11:30 a.m.–1 p.m.</td>
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<tr>
<td>NORTH-CENTRAL</td>
<td>Rockford, Illinois, USA</td>
<td>Fri., 3 April, 11:30 a.m.–12:30 p.m. and 12:30–1:30 p.m.</td>
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<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Thurs., 2 April, 11:30 a.m.–1 p.m.</td>
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<tr>
<td>CORDILLERAN</td>
<td>Kelowna, British Columbia, Canada</td>
<td>Thurs., 7 May, 11:30 a.m.–12:30 p.m. and 12:30–1:30 p.m.</td>
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<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Fri., 8 May, 11:30 a.m.–1 p.m.</td>
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<tr>
<td>ROCKY MOUNTAIN</td>
<td>Orem, Utah, USA</td>
<td>Mon., 11 May, 11:30 a.m.–1 p.m.</td>
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<td></td>
<td>Mann Mentors in Applied Hydrogeology Luncheon</td>
<td>Tues., 12 May, 11:30 a.m.–1 p.m.</td>
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The Dallas–Fort Worth metropolitan area is the largest in Texas. This astronaut photograph captures the northwestern portion of the metropolitan area, including Lake Lewisville and Grapevine Lake. Astronaut photograph ISS010-E-24596 from 14 April 2005, provided by the International Space Station Crew Earth Observations experiment and the Image Science & Analysis Group, Johnson Space Center.

**LOCATION AND CONTACT INFORMATION**

The meeting will take place at the conference center on the University of Texas at Dallas campus, 800 W. Campbell Road, Richardson, Texas 75080, USA.

Find details on field trips, workshops, student opportunities, the guest program, symposia and theme sessions, and additional hotels at [www.geosociety.org/meetings/](http://www.geosociety.org/meetings/).

For further information, or if you have special requirements, please contact the meeting chairs: local committee chair John Ferguson, ferguson@utdallas.edu, or technical program chair Bob Stern, rjstern@utdallas.edu.

**Special Thanks to These GSA South-Central Sponsors!**

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<td>Denbury Resources Inc.</td>
<td>The Dallas Geological Society</td>
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<td>XTO Energy</td>
<td>Forth Worth Geological Society</td>
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<td>EnCana</td>
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**REGISTRATION**

**Early Registration Deadline:** 9 February 2009

Please register at [www.geosociety.org/meetings/](http://www.geosociety.org/meetings/). Please note that GSA will distribute all badges at the meeting; no badges will be mailed.

**REGISTRATION FEES**

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<th></th>
<th>Early</th>
<th>Standard</th>
<th>One-day</th>
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<td>US$140</td>
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<td>US$30</td>
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<tr>
<td>Guest or Spouse</td>
<td>US$30</td>
<td>US$35</td>
<td>N/A</td>
</tr>
<tr>
<td>Field Trip or Workshop only</td>
<td>US$20</td>
<td>US$25</td>
<td>N/A</td>
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</tbody>
</table>

*Includes box lunch for each day of registered attendance.

**On-Site Registration & Registration Packet Pickup Schedule**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
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<tr>
<td>Sunday, 15 March</td>
<td>4–7:30 p.m.</td>
</tr>
<tr>
<td>Monday, 16 March</td>
<td>7:30 a.m.–5 p.m.</td>
</tr>
<tr>
<td>Tuesday, 17 March</td>
<td>7:30 a.m.–noon</td>
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</tbody>
</table>

In recognition of the fact that states in northeastern Mexico have just been added to the GSA South-Central Section, registration fees will be waived for geoscientists and students who are either employed or enrolled in Mexico (as evidenced by passport and/or other official ID). In addition, special arrangements have been made to provide financial support for Mexican geoscientists who are first author and presenting a paper or poster at the meeting. Please contact John Ferguson at ferguson@utdallas.edu, Bob Stern at rjstern@utdallas.edu, or Gabriel Chavez Cabello at Universidad Autónoma de Nuevo León, gabchave2001@yahoo.com.mx, for further details.

**Cancellations, Changes, and Refunds**

Requests for additions, changes, and cancellations must be received at GSA Headquarters by **17 February 2009**. No refunds will be made on cancellation notices received after this date.

**ACCOMMODATIONS**

**Hotel Registration Deadline:** 21 February 2009

Make your reservations via [www.geosociety.org/meetings/](http://www.geosociety.org/meetings/) using reservation code “2009 GSA South-Central Meeting.”

**CALL FOR PAPERS**

**Abstract deadline:** 9 December 2008

**Fee:** US$10

**Technical Program Chair:** Bob Stern, rjstern@utdallas.edu

**Theme Sessions**

1. Permian to Jurassic Tectonics, Magmatism, and Sedimentation in the NE Mexico and South-Central USA Region. Rafael Barboza, Universidad Autónoma de San Luis Potosi, rbarboza@uaslp.mx; William R. Dickinson, University of Arizona, wrdickin@dakotacom.net; Alexander Iriondo, Universidad Nacional Autónoma de Mexico Campus Juriquilla, iriondo@dragon.geociencias.unam.mx; Timothy F. Lawton, New Mexico State University,
2. **Geology and Health Issues in Texas, Mexico, and Beyond.** Bob Finkelman, University of Texas at Dallas, bohf@utdallas.edu; Joseph Oppong, University of North Texas, oppong@unt.edu.

3. **Trans-Pecos Volcanic Province.** Elizabeth Anthony, University of Texas at El Paso (UTEP), eanthony@utep.edu; Don Parker, Baylor University, don_parker@baylor.edu; Minghua Ren, UTEP, ren@geo.utep.edu; Dan Miggins, USGS/UTEP, dmiggins@usgs.gov.

4. **Water Resource Challenges and Opportunities in North-Central Texas and Surrounding Regions.** Tom Brikowski, University of Texas at Dallas, brikowski@utdallas.edu; Jack Sharp, University of Texas at Austin, jmsharp@mail.utexas.edu.

5. **Geology and Public Policy Forum: Resource Planning and Geoscientific Input.** Wendi Williams, University of Arkansas, wjwillia@uark.edu; Jack Sharp, University of Texas at Austin, jmsharp@mail.utexas.edu; Tom Brikowski, University of Texas at Dallas, brikowski@utdallas.edu.

6. **Shale Reservoirs—Giant Hydrocarbon Resources for the 21st Century.** John A. Breyer, Texas Christian University (TCU), j.breyer@tcu.edu; Daniel M. Jarvie, Worldwide Geochemistry and TCU Energy Institute, danjarvie@wwgeochem.com.

7. **A View from the Craton Southward into the Gulf of Mexico: The Geology and Geophysics of Transitions: Celebrating the Career of R.E. (Tim) Denison.** G.R. Keller, University of Oklahoma, grkeller@ou.edu; M. Cloos, University of Texas at Austin, cloos@mail.utexas.edu.

8. **Recent Advances in Geology, Geochemistry and Biostatigraphy of the Permain Basin, Texas and New Mexico.** M.K. Nestell, University of Texas at Arlington, nestell@uta.edu; P.J. Noble, University of Nevada—Reno, noblep@unr.edu.

9. **Undergraduate Research (Posters).** Sponsored by the Council on Undergraduate Research, Geosciences Division. Mon., 16 March. Diane Smith, Trinity University, dsmith@trinity.edu, +1-210-999-7656.

**FIELD TRIPS**

For an extended list of field trips and descriptions, go to www.geosociety.org/meetings/.

**Pre-meeting**

1. **Trans-Pecos (Big Bend) Volcanic Province Field Trip.** Thurs.—Sun., 12–15 March, 2009, Elizabeth Anthony, University of Texas at El Paso (UTEP); Don Parker, Baylor University; Minghua Ren, UTEP; Don Miggins, USGS/UTEP. This trip will be staging from the El Paso airport for those traveling by air to Dallas after the field trip. Groups and individuals traveling by road can join the field trip in Alpine, Texas. No unofficial vehicles will be permitted on the trip beyond Alpine. Cost: US$300; US$200 students. Min.: 15; max.: 32.


**Post-meeting**

1. **Field Work and Cyber-Mapping in the Arbuckle Mountains, Oklahoma.** Wed., 18 March. Mohammed Abdelsalam, Missouri University of Science and Technology (MUST); Carlos Aiken, University of Texas at Dallas; John Hogan, MUST. Cost: US$100; students, US$50. Min.: 15; max.: 30.

**SPECIAL EVENTS**

**Icebreaker Reception:** Sun., 15 March, 5:30–7:30 p.m., UTD Conference Center.

**South-Central Section Management Board Meeting:** Mon., 16 March, 4:30–5:30 p.m., UTD Conference Center.

**South-Central Section Business Meeting:** Mon., 16 March, 5:30–6:30 p.m., UTD Conference Center.

**Reception for GSA 50-Year Members:** Mon., 16 March. Save the date—invitations will be sent! For more information, contact Jack Sharp, jmsharp@mail.utexas.edu, or Robert Rutford, rutford@utdallas.edu.

**TRAVEL GRANTS**

Travel grants are available from the South-Central Section in cooperation with the GSA Foundation for GSA Student Members making oral or poster presentations at the meeting. Information and applications are at www.geosociety.org/sectdiv/southc/.

**OUTSTANDING POSTER PROGRAM**

One undergraduate and one graduate student poster will be selected for recognition. Award recipients will be given a complimentary registration to the 2009 GSA Annual Meeting & Exposition, and the selected posters will be displayed at that meeting.

**STUDENT VOLUNTEERS**

We rely on student volunteers to help meetings run smoothly, and the local committee and officers of GSA’s South-Central Section are pleased to offer student volunteers free registration for the meeting in return for ~6 hours of work. The deadline for volunteering is 1 February 2009. Contact student volunteer coordinator John Holbrook at the University of Texas at Arlington, holbrook@uta.edu, if interested.

**OPPORTUNITIES FOR K–12 EDUCATORS**

Please note the reduced rate for K–12 educators for the Sunday pre-meeting field trip “Sedimentary Environments and Dinosaur Tracks, Woodbine Formation, Lake Grapevine (Dallas).”

**Continuing Education Credit (CEU)**

CEUs can be accrued from participation in organized education experiences. One CEU equals 10 contact hours and applies to meeting field trips and/or short courses. There’s no extra charge for a certificate; please contact Beth Engle, bengle@geosociety.org, for more information.
EXTENDED: The Charitable IRA Rollover Act of 2006

One of the many provisions included in the Tax Extenders and Alternative Minimum Tax Relief Act of 2008 (passed by Congress on 3 October 2008) was the extension of the Charitable IRA Rollover Act of 2006. The bill makes no changes in the provisions of the IRA Rollover Act of 2006—it simply extends the 2006 provision of making charitable gifts from potentially taxable Individual Retirement Accounts (IRA) in 2008 and 2009 to qualified charities like the GSA Foundation. In short, gifts up to US$100,000 to the GSA Foundation from your IRA may be deducted from income that could otherwise be subject to tax under federal law and the laws of many states.

Key Requirements

- The donor must be 70½ years of age or older at the time the gift is made.
- Rollover gifts cannot exceed US$100,000 per taxpayer per year.
- Gifts must be made directly to the GSA Foundation (i.e., not to a donor advised fund or through a private foundation).

*This really is a new window of opportunity for GSA senior members.* While rollover gifts are not tax deductible, the amount rolled over from your IRA is also not included in your taxable income. If you have been concerned about paying taxes on money taken out of your IRA, *this rollover provides the means to send that money to the GSA Foundation intact, not reduced by income taxes.*

You still have time to make an IRA rollover gift in 2008, and you are not limited by the amount you may have already taken as your required minimum distribution. Your IRA custodian will have the appropriate form for this withdrawal. To learn more about making an IRA rollover gift, check with your estate planner or contact the GSA Foundation office at +1-303-357-1054, drussell@geosociety.org.

Don’t Be Late!

All donations to the GSA Foundation must be postmarked by 31 December 2008 in order to be tax deductible for 2008. You can also donate via the Foundation’s Web site at [gsafweb.org](http://gsafweb.org).

Most memorable early geologic experience:

As a preschooler, going with my grandfather to the Ohio State Museum in Columbus (he was a volunteer curator), and the excitement over being shown bright shiny minerals, strange bugs and shells, and so many rocks! I was hooked at 5 years of age!

—John T. Dutro
In Memoriam

Donald L. Baars  
Lawrence, Kansas, USA  
7 July 2008

Alfonso M. Escalante  
Brandon, Mississippi, USA  
7 January 2008

Robert Edward Folinsbee  
Nanticoke, Ontario, Canada  
notified 28 May 2008

McLain J. Forman  
New Orleans, Louisiana, USA  
1 June 2008

Irving Friedman  
Denver, Colorado, USA  
28 June 2008

James N. Gundersen  
Las Cruces, New Mexico, USA  
1 April 2008

John F. Harsh  
Tampa, Florida, USA  
7 January 2007  
(notified 2 Oct. 2008)

Joseph H. Hartshorn  
Sarasota, Florida, USA  
5 May 2008

Roy M. Huffington  
Houston, Texas, USA  
notified 14 July 2008

Albert L. Kidwell  
Phoenix, Arizona, USA  
16 August 2008

Charles E. Kirschner  
Union, Washington, USA  
7 November 2007  
(notified 22 Sept. 2008)

Philip E. LaMoreaux  
Tuscaloosa, Alabama, USA  
23 June 2008

Alvin R. Leonard  
Portland, Oregon, USA  
7 February 2007  
(notified 4 June 2008)

Benjamin F. Leonard  
McCall, Idaho, USA  
5 September 2008

Donald H. MacDonald  
Niagara on the Lake, Ontario, Canada  
2 November 2007  
(notified 30 June 2008)

Muriel Mathez  
Columbia, New Jersey, USA  
1 June 2008

Fred F. Meissner  
Centennial, Colorado, USA  
18 September 2007  
(notified 29 May 2008)

Akiho Miyashiro  
Albany, New York, USA  
22 July 2008

Margaret O. Oros  
New Rockford, North Dakota, USA  
notified 10 June 2008

John S. Owens  
Pengilly, Minnesota, USA  
30 June 2008

Robert T. Russell  
Montrose, Colorado, USA  
21 May 2008

Amos Salvador  
Austin, Texas, USA  
2 December 2007  
(notified 2 Oct. 2008)

John S. Shelton  
La Jolla, California, USA  
24 July 2008

Raymond T. Stotler Jr.  
Dallas, Texas, USA  
11 June 2008

Sidney E. White  
Columbus, Ohio, USA  
7 September 2008

To honor a friend or colleague with a GSA Memorial, please go to www.geosociety.org/pubs/memorials/mmlGuid.htm to learn how. Contact the GSA Foundation at +1-303-357-1054, drussell@geosociety.org, www.gsafweb.org, if you would like to contribute to the Memorial Fund.

About People

In recognition of his extraordinary originality, creativity, dedication, and “promise for important future advances,” GSA Fellow David Montgomery has been awarded a MacArthur Fellowship by The John D. and Catherine T. MacArthur Foundation. Read more at www.macfound.org.

GSA Senior Fellow Farouk El-Baz met with U.S. President George W. Bush at the White House for an Iftar reception and dinner in recognition and celebration of Ramadan on 17 September 2008. El-Baz is director of the Boston University Center for Remote Sensing.

At the 33rd International Geological Congress (IGC) in Oslo, Norway, 5–14 August, GSA Member Stan Finney began a four-year term as chair of the International Commission on Stratigraphy (IUGS). Also during the IGC, GSA Fellow Carlton Brett was presented with the IUGS Digby McLaren Prize in recognition of his outstanding career of significant contributions toward advancing the discipline of stratigraphy.

In July 2008, GSA Fellow Gordon Lister was awarded the S.W. Carey Medal by the Geological Society of Australia for a distinguished career in the field of tectonics.

GSA Member Robert Detrick of the Woods Hole Oceanographic Institution has been named the director of the Division of Earth Sciences for the National Science Foundation Directorate for Geosciences.

Deceased GSA Fellow Fred F. Meissner (see In Memoriam), a petroleum geologist with the Colorado School of Mines, was posthumously awarded the American Association of Petroleum Geologists (AAPG) Sidney Powers Memorial Award in April 2008. This gold medal, given in recognition of distinguished and outstanding contributions to, or achievements in, petroleum geology, is AAPG’s highest honor.
Life of the Past

A SEA WITHOUT FISH
Life in the Ordovician Sea of the Cincinnati Region
David L. Meyer and Richard Arnold Davis * With a chapter by Steven M. Holland
A thorough introduction to the abundant and beautiful rocks, fossils, and ancient sea-dwelling animals of the Cincinnati, Ohio region found in limestones and shales deposited on the sea floor about 450 million years ago.
Cloth $44.95

VERTEBRATE MICROFOSSIL ASSEMBLAGES
Their Role in Paleoecology and Paleobiogeography
Edited by Julia T. Sankey and Sven Baszio
The minute remains of animals and plants have proven very useful to paleontologists as tools for dating large fossils, describing the environments which existed at the time the fossils were deposited and identifying and mapping the extent of local floras and faunas, among other things. This volume presents state-of-the-art papers on important topics and methods in the analysis of vertebrate microfossil assemblages.
Cloth $59.95

ECHINODERM PALEOBIOLOGY
Edited by William I. Ausich and Gary D. Webster
Treats various paleobiological approaches to the phylum’s remarkable evolutionary history.
“Timely and necessary . . . the echinoderm fossil record provides the ideal data with which to ask important paleobiologic and evolutionary questions and to expect high-resolution answers.”
—Roy Plotnick, University of Illinois, Chicago Circle
Cloth $59.95
The School of Geography and Earth Sciences at McMaster University invites applications for a tenure track position in Stable Isotope Geochemistry at the Assistant Professor level beginning July 1, 2009. Appointment at the Associate Professor level may be considered under exceptional circumstances.

The School seeks an innovative earth scientist with an outstanding research record in the application of isotopes to understand processes in the environmental context. The successful candidate will be expected to develop new and innovative, topical techniques for the investigation of the geosphere. Candidates with research complementary to existing faculty research are strongly encouraged.

The successful applicant must hold a Ph.D. degree in Geology, Earth Sciences, Geochemistry, or a closely related field. The candidate will be expected to develop a strong externally funded research program and should have a strong commitment to undergraduate/graduate teaching and supervision.

All qualified candidates are encouraged to apply; however Canadians and permanent residents will be considered first for the position. McMaster University is strongly committed to employment equity and diversity in its community, and to recruiting a diverse faculty and staff. The University encourages applications from qualified women, Aboriginal peoples, persons with disabilities, and persons with diverse sexual orientations and gender identities.

The evaluation of candidates will begin on 15 January 2009 and will continue until the position is filled.

Applicants should send a cover letter outlining their research interests, a copy of their curriculum vitae, and a statement about teaching effectiveness (if applicable), contact information for three referees (address, phone number and e-mail) and copies of no more than three reprints or works in progress to the Chair of the search committee. Electronic applications will NOT be accepted.

Dr. Bruce Newbald, Chair, Search Committee, School of Geography and Earth Sciences, 1280 Main Street West, Hamilton, ON L8S 4K1, Tel: +905-525-9140, Fax: +905-546-0463, e-mail: newbald@mcmaster.ca.

ASSISTANT PROFESSOR, SOIL SCIENCE OR LOW-TEMPERATURE AQUOUS GEOCHEMISTRY

UNIVERSITY OF TENNESSEE AT CHATTANOOGA

The Department of Soil Science, Geology, and Astronomy at the University of Tennessee at Chattanooga invites applicants for a tenure-track appointment at the rank of Assistant Professor to begin in August 2009. We seek a soil scientist or a low-temperature aqueous geochemist who is committed to undergraduate teaching and research. Additional strengths in the areas of mineralogy and/or physical geochemistry are also desired. The successful candidate must have a Ph.D. in geology or related field by the time of appointment and should devote a major portion of their time to research and graduate teaching.

Applicants should send a letter of application describing their qualifications, statement of research and teaching interests, a current curriculum vitae, three letters of recommendation to Dr. Hable G. Churnet, Head, Dept. of Geology, University of Tennessee at Chattanooga, Chattanooga, TN 37403. Review of application materials will begin 15 January 2009 and will continue until the position is filled.

GEOGRAPHY, GEOLOGY, AND THE ENVIRONMENT

SLIPPERY ROCK UNIVERSITY, PENNSYLVANIA

Slippery Rock University of Pennsylvania is seeking candidates for two (2) full time, tenure track positions at the Assistant Professor level in the Department of Geography, Geology, and the Environment beginning in August 2009. For both positions, a Ph.D. in Geography, Geology, or a related field at time of appointment is required. Successful performance for both positions includes teaching and research demonstrations, is also required. The candidates must demonstrate a commitment to the education of diverse populations.

The selected candidates will be responsible for teaching introductory level Geography courses, as well as upper division courses in her/his area of expertise. The department has a tradition of providing students with opportunities for research, field experiences, and travel; the successful candidate will be expected to contribute to these efforts. We encourage applicants across a broad range of research interests, regional specialities, theoretical frameworks, and methodological approaches.

Position One (09-38): We seek a broadly trained Human Geographer with an active research and publication agenda in horso that can support the department’s environmental programs in a liberal arts context. Applicants must be prepared to teach cultural geography. Preference will be given to candidates who also demonstrate the ability to teach GIS at the introductory level.

Position Two (09-39): We seek an environmental geographer/geoscientist, with an active research and publication agenda, and whose expertise is compatible with the Department’s environmental programs. Applicants must be prepared to teach GIS, from introductory through advanced levels. Preference will be given to candidates who also demonstrate the ability to enhance departmental strengths in surficial Earth processes—soil-vegetation-atmosphere, biosphere, hydrosphere, and lithosphere.

Indicate the single position for which you wish to be considered. Send letter of interest, statements of your teaching philosophy and research agenda, curriculum vita, graduate and undergraduate transcripts (official transcripts are required before hiring), and letters from three references (include a list of their names, addresses

The Department of Geology & Geophysics at LSU announces a multiple year search to fill four endowed chair positions. For each position we seek an outstanding individual with an internationally recognized scientific reputation who will develop a strong, externally-funded research program. We invite inquiries, nominations, and applications for:

BILLY AND ANN HARRISON ENDED CHAIR: We seek an individual who will assume a leadership role among a large group of interdisciplinary scientists at LSU studying the dynamics of sedimentation, sedimentary environments, and sedimentary rocks. Research in fluvial, deltaic, and coastal processes has been elevated to one of three university-wide focus areas, with significant participation expected from the departments of Geology & Geophysics, Geography & Anthropology, Oceanography, and Civil & Environmental Engineering.

JOHN FRANKS ENDED CHAIR IN THE DEPARTMENT OF GEOLOGY AND GEOPHYSICS: We seek an individual with research interests in the broadly defined field of Earth materials and solid Earth processes. Potential areas of research include, but are not limited to, mineralogy, petrology, geochemistry, geodynamics, and tectonics. Two interdisciplinary research clusters at LSU, in materials science and high performance computing, offer immediate opportunities to establish links with other high-level programs on campus.

CHARLES T. MCCORD, JR., ENENDED CHAIR OF GEOLOGY: We seek an individual who will: 1) develop a program centered on fundamental and applied research relevant to petroleum geology, 2) complement existing departmental expertise in sedimentary geology and geophysics, 3) strengthen interdisciplinary teaching and research with LSU’s Department of Petroleum Engineering, and 4) maintain LSU’s strong ties with the petroleum industry. Candidates with significant research experience in petroleum geology/geochemistry and who have a strong commitment to undergraduate/graduate teaching and research are encouraged to apply.

AASP CHAIR IN PALEOPALYNOLOGY: We seek an individual that will develop a program in stratigraphic paleopalynology, particularly chronostratigraphy and/or palaeocology. The successful candidate will serve as Director of the American Association of Stratigraphic Palynologists (AASP) Center for Excellence in Paleontology within the Department of Geology & Geophysics. Candidates with significant academic and/or industrial experience in palynology, along with administrative and leadership skills, are encouraged to apply.

Required Qualifications: Ph.D. in geological sciences or other relevant disciplines; a strong record of published research; demonstrated ability to attract funding. Responsibilities: supervises graduate student research; publishes in highly ranked journals; teaches undergraduate and graduate courses in his or her area of specialization. Chair appointments would normally be made at the rank of Full Professor. However, exceptional candidates at the Associate Professor level will be considered.

The Department of Geology and Geophysics consists of 15 tenured and tenure-track faculty members having a wide range of expertise and offers B.S., M.S., and Ph.D. degrees in geology. The Department has a strong record in research and graduate training, ongoing federal and industry funded research and teaching programs, and a large and active alumni base. Two interrelated focus areas: “Evolution of Sedimentary Systems” and “Earth Materials and Solid Earth Processes” have been developed within the LSU Department of Geology and Geophysics to enhance existing strengths of the Department and allow the Department to interface synergistically with other academic units at LSU. See www.geol.lsu.edu for more information regarding these focus areas, faculty, facilities, and research programs.

An offer of employment is contingent on a satisfactory pre-employment background check. Application deadline is January 2, 2009 or until candidates are selected. Nominations or inquiries should be directed to Chair Search Committee, 225-578-3353 or geochemistry@lsu.edu. Applicants should send a copy of their curriculum vitae (including e-mail address), a statement of their research and teaching interests, and the names, addresses, phone numbers, and e-mail addresses of at least three references to: Endowed Chair Search Committee, Department of Geology and Geophysics, Louisiana State University, Ref: Log #2013, Baton Rouge, LA 70803.

LSU is an equal opportunity/affirmative action employer.

The selected candidates will be responsible for teaching introductory level Geography courses, as well as upper division courses in her/his area of expertise. The department has a tradition of providing students with opportunities for research, field experiences, and travel; the successful candidate will be expected to contribute to these efforts. We encourage applicants across a broad range of research interests, regional specialities, theoretical frameworks, and methodological approaches.

Position Two (09-39): We seek an environmental geographer/geoscientist, with an active research and publication agenda, and whose expertise is compatible with the Department’s environmental programs. Applicants must be prepared to teach GIS, from introductory through advanced levels. Preference will be given to candidates who also demonstrate the ability to enhance departmental strengths in surficial Earth processes—soil-vegetation-atmosphere, biosphere, hydrosphere, and lithosphere.
TENURE-TRACK FACULTY POSITION IN MINERALOGY/PETROLOGY
NORTHERN ILLINOIS UNIVERSITY
The Dept. of Geology and Environmental Geosciences at Northern Illinois University invites applications for an anticipated tenure-track position at the Assistant Professor level. The position is available August 19, 2009. Applicants must have achieved an individual whose research interests are in the broad areas of mineralogy, petrology, or a closely allied field. We expect the successful applicant to establish a vigorous externally funded research program that integrates with one or more of our existing strengths in experimental petrology, igneous and sedimentary petrology, geochemistry, and mineral physics. We are particularly interested in these areas: (1) a commitment to teaching at both the undergraduate and graduate levels. The department is in search of a person with a Ph.D. in Geosciences, Northern Illinois University. Applicants who can utilize existing equipment and facilities will be considered. Women and members of underrepresented minorities are especially encouraged to apply. The University of Iowa is an affirmative action/equal opportunity employer.

ASSISTANT PROFESSOR, GEOLOGY PHYSICAL SCIENCE DEPARTMENT PENN STATE–BEAVER
Westfield State College invites applications for a full-time, tenure-track Assistant Professor to teach 12 hours per semester, potentially including courses in physical geography, environmental geology, or oceanography. The successful candidate will teach multidisciplinary undergraduate courses that fit into the applicant’s career trajectory; (2) the names and contact information of three references; (3) a statement of teaching philosophy; and (4) a statement of experience. The position is renewable on a yearly basis for up to eight years. For more information about the position and to apply, visit the EPS Web site at www.eps.org. All materials must be received by 1 January 2009. AA/EEO Institution.

SEDIMENTARY GEOLGY, UNIVERSITY OF IOWA
The Dept. of Geology of the University of Iowa invites applications for a full-time tenure-track position in Sedimentary Geology at the Assistant Professor level. The position will begin in August 2009. We seek an outstanding researcher and teacher whose approach is quantitative, integrative, and preferably field-based. Areas of interest include: (1) sequence stratigraphy, basin analysis, quantitative stratigraphy, clastic or carbonate sedimentology, petroleum geology, and sedimentary basins; (2) the department and the College of Liberal Arts and Sciences are strongly committed to gender and ethnic diversity; the strategic plans of the University, College, and Department reflect this commitment. Emphasis will be placed on the applicant’s potential to establish a successful, externally funded research program that complements existing strengths within the department (including climate change, geochemistry, paleoecology, structural geology, tectonics, and natural resources) as well as interdisciplinary initiatives across the University. In addition to attracting and mentoring high quality graduate students, the successful candidate will be expected to teach at the undergraduate and graduate levels, including teaching a large general-education lecture course and developing an upper-level course through the Environmental Sciences BS program. Applicants should have a Ph.D. in hand by August 2009.

PRECEPTOR, EARTH AND PLANETARY SCIENCES (TEACHING/CURRICULUM DEVELOPMENT)
HARVARD UNIVERSITY
The Dept. of Earth and Planetary Sciences seeks applications for a preceptor. The successful applicant should be well versed on the issues of earth sciences, and have experience in developing and supporting sections and labs. A strong doctoral record is preferred. The salary range for this position is US$47,900 to US$53,100 depending on qualifications and experience. The position is renewable on an annual basis for up to eight years. For more information about the position and to apply, visit the EPS Web site at www.eps.org. Applicants should apply online at http://jobs.harvard.edu (résumé and letter of interest). To learn more about the position and to apply, visit the EPS Web site at www.eps.org. Applications must be received by 1 December 2008, AA/EEO Institution.

ASSISTANT/ASSOCIATE PROFESSOR IN GEOLOGY UNIVERSITY OF TEXAS–PAN AMERICAN
The Dept. of Geology and Geography at the University of Texas–Pan American invites applications for a tenure-track assistant/associate professor position in Geology. Texas-Pan American is a dynamic medium-size university with a wide variety of courses in related disciplines. All candidates must submit a letter of application, curriculum vitae, and the time of appointment, and a demonstrated commitment and ability to communicate effectively with faculty and students is essential. Required qualification for Associate Professor: Earned Doctorate in Geology/Earth Sciences. Proven excellence in teaching, a strong record of achievement in research, and a commitment to departmental and public service. The University of Texas-Pan American in this search includes significant publications within the discipline, previous success in developing a research program, and the ability to communicate effectively with our faculty and students. Described Qualification for Both Ranks: College-level teaching experience is preferred, as is a broad background in Geology, Geophysics, and/or GIS/Remote Sensing. The integration of GIS/Remote Sensing into course work is required. Ph.D. in Geology, and assisting with Geology Field trips to Mexico and North Texas is expected. This position will be the responsibility to coordinate and to establish a research program and grow with a newly revitalized and rapidly expanding department.

LETTERS OF INQUIRY TO: Search Committee Chair, Dept. of Geology and Geography, University of Texas–Pan American, 1201 W University Drive, Edinburg, TX 78541-2999.

Further information links:
• The Department: http://www.utpa.edu/dep/physsci/
• UTSA: http://www.utsa.edu

Closing Date: The position will remain open until filled; however, for best consideration, application materials must be received by 15 January 2009.

NOTE: UTSA is an affirmative action/equal opportunity employer. Women, racial/ethnic minorities and individuals with disabilities are encouraged to apply. This position is security-sensitive as defined by the Texas Education Code §51.251(C) and Texas Government Code §411.094(a)(2). Federal Law requires compliance with the Immigration Reform Control Act of 1986. Persons hired will be required to show identity and eligibility for work in the United States within three days of employment.

TENURE-TRACK POSITION EARTH AND MINERAL SCIENCE
PENN STATE–BEAVER
Penn State–Beaver invites applications for the position of Assistant Professor of Earth and Mineral Science (tenure-track, 36 weeks) to begin August 2009, or as negotiated. The successful candidate will be expected to teach 12 hours per week, with a wide variety of courses in related disciplines. All candidates must submit a letter of application, curriculum vitae, and statement of teaching philosophy. The position is renewable on an annual basis for up to eight years. For more information about the position and to apply, visit the EPS Web site at www.eps.org. Applicants should apply online at http://jobs.harvard.edu (résumé and letter of interest). To learn more about the position and to apply, visit the EPS Web site at www.eps.org. All materials must be received by 1 January 2009. AA/EEO Institution.

ASSISTANT/ASSOCIATE PROFESSOR IN GEOLOGY UNIVERSITY OF TEXAS–PAN AMERICAN
The Dept. of Geology and Geography at the University of Texas–Pan American invites applications for a tenure-track assistant/associate professor position in Geology. Texas-Pan American is a dynamic medium-size university with a wide variety of courses in related disciplines. All candidates must submit a letter of application, curriculum vitae, and the time of appointment, and a demonstrated commitment and ability to communicate effectively with faculty and students is essential. Required qualification for Associate Professor: Earned Doctorate in Geology/Earth Sciences. Proven excellence in teaching, a strong record of achievement in research, and a commitment to departmental and public service. The University of Texas-Pan American in this search includes significant publications within the discipline, previous success in developing a research program, and the ability to communicate effectively with our faculty and students. Described Qualification for Both Ranks: College-level teaching experience is preferred, as is a broad background in Geology, Geophysics, and/or GIS/Remote Sensing. The integration of GIS/Remote Sensing into course work is required. Ph.D. in Geology, and assisting with Geology Field trips to Mexico and North Texas is expected. This position will be the responsibility to coordinate and to establish a research program and grow with a newly revitalized and rapidly expanding department.

LETTERS OF INQUIRY TO: Search Committee Chair, Dept. of Geology and Geography, University of Texas–Pan American, 1201 W University Drive, Edinburg, TX 78541-2999.

Further information links:
• The Department: http://www.utpa.edu/dep/physsci/
• UTSA: http://www.utsa.edu

Closing Date: The position will remain open until filled; however, for best consideration, application materials must be received by 15 January 2009.

NOTE: UTSA is an affirmative action/equal opportunity employer. Women, racial/ethnic minorities and individuals with disabilities are encouraged to apply. This position is security-sensitive as defined by the Texas Education Code §51.251(C) and Texas Government Code §411.094(a)(2). Federal Law requires compliance with the Immigration Reform Control Act of 1986. Persons hired will be required to show identity and eligibility for work in the United States within three days of employment.

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COASTAL PROCESSES

UNIVERSITY OF CALIFORNIA–SANTA BARBARA

The Dept. of Earth Science at the University of California–Santa Barbara seeks a geoscientist who conducts creative research in coastal processes. This position will provide the opportunity to develop a vigorous research program as well as teaching opportunities in courses related to coastal sciences. The candidate is expected to be an active member of the academic community through research, teaching, and service. A Ph.D. in a field relevant to the candidate's research interests is required. Applicants should submit a letter of application, curriculum vita, statement of research and teaching objectives, and a list of three references. The position will remain open until filled. For more information, visit www.geol.ucsb.edu. UCSB is an Equal Opportunity/Affirmative Action employer.

DIRECTOR, NEVADA SEISMOLOGICAL LABORATORY

AND PROFESSOR OF GEOPHYSICS

UNIVERSITY OF NEVADA–RENO

The University of Nevada–Reno (UNR) invites applicants for the position of Director, Nevada Seismological Laboratory (NSL). The position requires a Ph.D. in geophysics, or a related field, with a strong publication record in peer-reviewed journals, a successful record of grantwriting, and 10+ years of research experience. The preferred starting date of 1 July 2009 is flexible. A Ph.D. is required at the time of appointment. The Director of NSL reports directly to the Director of the Dept. of Geological Sciences and Engineering (DGSE).

The NSL operates a regional network of over 200 real-time seismograph stations that spans Nevada and areas of Utah and Idaho. The NSL is one of the primary regional network operators of the USGS Advanced National Seismic System and is the statewide agency designated to provide earthquake information to the public and to first-responders. The NSL operates a regional network of over 200 real-time seismograph stations that spans Nevada and areas of eastern California, and operates its own statewide data communications system. Moreover, the NSL conducts seismic hazard research and operates the seismic monitoring program for the Dept. of Energy’s Yucca Mountain Project.

Applications: Tenure will be awarded upon appointment, subject to approval by the Board of Regents. For more information and to apply, visit www.ags.gov.ab.ca/employment.html for full job descriptions and for qualification and application details.
**ENVIRONMENTAL MINERALOGIST UNIVERSITY OF MICHIGAN ANN ARBOR**

The University of Miami is committed to educating and nurturing students, creating knowledge, and providing service to our community and beyond. We are leaders in the areas of research and development, and we attract talented students who will complement and expand departmental strengths.

**ASSISTANT PROFESSOR–GEOPHYSICS HOFOSTRA UNIVERSITY**

The Dept. of Geology, Hofstra University, invites applications for an anticipated tenure track position at the assistant professor level. We seek a candidate with a background in Geophysics applied to one or more of the following areas: hydrology, petroleum exploration geology, or exploration geophysics. Candidates must be committed to excellence in undergraduate teaching and mentoring undergraduate students in research. The successful applicant can expect a contact hour of 12 to 16 per semester teaching load and will be expected to teach one introductory level and one advanced undergraduate course per academic year. The candidate will teach physical geology and should be prepared to offer an advanced lecture/laboratory course in geophysics and in at least one additional topic. The candidate must be willing to contribute to the candidate that compliment the existing course offerings in the department. We are looking for a dynamic individual who combines excellence in teaching with breadth and versatility in professional productivity, and who shares our commitment to close student-faculty interaction, including a vigorous program of field trips and student involvement in faculty research and professional activities.

Hofstra University is located in suburban Long Island, New York, about 25 miles from Manhattan. The University occupies a beautiful 240 acre campus that is also a historic 8,000 full-time undergraduates and 4,500 graduate and part-time students. The Geology Department consists of four full-time and three part-time colleagues. Candidate must have a PhD in either Geophysics or Environmental Geosciences with a demonstrated ability to provide transformational leadership in the geosciences.

The initial appointment will be approximately 50% teaching, 50% research and the candidate will be expected to develop an active and vigorous research program. The candidate will have the opportunity to work closely with other Geology faculty members and students to provide comprehensive research and professional development opportunities. The initial appointment will be for a 3-year period with promotion and reappointment thereafter. The position will begin Fall 2009. Applications are encouraged by November 1, 2008. The candidate must have a Ph.D. in Geology, Geophysics or related field.

Applications should be submitted by November 1, 2008 and must include a cover letter, curriculum vitae, statement of teaching philosophy, three letters of recommendation, a research statement, and a teaching statement. Hofstra University is an Affirmative Action/Equal Opportunity Institution.

**UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE**

The University of North Carolina at Charlotte (UNC Charlotte) is a public research university in Charlotte, North Carolina. UNC Charlotte is one of the University of North Carolina System’s 16 constituent institutions.

**ASSISTANT PROFESSOR–GEOLOGY UNIVERSITY OF UTAH**

The Dept. of Geology, University of Utah, invites applications for one tenure-track position to be filled in the fall 2009. We seek a candidate with a Ph.D. in sedimentary geology. Responsibilities include teaching courses in sedimentary geology, and participation in departmental activities.

Applicants should submit a letter describing their qualifications for the position including research and teaching interests, a curriculum vitae and the names and contact information of three professional references to: Geology Search Committee Chair, Dept. of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112-9206. Screening of applications will begin immediately. Applications received after January 1, 2009 will not be considered.

**UNIVERSITY OF MICHIGAN SEDIMENTARY GEOLGY**

The Department of Geology at the University of Michigan is currently accepting applications for a tenure-track position in sedimentary geology, at the assistant professor level, beginning Fall 2009. We seek a candidate with a Ph.D. in sedimentary geology, with research interests that may encompass any aspect of the Earth’s pre-historic bedload. The successful candidate will be expected to teach one teaching load and will be expected to teach one advanced undergraduate course in geologic history, one introductory level course, and at least one graduate level course per academic year.

The successful candidate will be expected to teach undergraduate and graduate courses in the pre-historic bedload and will be expected to develop an active and vigorous research program. The position will be for a 3-year period with promotion and reappointment thereafter. The position will begin Fall 2009. Applications are encouraged by November 1, 2008. The candidate must have a Ph.D. in Geology, Geophysics or related field.

Applications should be submitted by November 1, 2008 and must include a cover letter, curriculum vitae, statement of teaching philosophy, three letters of recommendation, a research statement, and a teaching statement. The University of Michigan is an Affirmative Action/Equal Opportunity Institution.
Dean, College of Geosciences  
http://geosciences.tamu.edu

The College of Geosciences is seeking an exceptional individual as Dean. The holder of this position is the chief executive officer of the College with 110 tenured and tenure-track faculty members, 16 research scientists, 265 graduate students, 489 undergraduate students, and a total research and teaching budget of $84 million. The College of Geosciences seeks to provide an understanding of our changing planet: the solid earth, the oceans, the atmosphere, coupled human and natural systems; and the application of state-of-the-science research to energy, environment and climate change. The College includes the Departments of Atmospheric Sciences, Geology and Geophysics, Geography, and Oceanography and a variety of research units including the Integrated Ocean Drilling Program, the Sea Grant College Program, and the Geochemical and Environmental Research Group. Close collaborations, through programs such as the Center for Atmospheric Chemistry and the Environment and the Sustainable Coastal Margins Program, exist with other colleges across the campus.

TEXAS A&M IS SEEKING DISTINGUISHED, PROACTIVE, AND VISIONARY CANDIDATES WITH:

- A clear and demonstrated commitment to excellence in research, undergraduate and graduate education, and active engagement with our federal, state, industry and community partners;
- Commitment to diversity, equal opportunity, and global perspectives;
- A strong record of accomplishment in academia, industry, or government appropriate for a tenured full Professor in one of the Departments of the College;
- Proven and distinguished record of administrative service;
- Clear and demonstrated commitment to excellence in research, undergraduate and graduate education, and active engagement with our federal, state, industry and community partners;
- Commitment to leadership in fund-raising and obtaining enhanced external support.

Texas A&M University is in the ninth year of a long-range planning process entitled Vision 2020 (http://www.tamu.edu/vision2020) with the goal of becoming a consensus “top 10” public university. So far, the University has raised over $1.5 billion through a development campaign and has hired faculty for 442 new faculty lines, 26 of whom are in the College of Geosciences.

Bryan-College Station, home of Texas A&M University, consistently ranks as one of the most livable metropolitan areas in the nation. Centrally located among three of the country’s 10 largest cities (Dallas, Houston, San Antonio) and just over an hour from the state capital (Austin), B-CS boasts a combined population of 1.5 million, including the Texas A&M student body. The community has excellent school systems, shopping centers, hospitals, and restaurants. The twin cities are home to a high proportion of professional people and feature many of the advantages of a cosmopolitan center without the disadvantages of a congested urban environment.

The Search Advisory Committee will begin to review applications on November 15, 2008. The review will continue until the position is filled. Applicants should submit a letter of application, 1-2 page narrative summary of experience and administrative philosophy, curriculum vitae and the names and telephone numbers of at least three references. (References will be contacted only after permission is obtained from the candidate.) Applicants should also provide a preferred telephone number and mailing and e-mail addresses.

PLEASE SEND APPLICATIONS AND NOMINATIONS TO:

Dr. J. Joseph Newton, Chair  
Geosciences Search Advisory Committee  
Texas A&M University, College of Science  
3257 TAMU, College Station, Texas 77843-3257  
Phone: 979.845.8817 | Fax: 979.845.6077  
e-mail: jnewton@tamu.edu

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Texas A&M University is an Equal Opportunity/Affirmative Action Employer.
Must demonstrate a commitment to excellence in teaching and to pursuing and disseminating research at the undergraduate, mas-
ter’s, and post-doctoral levels.

Will be expected to develop a strong externally funded research program in geophysics and/or GIS.

Collaborative and interdisciplinary research is encouraged.

Prospective candidates should obtain additional information at www.kwu.edu/geoweb.

Interested candidates should submit a letter of application, curriculum vitae, the names of three references and separate statements of (1) teaching and (2) research philosophy to Dept. of Geography and Geology, Geomorphology Search Committee, Western Kentucky University, 1906 College Blvd #31066, Bowling Green, KY 42101-1066.

Review of applications began 30 November 2008; position will remain open until filled.

All qualified individuals are encouraged to apply including women, minorities, persons with disabilities and disabled veterans. Western Kentucky University is committed to the promotion of stewardship and stu-
dent engagement.

Meteoricites/planetary science
Texas Christian University

The Dept. of Geology invites applications for a tenure-
track assistant professorship in meteoritics or related planetary science beginning in Fall 2009. This position will be responsible for curating the Monnig Meteorite Collection, conducting mete-oritic research and teaching introductory pro-
tary science and related courses. The Monnig Collection is one of the finest university meteorite collections in the world. The Dept. of Geology also hosts and will include acquisition of new specimens, care of the collection, and participation in outreach programs. An annual acquisition budget will be available for enhancement of the collection. A new active research program in meteoritics will be expected. Although analytical facilities are limited on site, annual funding is available for off-campus instrument time and travel to other labs. Teaching would gener-
ally consist of one course per semester, together with supervision of graduate research projects. For additional in-
formation about the Dept. of Geology and the Monnig Collection, see our website at www.geo.tcu.edu and www.monn-
igmuseum.tcu.edu.

To apply send a vita, statement of teaching interests, proposed research program, and contact information for three references to R.E. Hanson, Chair, Dept. of Geology, Box 298830, Fort Worth, TX 76129. Review of applications will begin 1 February 2009 and con-
tinue until the position is filled. A Ph.D. in meteoritics or related fields is required at the time of appointment and postdoctoral experience is preferred. TCU is an EEO/AA employer and encourages a diversity of applicants.

Sedimentary Geology/petroleum geology
Texas Christian University

The Dept. of Geology invites applications for a tenure-
track assistant professor position in sedimentary geo-
logy/petroleum geology. This position is available beginning in Fall 2009. The appointee will be responsible for teaching introductory geology and advanced geology courses, conducting research in their specialty, as well as supervising graduate students. The normal teaching load is two courses per semes-
ter. TCU operates a teacher-scholar model. Faculty are expected to excel in the classroom and maintain an active research program resulting in publication in peer-reviewed national and international journals. We are looking for a person who will complement existing depar-
tmental strengths in sedimentary geology applied to the field of petroleum geology. Applications from persons with research interests in the deposition and diagenesis of mudrocks are especially welcome. The successful candidate will have the opportunity to part-
ticipate in research programs associated with the TCU Energy Institute. For more information about the Dept. of Geology and the Energy Institute see our Web site at www.

To apply send a vita, statements of teaching and research interests, and contact information for three references to John A. Breyer, Chair, Search Committee, Dept. of Geology, Box 298830, Fort Worth, TX 76129. Review of applications will begin 1 February 2009 and con-
tinue until the position is filled. A Ph.D. is required at the time of appointment. TCU is an EEO/AA employer and encourages a diversity of applicants.

Earth and Environmental Science Education Position
Vanderbilt University

The Dept. of Earth and Environmental Sciences at Vanderbilt University invites applications for a tenure-track faculty position in the general area of Biogeoscience. This position, effective the Fall 2009 semester, is at the Assistant Professor level. We seek an individual who is aimed at the highest standards of scholarship in research and teaching at both the undergraduate (B.S., B.Ed., Ph.D.) level, and who will be attracted by opportunities at Vanderbilt for interaction with a diverse, enthusiastic faculty and a student body that includes a wide mix of humanities and sciences and related fields. We welcome applications from can-
didates pursuing theoretical, experimental, and/or field-
based work that is specific to the general area. Examples of fields of interest include, but are not limited to, climate change and paleoclimate; origin and evolu-
tion of the biotic/clayalimentary, oceanography; biogeochem-
ical cycling; ecological processes (floral and/or faunal); and extinction patterns and processes. We seek candidates who have significant interest in both ancient and modern biological systems. Applications should include a vita, a statement of research and teaching interests, and names of at least three references (including mail and e-mail addresses and phone numbers). Select candidates will be later be asked to submit a e-mail in PDF or MS-Word format to Eooss. Applications must be received by 15 August 2009. TCU is an equal opportunity/affirmative action employer. Women and minorities are especially encouraged to apply.

FULL-TIME, ASSISTANT PROFESSOR OF GEOSCIENCES

CLIMATE SCIENCES, SKIDMORE COLLEGE

Description: The Dept. of Geosciences invites applica-
tions for an opening in Climate Sciences at the level of Assistant Professor to begin Fall 2009. The Department seeks candidates who will build and maintain an active research program with a focus on climate sciences, including but not limited to the study of climatic, ocean-atmosphere interaction, climate diagnostics and analysis, and basic processes in atmospheric and ocean dynamics. Course coverage includes Introduction to Oceanography, Climatology, and upper-level courses in the candidate’s area of expertise. The position also involves contribution to all-college requirements; e.g., by way of Interdisciplinary Seminar (topic open) for first year students. The College offers start-up funds, pre-tenure sabbatical, and other benefits. However, the successful candidate is expected to seek and obtain external research funding. Skidmore College is a liberal arts insti-
tution of approximately 2,400 students in a full-time, faculty, located in upstate New York. Skidmore College also seeks to attract an academically and culturally diverse faculty. We welcome applications from women and men of diverse background.

Qualifications: A Ph.D. in the geosciences or a related field. All candidates will be given equal consider-
tation to those candidates with teaching experience. The review process of this position will begin 1 January 2009.

Apply to: Candidates should send a vita, evidence of excellence in teaching and scholarship, and three letters for recommendation to: Kyle Nichols, Chair, Dept. of Geosciences, Skidmore College, 815 North Broadway, Saratoga Springs, NY 12866.
Opportunities for Students

Jonathan O. Davis Scholarship, Division of Earth and Ecosystem Sciences, Desert Research Institute.

The family and friends of Jonathan O. Davis, a prominent U.S. geologist and geochronologist and a DRI faculty member, have established an endowment that provides a yearly national Jonathan O. Davis Scholarship, as well as a stipend for a University of Nevada–Reno student.

Jonathan was tragically killed in an automobile accident in December 1990. It is the wish of his family and friends to support graduate students working on the Quaternary geology of the Great Basin, research close to Jonathan’s heart. The national scholarship is $4,000 and the stipend is $3,500 per academic year.

The national scholarship, administered by the Division of Earth and Ecosystem Sciences of the Desert Research Institute, is awarded to graduate students enrolled in an M.S. or Ph.D. program at any university in the United States. The stipend, also administered by the Division of Earth and Ecosystem Sciences, is open to graduate students enrolled in an M.S. or Ph.D. program at the University of Nevada–Reno. Quaternary geology, as used in the scholarship description, is a field commonly considered as part of the Quaternary sciences.

The research, however, must have a substantial geologic component or demonstrate a strong reliance on geologic techniques and must be focused on the Great Basin.

Applications should include:

- A completed application form and a statement from the individual qualifies for the award. Please include your social security number and state whether you are applying for the (1) national scholarship or the (2) UNR stipend.
- A current résumé or vitae.
- A two-page, single spaced description of the thesis/dissertation research, or summary of the student’s activity documents the geological orientation and research significance. Figures, tables, and references do not count against the two-page limit. If the thesis or dissertation research has been published or accepted for publication, that information should be provided.
- A short statement on how funding would be used.
- A letter of recommendation from the thesis/dissertation advisor and/or student’s ability and potential as a Quaternary scientist.

Applications must be postmarked by 2 February 2009. Successful candidates will be announced by or shortly after 15 March 2009. Successful candidates will be required to submit a formal application to the DRI. If you have further questions regarding the awards or the application process, please contact Barbara Jackson at +1-775-673-7454 or bjJackson@drri.unr.edu.

Ph.D. in Carbonate Geochemistry and Global Ocean-Climate Change, Department of Marine Sciences, University of North Carolina-Chapel Hill.

The Ries Laboratory (http://marine.unc.edu/people/Faculty/JRES) in the Dept. of Marine Sciences at the University of North Carolina–Chapel Hill seeks a doctoral student interested in conducting research on the relationship between global ocean-climate change and the ocean biogeochemical systems. New Ph.D. students will be expected to focus on the role of calcium carbonate in the functioning of the ocean during past climate states.

Applications should include:

- A two-page research project proposal
- A current résumé or vitae
- A letter of recommendation from the applicant’s advisor

Successful candidates will be announced by or shortly after 15 March 2009. Successful candidates will be required to submit a formal application to the University of North Carolina–Chapel Hill.

Ph.D. Assistantships—Soil Carbon-Mineral Weathering, NMSU. The New Mexico State University (NMSU) Graduate Research Program offers a field-intensive curriculum emphasizing earth materials, mineral-rock-water interactions, environmental geophysics, and natural resource hazards assessment. Programs are supported in geology, petrology, and geochemistry, with emphasis on global change, climate change, and the evolution of life. Each of the above departments offers graduate assistantships that carry a full tuition scholarship and a stipend.

Applications should be submitted by 15 January 2009, and decisions will be announced by or shortly after 15 March 2009. Successful candidates are expected to begin their graduate program at Yale between 1 July and 31 December 2009.

Application materials and reference letters should be sent by email to gradinfo@case.edu or by post: Interdepartmental Postdoctoral Fellowship, Yale University, Dept. of Geology and Geophysics, PO Box 208105, New Haven, CT 06520-8109. Yale University is an equal opportunity/affirmative action employer; applications from women and minority scientists are strongly encouraged.

Financial aid is available from the Earth Sciences Graduate Assistantship Program, which provides a stipend of $23,000 per academic year plus full tuition coverage. The fellowship is renewable for up to three years. Additional funding is available to cover some costs for field and laboratory expenses.

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