GSA Today science articles:

Hot topics and recurring themes, 1998 to 2008

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INTRODUCTION

Over the past 10 years, *GSA Today* has printed 111 peer-reviewed science articles, which were selected by the science editors for their timeliness, accessibility to a broad audience of geoscientists, and focus on current topics in the earth sciences. *GSA Today* is posted online from 1995 to present, and all science articles are open-access via link at www.geosociety.org/pubs/.

The purpose of this review is to provide readers with a perspective on those issues and topics that have shaped our community over the past decade as well as the future evolution of the earth sciences. I first recount the topics most commonly addressed in *GSA Today* through a review of key words (see Table 1), followed by abstracts and comments on one or two science articles from each of the past 10 years. The list of papers is a personal one; selection was based on what seemed to me to be key issues and on the success of the papers in communicating to the broadest audience possible.

Table 1 records the top 50 key words in abstracts from 1998 to 2008. In order to have made the top-50 list, a word would have had to appear in at least *seven* of the 111 abstracts. Key words from Presidential Addresses were not included in Table 1 because most do not have abstracts.

The geological terms used most often were sediments (36 times), crust (33), and water (32), with references to surface/surficial processes (29) , ocean/oceanic (29), and models/modeling (27) following close behind. Words that usually come to mind when one thinks of geology didn't have enough hits to make the list, like dinosaurs (two), soil (four), resources (three), or gems (zero). "Mountain" had just 11 occurrences in the abstracts; the mountains referenced most

Table 1. 50 common keywords from *GSA Today* science article abstracts, 1998–2008

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. of science articles for each year (111 total)	10	11	12	12	10	9	8	10	9	10	10
Keywords (no. of articles)											
Antarctic (7)	3	1	1	1	–	–	–	–	1	–	–
Archean (14)	2	–	2	2	2	1	–	2	1	–	2
Basin (20)	–	2	3	3	4	–	–	1	3	1	3
Cambrian/ Precambrian (9)	2	–	2	1	1	–	–	–	1	–	2
Carbon/radiocarbon (13)	2	2	1	–	2	1	1	1	2	1	–
CO_2 (8)	1	1	–	–	–	2	2	1	–	–	1
Climate (20)	1	3	3	3	2	2	1	–	2	3	–
Coast (8)	–	1	1	1	1	–	1	–	1	2	–
Continent (29)	4	2	2	4	2	4	1	3	2	3	2
Cretaceous (11)	–	1	1	2	2	1	–	2	–	2	–
Crust (33)	3	1	4	5	4	4	1	3	2	2	4
Deformation (16)	1	–	2	5	2	2	1	1	–	1	1
Earthquake (13)	–	–	3	1	3	2	–	–	2	–	2
Environment (19)	1	2	4	1	1	–	1	1	2	2	4
Erosion/eroded (12)	–	1	–	–	1	2	–	2	2	3	1
Evolution of Earth (13)	1	–	–	3	1	1	1	3	–	2	1
Evolution of life (14)	2	2	4	1	2	–	–	1	–	1	1
Extinction (8)	1	–	2	1	1	–	1	1	–	–	1
Fault/faulting (13)	–	1	3	1	1	3	2	–	–	1	1
Fossil/assemblage (10)	2	1	2	1	2	–	–	–	1	–	1
Geomorphology (7)	–	1	–	1	–	–	1	2	–	1	1
Glacial/glaciation (13)	3	–	1	1	1	2	1	1	1	–	2
Global warming/ climate change (13)	1	2	2	–	1	2	1	–	1	2	1
Greenhouse (7)	1	1	1	–	–	2	1	–	1	–	–
Hazards (7)	–	–	1	1	1	1	2	–	1	–	–
Human/ anthropogenic (12)	1	–	1	1	1	–	2	2	1	2	1
Image/imaging (11)	2	–	2	1	–	–	2	2	1	1	–
Isotope/isotopic (14)	1	1	2	1	1	1	–	2	3	2	–
Landscape (9)	2	–	–	–	1	1	–	2	1	1	1
Lithosphere (18)	1	–	1	3	3	2	–	1	2	2	3
Magma (17)	1	–	1	4	3	1	2	3	–	1	1
Mantle (23)	1	–	2	4	6	1	–	3	1	2	3
Marine (18)	2	2	3	2	3	–	1	–	1	1	3
Mineral (10)	–	1	1	3	–	1	1	1	1	1	–
Models/modeling (27)	1	4	3	6	1	4	2	–	1	3	2
Mountain (11)	1	1	–	2	3	–	–	–	2	–	2
Ocean/oceanic (29)	2	4	3	2	4	2	–	1	4	2	5
Orogeny/orogenic (14)	1	2	1	1	2	3	–	1	1	1	1
Proterozoic/ Neoproterozoic (16)	4	1	2	3	3	–	–	1	1	–	1
Rocks (21)	3	1	1	5	1	2	1	–	3	4	–
Sea level (15)	1	–	3	1	3	1	2	1	1	2	–
Sediments (36)	2	2	4	6	5	–	2	3	3	4	5
Seismic (23)	1	1	4	2	4	1	4	1	3	1	1
Strata/stratigraphic (22)	3	1	–	2	3	1	–	1	4	5	2
Subduction (14)	1	–	1	4	2	1	–	2	1	1	1
Surface/surficial (29)	2	2	4	4	3	2	1	2	5	2	2
Tectonic (24)	3	3	3	3	2	1	–	2	3	3	1
Temperature/°C (16)	2	2	1	–	3	2	1	1	2	–	2
Terrane (9)	2	1	–	1	2	–	–	1	–	1	1
Water (32)	3	3	3	3	4	2	4	4	3	2	1

Note: Key words counted only once per abstract. The April 1998 *GSA Today* included four related science articles; key words for that month are from the titles only. Presidential Address articles are not included in these totals as most do not include an abstract.

GSA Today, v. 19, no. 1, doi: 10.1130/1052-5173(2009)19[41:GTSAHT]2.0.CO;2

often were the Himalaya (five articles) and the Rockies (four articles); Yucca Mountain was the focus of two articles.

The most-often-mentioned location outside of the United States was the Antarctic, with seven articles (see the April 1998 issue for a four-part treatment of the Antarctic Sirius Group). Canada was also a popular location of study, with five occurrences, and China and Tibet combined were featured in eight abstracts.

A TEN-YEAR RETROSPECTIVE

1998

Environmental change, geoindicators, and the autonomy of nature
Antony R. Berger (Jan. 1998, v. 8, no. 1, p. 3–8; ftp://rock.geosociety.org/pub/GSAToday/gt9801.pdf).

Abstract: Geological indicators of rapid environmental change provide a conceptual framework for assessing changes in the abiotic components of landscapes and ecosystems resulting from natural processes or human actions. The application of geoindicators to monitoring of landscape conditions, particularly in state-of-the-environment reporting and long-term ecosystem research, can help earth scientists to contribute more effectively to these interdisciplinary efforts. Geoindicators may also help to remind policymakers and the general public of the reality of natural change and the common difficulty of distinguishing it from human modifications.

Note

Berger's Table 1 lists 27 "geoindicators" of environmental change, with the caveat that they be modified and amended as necessary over time. Berger is clear that both natural *and* anthropogenic change should be scrutinized, writing that "anthropogenic stress on the environment … is rightly the central concern … [but] natural change and its effects on land and the biosphere tend to be overlooked" (p. 5). In his final paragraph (p. 7), Berger calls for geoscientists to develop "better ways to assess changes to the landscape, whatever the cause" because "society must not only reduce unsustainable human activities but must also adjust to natural fluctuations."

Gas hydrates: Greenhouse nightmare? Energy panacea or pipe dream?
Bilal U. Haq (Nov. 1998, v. 8, no. 11, p. 1–6; ftp://rock.geosociety.org/pub/GSAToday/gt9811.pdf).

Abstract: Recent interest in methane hydrates has resulted from the recognition that they may play important roles in the global carbon cycle and rapid climate change through emissions of methane from marine sediments and permafrost into the atmosphere, and in causing mass failure of sediments and structural changes on the continental slope. Their presumed large volumes are also considered to be a potential source for future exploitation of methane as a resource. Natural gas hydrates occur widely on continental slope and rise, stabilized in place by high hydrostatic pressure and frigid bottom-temperature conditions. Change in these conditions, either through lowering of sea level or increase in bottom-water temperature, may trigger the following sequence of events: dissociation of the hydrate at its base, weakening of sediment strength, major slumping, and release of significant quantities of methane in the atmosphere to affect enhanced greenhouse warming. Thus, gas-hydrate breakdown has been invoked to explain the abrupt nature of glacial terminations, pronounced ^{12}C enrichments of the global carbon reservoir such as that during the latest Paleocene thermal maximum, and the presence of major slides and slumps in the stratigraphic record associated with periods of sea-level lowstands. The role of gas hydrates in controlling climate change and slope stability cannot be assessed accurately without a better understanding of the hydrate reservoir and meaningful estimates of the amount of methane it contains. Lack of knowledge also hampers the evaluation of the resource potential of gas hydrates, underscoring the need for a concerted research effort on this issue of significant scientific importance and societal relevance.

Note

This is the only *GSA Today* article in the past ten years that deals directly with a potential energy resource (methane hydrates) as well as climate change. You can still read Haq's 25 May 1999 testimony on these issues before the House Committee on Science Subcommittee on Energy and Minerals at www.nsf.gov/about/congress/106/bhaq990525.jsp.

1999

Hurricanes Dennis and Floyd: Coastal effects and policy implications
Robert S. Young et al. (Dec. 1999, v. 9, no. 12, p. 1–7; ftp://rock.geosociety.org/pub/GSAToday/gt9912.pdf).

Abstract: Tropical systems Dennis and Floyd impacted eastern North Carolina in 1999, the fourth and fifth storms in three years to make landfall in this area. All five storms were very similar in strength (wind speed); however, the effects on the coast were quite different. In addition to absolute storm strength, morphological changes to the natural environment were controlled by the forward speed of the storms, orientation of the shoreline relative to storm track, underlying geology, impacts of recent storms, and associated rainfall. Damage to buildings was a function of the placement of structures with respect to the shoreline and the removal of weaker buildings by previous storms. On the basis of these observations, we recommend a new Hurricane Impact Scale, which will allow prediction of possible storm impacts and comparisons of coastal impacts in other Hurricanes.

Each additional Hurricane demonstrates that our society does not have a forward-looking plan for dealing with coastal storms. Instead, we typically repair and rebuild in place, and continue the upward spiral of property damage in storms. Although the dollar amount of property damage will be low from these storms, the public must bear the cost of cleanup and repair of infrastructure.

Note

Published more than five years before Hurricane Katrina, this article cites the lessons to be learned from the "the legacy of Bertha, Fran, Bonnie, Dennis, and Floyd" (p. 6): (1) the need for a proactive plan for dealing with coastal storms rather than "the typical response [of] cleanup and complete rebuilding, maintaining the status quo"; and (2) a new Hurricane Impact Scale that includes the cost to local citizens of infrastructure repair.

Recommended reading: See "Katrina's unique splay deposits in a New Orleans neighborhood" (v. 16, no. 9, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0609_NWS.pdf) and "Submergence of ancient Greek cities off Egypt's Nile delta—A cautionary tale" (Jan. 2004, v. 14, no. 1, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0401.pdf).

2000

Evaluating global warming: A post-1990s perspective

David S. Gutzler (Oct. 2000, v. 10, no. 10, p. 1–7; ftp://rock.geosociety.org/pub/GSAToday/gt0010.pdf).

Abstract: Globally averaged surface-air temperature warmed approximately 0.5 °C during the twentieth century, and the rate of warming has accelerated considerably since about 1980. Proxy climate data suggest that current global temperatures are warmer than at any time in the last millennium. As this trend persists, the likelihood increases that the warming is due at least in part to anthropogenic inputs of atmospheric greenhouse gases. There is no debate over the measured increases in greenhouse gas concentrations, or the anthropogenic origin of these increases, or the direct radiative effect of increased greenhouse gas concentrations.

Public debate and policy development on global warming are stuck, however, in part because it remains exceedingly difficult to specifically attribute current global warming to increases in greenhouse gases, or to make confident predictions of the rate and spatial variability of future warming. Attribution and prediction of global warming both depend on large-scale modeling, and the complexities associated with simulating the climate system are so great that conclusive attribution and prediction will probably not be reached for some time. These uncertainties tend to overshadow the higher degree of certainty associated with observational evidence for global warming. The scientific community should acknowledge that the attribution and prediction problems will not be resolved to the satisfaction of policy makers in the near future, and should instead work toward establishing new paradigms for partnership with policy makers, with greater emphasis on observations of past and present climate change.

Note

Gutzler notes that the six warmest years out of a 120-year period from 1880 to 1999 "all occurred in the 1990s" (p. 1; see also his Fig. 2, p. 4) and writes, "The debate over *detection* of climate change is drawing to a close … [but] it remains extraordinarily difficult to *attribute* the warming trend to any particular forcing function with sufficient certainty to satisfy policy makers" (p. 5). The "Recommendations and Conclusions" section (p. 6) warns, "We will not truly be able to attribute global warming to greenhouse gas increases until the climate has already warmed a great deal relative to pre-twentieth century temperatures," and ends with a call for the geoscience community to advance "our ability to model the climate system with sufficient confidence to assuage skepticism and debate on those issues."

2001

Grand challenges in earth and environmental sciences: Science, stewardship, and service for the twenty-first century

Mary Lou Zoback (Dec. 2001, v. 11, no. 12, p. 41–47; ftp://rock.geosociety.org/pub/GSAToday/gt0112-presAddr.pdf).

Note

This millennial Presidential Address from GSA's 2000 Annual Meeting in Reno, Nevada, USA, presents six challenges for geoscientists in the coming decades. There is no abstract; what follows is a brief summary.

Zoback begins, "A measure of our future success as earth scientists will depend on our ability to help our global society find and implement effective solutions to environmental problems," (p. 41) and then presents six "Grand Challenges in Earth and Environmental Science":

1. Answer the question, "Are steady increases in global temperature … in the past 150 years simply an expression of natural variability, or are they a direct result of mankind's activities that have resulted in an increase in greenhouse gases?" (p. 41);
2. Understand "biogeochemical cycles such as the carbon or nitrogen cycle," which is "fundamental to understanding how larger natural systems, such as the global climate system, function" (p. 42);
3. Recognize "that actions of man have deliberately or inadvertently perturbed natural systems" (p. 43), including urban weather (see Zoback's Fig. 4, p. 44, depicting urban sprawl for Atlanta, Georgia, USA) and local, regional, and global water cycles;
4. Identify "geologic, chemical, or biologic parameters or a suite of parameters that can indicate the health or biodiversity of an ecosystem" as well as come up with systems to "monitor or measure" these parameters in order to understand "the effectiveness of our … efforts at restoration or remediation" (p. 44);
5. Build "complex computer models of natural systems that can forecast impending disasters" (p. 44); and
6. "Refocus society's desire for absolute guarantees from science and replace it with an acceptance that most solutions are uncertain and will carry some level of risk and also some level of environmental consequences" (p. 45).

Further, under the heading "What Should We Do?" Zoback calls on the earth science community to become active participants in "one of the grandest scientific, technological experiments of the twenty-first century … [to] tackle safe, long-term isolation of high-level radioactive waste" (p. 46).

2002

Eocene meridional weather patterns reflected in the oxygen isotopes of Arctic fossil wood

A. Hope Jahren *and* ***Leonel Silveira Lobo Sternberg*** (Jan. 2002, v. 12, no. 1, p. 4–9; ftp://rock.geosociety.org/pub/GSAToday/gt0201.pdf).

Abstract: The spectacularly preserved *Metasequoia* wood excavated from the Fossil Forest site of Axel Heiberg Island (Canadian High Arctic) provides a unique window into the $\delta^{18}O$ value of Eocene meteoric water via the analysis of fossil cellulose. Seventeen fossilized *Metasequoia* individuals yielded cellulose with $\delta^{18}O$ (Vienna standard mean ocean water [VSMOW]) values ranging from 17.1‰ to 21.4‰ and with a mean value of 19.9‰—strikingly low compared to modern trees of all latitudes. Using established biosynthetic relationships for plant cellulose, we reconstructed the $\delta^{18}O$ (VSMOW) value of Eocene meteoric water to be –15.1‰ on Axel Heiberg Island—a value similar to previous determinations of Eocene terrestrial water using varied paleoenvironmental indicators. A wholly temperature-based interpretation of these isotopic results would predict a mean annual temperature of

−2.7 °C, but this is incompatible with extremely high forest productivity. Instead, a calculation of isotopic fractionation in moisture transported from the Pacific Ocean north across North America explains the simultaneous arrival of warm air and isotopically depleted moisture in the Eocene Arctic; we suggest that these meridional weather patterns were caused by the absence of a Polar Front during the ice-free Eocene.

Note

This is the only paleontological and climatological study in *GSA Today* focusing on a species of Earth's flora rather than fauna.

2003

An alternative Earth

Warren B. Hamilton (Nov. 2003, v. 13, no. 11, p. 4–12; ftp://rock.geosociety.org/pub/GSAToday/gt0311.pdf).

Abstract: The standard Earth of geodynamics and geochemistry is rationalized from assumptions that the mantle is compositionally inverted—still-unfractionated lower mantle beneath volatile-depleted upper mantle—and that material circulates easily from bottom to top. Multidisciplinary data better fit a less-volatile and less-radioactive planet wherein depleted lower mantle, fractionated early and irreversibly, is decoupled from upper mantle plus crust that evolve and circulate separately. Early Archean fractionation produced global(?) felsic crust and refractory upper mantle. Later Archean granite-and-greenstone upper crust formed atop this ancient crust, which remained hot and weak; distinct continents and oceans did not exist, and upper mantle was much hotter than now. Plate tectonics began ca. 2.0 Ga when continents could stand above oceans and oceanic lithosphere could cool to subduction-enabling density and thickness. Upper mantle has since become more fertile and new increments of continental crust more mafic as continental crust has been progressively diminished by recycling into cooling mantle. Plate circulation is driven by subduction, which is enabled by density inversion produced by sea-water cooling from the top of oceanic lithosphere, is self-organized, and is confined to upper mantle. The matching rates of hinge rollback and of advance of fronts of overriding plates are keys to dynamics. Slabs sinking broadside from retreating hinges drive both subducting and overriding plates and force seafloor spreading in both shrinking and expanding oceans. An Antarctica-fixed framework depicts prediction-confirming "absolute" plate motions that make kinematic sense, whereas hotspot and no-net-rotation frames do not. Plumes from deep mantle, subduction into deep mantle, and bottom-up convective drive do not exist.

Note

Hamilton's overview perfectly summarizes what makes his *GSA Today* article unique (p. 11): "The Earth described here differs profoundly from that accepted as dogma in most textbooks and research papers." Be sure to read Hamilton's four "major stages in Earth evolution" on pages 11–12, and check out the Comment and Reply on this article, published March 2004, by linking to them at www.geosociety.org/pubs.

Figure 1. Nov. 2004 cover; drawing by Ray Troll.

2004

Geology, geomorphology, and the restoration ecology of salmon

David R. Montgomery (Nov. 2004, v. 14, no. 11, p. 4–12; ftp://rock.geosociety.org/pub/GSAToday/gt0411.pdf).

Abstract: Natural and anthropogenic influences on watershed processes affect the distribution and abundance of salmon across a wide range of spatial and temporal scales, from differences in species use and density between individual pools and riffles to regional patterns of threatened, endangered, and extinct runs. The specific impacts of human activities (e.g., mining, logging, and urbanization) vary among regions and watersheds, as well as between different channel reaches in the same watershed. Consequently, recognizing and diagnosing the nature and causes of differences between historical and contemporary fluvial and watershed conditions and processes can require careful evaluation of both historical and spatial contexts. In order to be most effective, the contribution of geomorphological insights to salmon recovery efforts requires both assessment protocols commensurate with providing adequate knowledge of context, and experienced practitioners well versed in adapting general theory to local settings. The substantial influences of watershed processes on salmon habitat and salmon abundance indicate the need to incorporate insights from geology and geomorphology into salmon recovery efforts.

Figure 2. Jan. 2005 cover: Incidences of lead poisoning in children in Indianapolis, Indiana, USA, from 1992 to 1994.

2005

Urban lead poisoning and medical geology: An unfinished story

Gabriel M. Filippelli et al. (Jan. 2005, v. 15, no. 1, p. 4–11; ftp://rock.geosociety.org/pub/GSAToday/gt0501.pdf).

Abstract: The intersection between geological sciences and human health, termed *medical geology*, is gaining significant interest as we understand more completely coupled biogeochemical systems. An example of a medical geology problem largely considered solved is that of

lead (Pb) poisoning. With aggressive removal of the major sources of Pb to the environment, including Pb-based paint, leaded gasoline, and lead pipes and solder, the number of children in the United States affected by Pb poisoning has been reduced by 80%, down to a current level of 2.2%. In contrast to this national average, however, about 15% of urban children exhibit blood Pb levels above what has been deemed "safe" (10 µg per deciliter); most of these are children of low socioeconomic-status minority groups. We have analyzed the spatial relationship between Pb toxicity and metropolitan roadways in Indianapolis and conclude that Pb contamination in soils adjacent to roadways, the cumulative residue from the combustion of leaded gasoline, is being remobilized. Developing strategies to remove roadway Pb at the source is a matter of public health and social justice, and constitutes perhaps the final chapter in this particular story of medical geology.

Note

GSA's Geology and Health Division was established in the spring of 2005, shortly after the publication of this article, but this remains a unique topical contribution to *GSA Today.*

2006

Katrina's unique splay deposits in a New Orleans neighborhood

Stephen A. Nelson *and* ***Suzanne F. Leclair*** (Sept. 2006, v. 16, no. 9, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0609_NWS.pdf).

Figure 3. Sept. 2006 cover: Car exhumed from the post–Hurricane Katrina levee breach sedimentary deposits in New Orleans, Louisiana, USA.

Abstract: On 29 August 2005, storm surge from Hurricane Katrina entered the drainage canals in the northern part of the city of New Orleans, Louisiana, USA. Although the floodwalls and levees on these canals were not overtopped, the surge resulted in three levee breaches that flooded 80% of the city. The southern breach on the London Avenue Canal resulted in a blast of water that displaced a house in front of the breach and buried parts of the neighborhood with up to 1.8 m of sandy sediment derived from remobilization of subsurface late-Holocene marsh and beach deposits. These deposits are a rare but spectacular example of crevasse splay deposits in an urban environment. Approximately 26,380 m^3 of material, varying in size from fine sand to gravel-size clay balls, along with various human-made objects, was deposited mostly as planar strata, with some small- and medium-scale cross-strata showing climbing bed forms that were deposited on and around obstacles, such as cars and houses. This unique splay deposit has no preservation potential, and this paper reports the first (and probably only) results from the study of its morphology and sedimentology.

Note

Written by a team from New Orleans' Tulane University, this is one of the first geoscience papers published about the aftermath of Hurricane Katrina. It includes a map drawn during post-hurricane field work that illustrates the extent of the splay deposits in a neighborhood near the London Avenue Canal breach as well as photos taken Feb. 2006 of remaining deposits.

2007

Birth of a mud volcano: East Java, 29 May 2006

Richard J. Davies et al. (Feb. 2007, v. 17, no. 2, p. 4–9; ftp://rock.geosociety.org/pub/GSAToday/gt0702.pdf).

Abstract: On 29 May 2006, an eruption of steam, water, and, subsequently, mud occurred in eastern Java in a location where none had been previously documented. This "pioneer" mud eruption (the first to occur at this site) appears to have been triggered by drilling of overpressured porous and permeable limestones at depths of ~2830 m below the surface. We propose that the borehole provided a pressure connection between the aquifers in the limestones and overpressured mud in overlying units. As this was not protected by steel casing, the pressure induced hydraulic fracturing, and fractures propagated to the surface, where pore fluid and some entrained sediment started to erupt. Flow rates remain high (7000–150,000 m^3 per day) after 173 days of continuous eruption (at the time of this writing), indicating that the aquifer volume is probably significant. A continued jet of fluid, driven by this aquifer pressure, has caused erosion and entrainment of the overpressured mud. As a result, we predict a caldera will form around the main vent with gentle sag-like subsidence of the region covered by the mud flow and surrounding areas. The eruption demonstrates that mud volcanoes can be initiated by fracture propagation through significant thicknesses of overburden and shows that the mud and fluid need not have previously coexisted, but can be "mixed" within unlithified sedimentary strata.

Note

This is the first major scientific article published on the event, which buried four villages in eastern Java, Indonesia. See a follow-up article in the August 2008 issue of *Geology*, "Triggering of the Lusi mud eruption: Earthquake versus drilling initiation" by M. Tingay et al. You'll also find pictures and extended coverage in May 2008's *Geoscientist* (v. 18, p. 24–27).

Is agriculture eroding civilization's foundation?

David R. Montgomery (Oct. 2007, v. 17, no. 10, p. 4–9; ftp://rock.geosociety.org/pub/GSAToday/gt0710.pdf).

Abstract: Recent compilations of data from around the world show that soil erosion under conventional agriculture exceeds both rates of soil production and geological erosion rates by from several times to several orders of magnitude. Consequently, modern agriculture—and therefore global society—faces a fundamental question over the upcoming centuries. Can an agricultural system capable of feeding a growing population safeguard both soil fertility and the soil itself? Although the experiences of past societies provide ample historical basis for concern about the long-term prospects for soil conservation, data compiled in recent studies indicate that no-till farming could reduce erosion to levels close to soil production

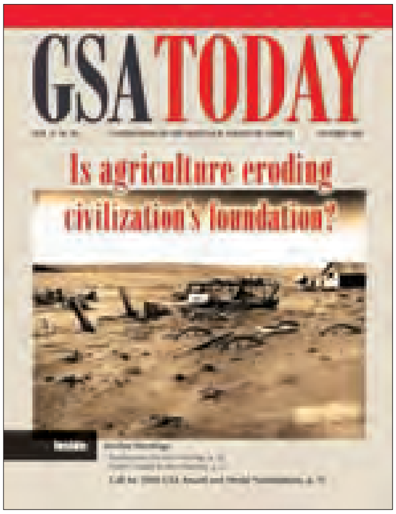

Figure 4. Oct. 2007 cover: U.S. Dept. of Agriculture image from 13 May 1936 of Dallas, South Dakota, USA.

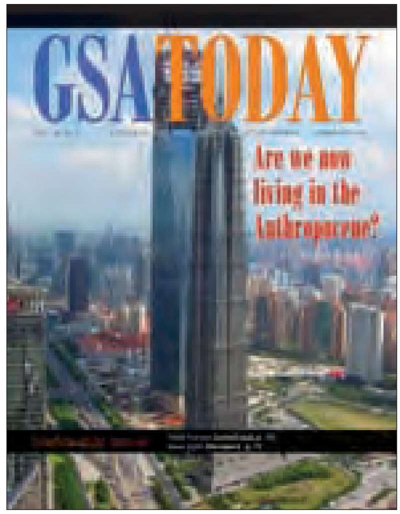

Figure 5. Feb. 2008 cover: Shanghai, People's Republic of China, 2007.

rates. Similarly, organic farming methods have been shown to be capable of preserving—and in the case of degraded soils, improving—soil fertility. Consequently, agricultural production need not necessarily come at the expense of either soil fertility or the soil, even if recent proposals to rely on conventionally grown corn for biofuels exemplify how short-term social and economic trade-offs can de-prioritize soil conservation. Like the issues of climate change and loss of biodiversity, ongoing global degradation and loss of soil present fundamental social challenges in which the slow pace of environmental change counter-intuitively makes solutions all the more difficult to adopt.

Note

David Montgomery (also author of 2004's "Geology, geomorphology, and the restoration ecology of salmon" [v. 14, no. 11, p. 4–12]) was awarded a MacArthur Fellowship in September 2008 for exceptional achievement and promise.

2008

Are we now living in the Anthropocene?

Jan Zalasiewicz and 20 others

(Feb. 2008, v. 18, no. 2, p. 4–8; ftp://rock.geosociety.org/pub/GSAToday/gt0802.pdf).

Abstract: The term *Anthropocene*, proposed and increasingly employed to denote the current interval of anthropogenic global environmental change, may be discussed on stratigraphic grounds. A case can be made for its consideration as a formal epoch in that, since the start of the Industrial Revolution, Earth has endured changes sufficient to leave a global stratigraphic signature distinct from that of the Holocene or of previous Pleistocene interglacial phases, encompassing novel biotic, sedimentary, and geochemical change. These changes, although likely only in their initial phases, are sufficiently distinct and robustly established for suggestions of a Holocene-Anthropocene boundary in the recent historical past to be geologically reasonable. The boundary may be defined either via Global Stratigraphic Section and Point ("golden spike") locations or by adopting a numerical date. Formal adoption of this term in the near future will largely depend on its utility, particularly to Earth scientists working on late Holocene successions. This datum, from the perspective of the far future, will most probably approximate a distinctive stratigraphic boundary.

Note

This article received an exceptional amount of media attention, as well as interest from both Parliament (UK) and the U.S. House of Representatives. Articles appeared in *Science Daily*, *DiscoveryChannel.com*, *The Australian*, *Telegraph.co.uk*, *NationalGeographic.com*, the *Christian Science Monitor*, *Wired*, *Money Times*, the *Edmonton Journal*, the *Vancouver Sun*, and more. As of this writing (November 2008), five of the six "*GSA Today* in the News" articles listed on the *GSA Today* home page at www.gsajournals.org are related to this article, and it has been on our list of the top-five most-viewed *GSA Today* articles since its publication.

A geological and geophysical context for the Wenchuan earthquake of 12 May 2008, Sichuan, People's Republic of China

B.C. Burchfiel et al. (July 2008, v. 18, no. 7, p. 4–11; ftp://rock.geosociety.org/pub/GSAToday/gt0807.pdf).

Abstract: On 12 May 2008, a magnitude 7.9 earthquake ruptured the Longmen Shan margin of the eastern Tibetan plateau. This event occurred within the context of long-term uplift and eastward enlargement of the plateau. The area has numerous geological features not typical of active convergent mountain belts, including the presence of a steep mountain front (>4 km relief) but an absence of large-magnitude low-angle thrust faults; young high topography (post ca. 15 Ma) and thickened crust but low global positioning system (GPS) shortening rates (<3 mm/yr); and no coeval foreland subsidence. In our interpretation, crustal thickening beneath the eastern Tibetan plateau occurred without large-scale shortening of the upper crust but instead is caused by ductile thickening of the deep crust in a weak (low-viscosity) layer. Late Cenozoic shortening across the Longmen Shan could be as little as 10–20 km, with folding and faulting mainly accommodating differential surface uplift between the plateau and the Sichuan Basin. The earthquake of 12 May probably reflects long-term uplift, with slow convergence and right-slip, of the eastern plateau relative to the Sichuan Basin. GPS-determined rates in the vicinity of the 12 May event suggest an average recurrence interval of ~2,000–10,000 yr.

Note

The rapid date to publication of this article after the Sichuan earthquake shows the editorial flexibility of *GSA Today* in addressing timely events of geologic importance. This article was received on 4 June 2008, peer-reviewed, and accepted on 7 June 2008, going to press just three weeks later. This article has remained one of the top-five most viewed *GSA Today* articles since its publication.

CONCLUSIONS

I invite readers to have a look at the past ten years of *GSA Today* articles (or even farther—*GSA Today* is online beginning from 1995, and copies of articles are available back to 1991) and comment on the selections herein or on other themes or stand-out articles that may have been missed. Letters to the editor are welcome and can be sent via post to *GSA Today,* P.O. Box 9140, Boulder, CO 80301-9140, USA, or by e-mail to kasmus@geosociety.org. Please keep your letter to 300 words or fewer. *GSA Today* reserves the right to edit letters for space and clarity.

GSA TODAY'S RECURRING THEMES

Over the past 10 years, *GSA Today* has also published a few articles with recurring themes. All articles are open access at www.geosociety.org/pubs.

JELLY SANDWICHES & CRÈME BRÛLÉE

See the April 2008 issue of *Geology* (v. 36, no. 4, p. 331–334; doi: 10.1130/G24424A.1) for another article in this "series": "Toasting the jelly sandwich: The effect of shear heating on lithospheric geotherms and strength," by Ebbe H. Hartz and Yuri Y. Podladchikov.

Strength of the continental lithosphere: Time to abandon the jelly sandwich?

James Jackson (Sept. 2002, v. 12, no. 9, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0209.pdf).

The long-term strength of continental lithosphere: "jelly sandwich" or "crème brûlée"?

E.B. Burov *and* ***A.B. Watts*** (Jan. 2006, v. 16, no. 1, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0601.pdf).

GRAND CANYON SAND

Floods and sandbars in the Grand Canyon

Ivo Lucchitta *and* ***Luna B. Leopold*** (Apr. 1999, v. 9, no. 4, p. 1–7; ftp://rock.geosociety.org/pub/GSAToday/gt9904.pdf).

Is there enough sand? Evaluating the fate of Grand Canyon sandbars

Scott A. Wright et al. (Aug. 2008, v. 18, no. 8, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0808.pdf).

WHAT DROVE THE PHANEROZOIC CLIMATE?

Celestial driver of Phanerozoic climate?

Nir J. Shaviv *and* ***Ján Veizer*** (July 2003, v. 13, no. 6, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0307.pdf).

CO_2 as a primary driver of Phanerozoic climate

Dana L. Royer et al. (Mar. 2004, v. 14, no. 1, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0403.pdf).

CAN YOU INTERPRET THIS?

Both of the following articles include a "mystery graphic" to be interpreted by the reader. Check them out online.

Experimental stratigraphy

Chris Paola et al. (July 2001, v. 11, no. 7, p. 4–9; ftp://rock.geosociety.org/pub/GSAToday/gt0107.pdf).

What do you think this is? "Conceptual uncertainty" in geoscience interpretation

C.E. Bond et al. (Nov. 2007, v. 17, no. 11, p. 4–10; ftp://rock.geosociety.org/pub/GSAToday/gt0711.pdf).