Limnogeology Division Newsletter

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Limnogeology Division
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From the Editor

Peter Drzewiecki
Storrs, CT

I was hoping to have this Newsletter out before abstracts were due for the 2008 GSA Annual Meeting, but unfortunately, that did not happen. But, as the saying goes, better late than never…

This edition of the Limnogeology Division Newsletter contains several important bits of information, and a research article from Melissa Berke on lacustrine biomarkers. The information includes:

- Biographies of potential division officers for the next two years
- An announcement for the Kerry Kelts Research Award
- A report on the 2007 GSA Annual Meeting
- Information on the 2008 GSA Annual Meeting

The Newsletter can also be a way of providing information to the division. Please send me any announcements, etc. you want distributed. As always, I would love to receive more technical articles for the Newsletter. It is a great way to share your ideas with colleagues.

I hope to see you at GSA!

Message from the Chair

Kevin Bohacs
Houston, TX

Kevin Bohacs, our leader for the past two years, is currently touring some part of the world, gathering, I am sure, more wonderful data on lake systems.

We were unable to reach him for a *Report from the Chair*, but I did receive the picture above from an anonymous source showing Kevin hard at work in the field. We thank Kevin for his leadership over the past two years. Next time you see him, buy the man a drink!

I'm sure Kevin would love to see you at a Core Workshop he is co-organizing with Beth Gierlowski-Kordesch for the 2008 GSA Annual Meeting (see announcement on page 16).

Call for 2008 Kerry Kelts Award Nominations

A call for Kerry Kelts Research Award nominations was published in the April/May, 2008 edition of *GSA Today* (page 71). This award provides $350 dollars for up to three undergraduate or graduate research projects related to the fields of limnology, limnogeology, and paleolimnology. Submit a proposal (five page limit) describing the

proposed research, its significance, and how the award will be used in PDF format (along with your name and a short two-page CV) to Limnogeology Division Chair, Michael Rosen, at mrosen@usgs.gov by August 10, 2008.

Awards will be announced during the Limnogeology Business Meeting at the 2008 GSA Annual Meeting in Houston.

As always, donations to allow this award to grow can be sent to the Kerry Kelts Research Awards of the Limnogeology Division at GSA, P. O. Box 9140, Boulder, CO, 80301-9140, USA. It is also easy to make donations when you pay your membership dues – the Kerry Kelts Research Award is listed on the donations page.

Lake Research

The Promise of New Sedimentary Biomarkers in Paleoclimatology

Melissa A. Berke
Large Lakes Observatory
Duluth, Minnesota

If someone had told me that I would one day be utilizing organic chemistry in my geologic research, I would have been pretty incredulous. My vision of my life as a geologist was hitting rocks with a hammer and camping, not flasks and graduated cylinders. But my interests in geology turned to high-resolution paleoclimate records and new geochemical proxies to address fundamental questions in paleoclimatology. These geochemical techniques include powerful organic geochemical proxies, providing a means of determining paleoenvironmental data that can be accessed in no other way. Combining aspects of geology, chemistry and microbiology, lipid biomarker research involves the extraction and identification of lipids, molecules biosynthesized by all living organisms.

A useful biomarker is one that is relatively easily uncovered (extracted in the lab) and measured, contains diagnostic characteristics (chemical structures) that are identifiable, is fairly resistant to degradation (or degrades in a characteristic way) and can be definitively linked back to a specific organism or group of organisms that live under limited conditions. Molecular biomarkers thus vary widely in their applications

and utility based upon the specificity of the biomarker and the degree to which they have undergone diagenesis.

Although the lab procedure for extracting these lipids from geologic mediums can be time consuming, it is relatively straightforward and provides a host of compounds, that with little additional processing, can be utilized for a multitude of paleoenvironmental information (Wakeham and Pease, 1992; Russell and Werne, 2007) (Fig. 1).

One of the most important recent innovations in the use of organic geochemistry applied to paleoenvironmental studies is the development of new paleothermometry techniques. As one of the most important components of global climate, determining patterns of surface water temperature is crucial and thus this advancement plays a significant role towards understanding past continental climate variability. In 2004, a novel limnological proxy of past water temperature from the sediments of large lakes was described by Powers et al. at the Large Lakes Observatory. This molecular proxy, called TEX_{86}, though first developed for the marine realm by Schouten et al. (2002), provides a significant advance in paleolimnology. TEX_{86} (tetraether index of tetraethers with 86 carbon atoms) uses ubiquitous membrane lipids from the aquatic microbe Crenarchaeota that have been shown to have a positive correlation between the number of cyclopentane rings in these membrane lipids (known as glycerol dialkyl glycerol tetraethers, or GDGTs) and growth temperature (Schouten et al., 2002). In cultured thermophilic Crenarcheota, it has been shown that the addition of cyclopentane rings within the lipid structure allows for adjustment of membrane fluidity in varying temperature settings (Uda et al., 2001). With similar membrane structures, non-thermophilic Crenarchaeota are extrapolated to function similarly, as a paleothermometer of surface temperatures. Presently, there is

Figure 1: Preparing samples in the lab at the Large Lakes Observatory.

only 1 species of non-thermophilic Crenarchaeota in culture (Könneke et al., 2005), so much remains to be learned about the ecology of this Kingdom-level group.

GDGTs are commonly found in both marine and lacustrine settings, unlike alkenones (the basis for another SST proxy known as $U^{K'}_{37}$) which are absent from most lake settings. Due to their highly refractory nature, the lipids are easily preserved with their temperature signal intact, and can be utilized for modern or deep-time paleotemperature studies on samples as old as 120 million years (Kuypers et al., 2001). Ether bonds within the structure of these lipids account for this refractory nature, making these lipids especially resistant to oxidation, acidic or alkaline conditions, or heat (van de Vossenberg et al., 2000). TEX_{86} is calculated by looking at a ratio of GDGT isomers following Schouten et al. (2002) and is found to have a high linear correlation (r^2=0.92) with surface temperatures of certain large lakes with low terrestrial input (Powers et al., 2005).

GDGT's are used for a variety of other reconstructions. Weijers et al. (2007) reconstructed mean air temperature records from the Congo Basin for the last 25 ky using the Methylation Index of Branched Tetraethers (MBT) and Cyclization Ratio of Branched Tetraethers (CBT). These techniques look at the fluvially transported soil bacterial lipids deposited into marine or lacustrine settings. Soil pH can also be determined using MBT and CBT proxies by looking at a 3-dimensional scatter plot correlation as described by Weijers et al. (2006). Additionally, the Branched vs. Isoprenoid Tetraether (BIT) index can be used as a proxy for shifting sediment sources, comparing the ratio of terrestrial vs. aquatic inputs of organic matter.

My initial work using the TEX_{86} proxy involved a 17 ky sediment record from the central basin of Lake Malawi, East Africa (Fig. 2). Powers et al. (2005) reported the temperature history of Lake Malawi based on a TEX_{86} profile in a core from

Figure 2: An example of finely-laminated sediments from Lake Malawi.

the north basin of the lake. We subsequently questioned whether this thermal history reflected past regional air temperature or the intensity of upwelling in the north basin. We addressed this question in a pilot study by using TEX_{86} to reconstruct mean annual lake surface temperatures from a sediment core from the central basin of the lake, far from regions of major upwelling. The results correlated well with the paleotemperature reconstruction from the northern basin of Lake Malawi (Powers et al., 2005) (Fig. 3), and supported our interpretation of the north basin core showing a change in thermal history for this region, and not localized difference in upwelling.

It was found that both Lake Malawi's central and northern basins show dramatic temperature shifts in response to changing global climate. Specifically, there are cool temperatures recorded in both basins around the 8.2ka event (24.4ºC). Additionally, there is ~2 ºC of cooling entering the Younger Dryas. These responses, though different in magnitude, are similar for coastal Indian Ocean SSTs reported by Bard et al. (1997). Lake Malawi's early Holocene cooling of ~3ºC and the lowest temperatures of the central basin are coincident with early Holocene aridity previously noted in this region (Castañeda et al., 2007; Gasse, 2000). The warmest temperatures seen in both basin records (~5-6ka) precede a period of extreme drought in equatorial Africa (Gasse, 2000). Bard et al. (1997) find a similar maximum warming around this time (~6-7ka) in marine alkenone records from the African coastal Indian Ocean.

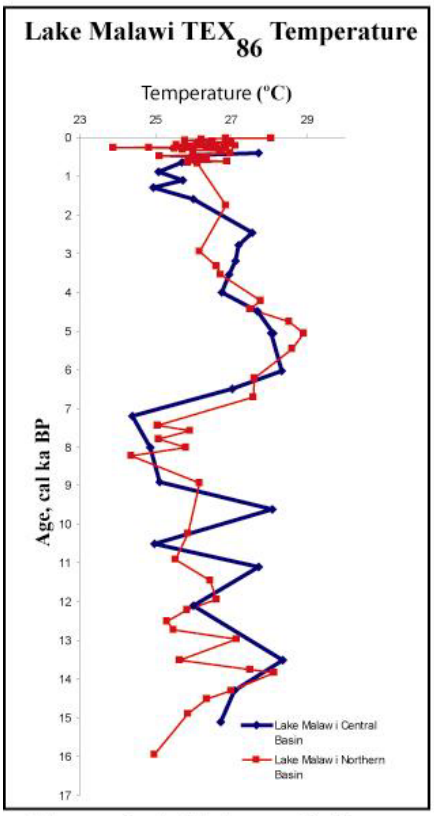

Figure 3: Initial results from a pilot study of Lake Malawi's central basin compared with previously published northern basin results (Powers et al., 2005). Additional samples will be added to this record.

My future work involves utilizing the TEX_{86} proxy to create a regional reconstruction of the thermal and hydrologic history of the East African rift lakes since the Last Glacial Maximum (LGM), using a multiproxy approach. My analyses are focusing on four lakes in the East African Rift Valley (Lakes

Turkana, Albert, Malawi, and Victoria). In establishing the TEX_{86} modern calibration, Powers et al. (2005) noted that the lake surface temperatures are directly coupled to the annual air temperature. The lake surface temperature and air temperature should closely track one another due to the same processes in the heat budget affecting each (insolation, cloud cover, evaporation and precipitation).

This proxy will then be linked to a sedimentary indicator of aridity, δD isotopes from aquatic and terrestrial biomarkers. This signal has been shown to reflect the δD of the source water, used in concert with paleotemperature calibration studies (Huang et al., 2002) and have been used in paleoaridity reconstructions (Anderson et al., 2001). Hydrogen isotope values (δD) are related to their original source water and also show Rayleigh Distillation rainout affects (Alley and Cuffey, 2001). Evaporative effects alter this precipitation signal, with heavier δD generally indicating increased evaporation (and thus lower lake levels) while lighter δD indicates intensified precipitation (Huang et al., 2002). The linkage between temperature and hydrologic change is assumed for this part of the tropics, but the degree to which they are connected is still unknown. This study will address this deficiency by linking these relatively new molecular sedimentary proxies to compare aridity to lake surface temperature. It will provide details of how variable the climate response, timing and magnitude are for each of these lakes, on a regional scale. Specifically, this will test if the thermal and hydrologic responses are coupled, and if large scale climatic forcing events, such as those seen in high latitude records, can be seen in this response.

The use of organic geochemical proxies has diversified considerably over the last few decades. New advances in these techniques as well as continual innovations in the instruments necessary to run these organic compounds occur frequently. This brief synopsis of some of the organic geochemistry research I am doing with my colleagues at the Large Lakes Observatory is in no way intended to represent the sum total of all that can be done with these proxies. Instead, the hope is to illustrate the utility of these techniques with some key examples and encourage others to consider using these proxies in their own research.

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Report on 2007 GSA Annual Meeting

Peter Drzewiecki
Storrs, CT

The giant blue Grizzly outside of the Colorado Convention Center.

The Limnogeology Division was active at the 2007 GSA Annual Meeting, sponsoring and co-sponsoring 7 oral sessions and 2 poster sessions. These included:

- T4. From Geoarchaeology and Paleo-anthropology to Sedimentary Geology and Geochemistry: A Memorial to Richard L. Hay
  - Two oral sessions
- T45. Advances in Understanding and Detection of Groundwater–Stream Water Interactions across Temporal and Spatial Scales
  - Oral session
- T46. Climate Change Hydrology
  - Oral session
- T52. Inland Waters, Playas and Saline Lakes: More than Mini-Oceans
  - Oral session
- T53. Evidence for Paleoenvironmental Change during the Paleogene from the Interior Basins of Western North America
  - Oral session and poster session
- T58. Long Records of Paleoclimate in the Southern Deserts of North America
  - Oral session
- Session 142. Limnogeology Posters
  - Poster session

About 15 division members attended the joint Limnogeology and Sedimentary Geology Division Business Meeting on October 28th at the Colorado Convention Center. At this meeting, the Kerry Kelts Research Award was presented to four deserving individuals (see below). Speakers included Dr. Kevin Bohacs (Limnogeology Chair), Dr. Gail Ashley (Sedimentary Geology Chair), and Dr. Michael Arthur (Pennsylvania State University). Mike Arthur entertained the meeting attendees with a rousing song he wrote, raising the stakes for our Division Chair-elect, Michael Rosen, at the next business meeting.

The following individuals were presented with the Kerry Kelts Award in 2007 at the business meeting:

- **Melissa Berke** (University of Minnesota-Duluth) Creating a regional reconstruction of the thermal and hydrologic history of the East African Rift Lake area during the Holocene, since the Last Glacial Maximum, using a multiproxy approach. Melissa included a report on her research in this Newsletter.
- **Jessica Chappell** (Syracuse University) Neogene through Quaternary climate variability in Lake Albert, East African Rift, from scanning XRF analysis of oil exploration well cuttings.
- **Colin A. Cooke** (University of Alberta) Lake-sediment archives of atmospheric mercury deposition from the Peruvian and Bolivian Andes.
- **Michael McGlue** (University of Arizona) Understanding topographic closure and the evolution of foreland basin lakes, developing generic facies models for small lacustrine systems, and developing late Pleistocene-Holocene records of southern hemisphere climate change.

Kevin Bohacs, our fearless Division Chair, giving an important address

Upcoming 2008 GSA Annual Meeting

Peter Drzewiecki
Storrs, CT

This year, the Annual Meeting of the Geological Society of America will be a joint meeting between GSA, Soil Science Society of America (SSSA), American Society of Agronomy (ASA), Crop Science Society of America (CSSA), the Gulf Coast Association of Geological Societies (GCAGS), and the Gulf Coast Section of SEPM, and is hosted by the Houston Geological Society (HGS).

The meeting will focus on the 10 multidisciplinary themes declared by *The International Year of Planet Earth,* which include health, climate, groundwater,

ocean, soils, deep Earth, megacities, hazards, resources, and life. Topical sessions co-sponsored by the Limnogeology Division include:

- T21. Lakes, Playas, and Soil (Elizabeth Gierlowski-Kordesch)
- T24 Lakes in Extreme Environments: Earth and Beyond (David Finkelstein and Thomas Kulp)
- T25 Terrestrial Response to Climate Variability: During the Medieval Warm Period: Lakes, Tree Rings, and Human Adaptations (David Miller, Kenneth Adams, and Edward Cook)
- T26 Lake Cores: Climate Change and Tectonics (Kevin Bohacs and Elizabeth Gierlowski-Kordesch)

Currently, the technical program is being created, and a list of sessions is not available. A link to the meeting website: https://www.acsmeetings.org/

THE GEOLOGICAL SOCIETY OF AMERICA

Soil Science Society of America

American Society of Agronomy

Crop Science Society of America

Meeting Host

Another GSA Lake Core Workshop in 2008!

Peter Drzewiecki
Storrs, CT

The Limnogeology Division will sponsor a “Lake Cores: Climate Change and Tectonics” core workshop at the 2008 GSA Annual Meeting on Oct. 4. The workshop was organized by Kevin Bohacs and Elizabeth Gierlowski-Kordesch. The cores will come from a variety of ages and locations. The workshop will most likely begin sometime in the late morning. Details on the time and location will be sent along soon.

The last core workshop (2006 GSA) was attended by over 70 participants, and offered an enjoyable and valuable way of sharing data and ideas. Please make plans to be at the GSA Meeting on the 4th to attend this workshop. Even if you did not submit a formal proposal to the core session, please bring core samples, core photos, or posters to share.

Upcoming Meetings

American Society of Limnology and Oceanography (ASLO)

June 8-13, 2008

The summer conference of the American Society of Limnology and Oceanography will be held in St. John's, Newfoundland, Canada. The conference website is: http://www.aslo.org/meetings/stjohns2008/

Geological Society of America (GSA) Annual Meeting

October 5-9, 2008

The Geological Society of America will hold its Annual Meeting in Houston, Texas, USA. It will be a joint meeting with the Soil Science Society of America (SSSA), American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and the Gulf Coast Association of Geological Societies with the Gulf Coast Section of SEPM (GCAGS), and it will be hosted by the Houston Geological Society (HGS). The meeting website is: https://www.acsmeetings.org/2008/

North American Lake Management Society (NALMS)

November 11-14, 2008

The 28th International Symposium of the North American Lake management Society will take place at Lake Louise, Alberta, Canada. The website is: http://www.nalms.org/Conferences/2008LakeLouise/Default.aspx

International Lake Environment Committee (ILEC)

Nov. 1-5, 2009

The 13th World Lakes Conference (WLC) will take place in Wuhan, China. Abstract Deadline: unknown (perhaps it is in the official announcement, written in Chinese, in the second link below). Hopefully we will have more information in the next newsletter. The conference website is: http://www.ilec.or.jp/eg/wlc/index.html. The official website (in Chinese) is: http://www.wlc2009-ilec.org/

International Society of Limnology (SIL)

August, 2010

The International Society of Limnology will hold a conference in Capetown, South Africa in August of 2010. Stay tuned for updates. The Society's website is: http://www.limnology.org/index.html

News Ripples…

The International Year of Planet Earth in 2008
Submitted by Jim Teller (Winnipeg, Manitoba)
A reminder from the last Newsletter

The United Nations proclaimed 2008 as the International Year of Planet Earth. It is the central year in a Planet Earth triennium that will begin in January 2007 and end in December 2009. All 191 UN nations have adopted the aims and ambitions of The Year and are willing to contribute to their implementation. Hence, this proclamation is the most ambitious scientific and outreach program ever designed in the geosciences, and provides an unprecedented opportunity to showcase to the world the relevance and socioeconomic importance of the Earth sciences.

If you have any news you would like to be sent out to the division, please submit it to Peter Drzewiecki at drzewieckip@easternct.edu.

Go to the Limnogeology Division website at:

http://rock.geosociety.org/limno/index.html

To get the latest information on other Limnogeology meetings and workshops…

John W. Johnston, Webmaster jwjohnst@uwaterloo.ca

If you can't access our website, please contact a Division officer for a list of meetings.

Changes in Limnogeology Division Leadership

Peter Drzewiecki
Storrs, CT

While most of the political news around the nation is focused on who will become the president of the United States of America later this year, the more important question of who will lead the Limnogeology Division over the next two years has been largely ignored by the popular media. Candidate biographies and the ballot are on the following pages. Please be sure to vote by August 31.

Biographies for 2008-2010 Officer Candidates

Chair. **Michael R Rosen.** Limnogeology; chemical limnology; water quality. Educ: BS Geol, Haverford Coll; MS Geol, U Rochester; PhD Geol, UT-Austin. Prof Exp: USGS, Rsrch Hydro 01-present; Inst Geol Nucl Sci, NZ, Prog Ldr 93-01; U MN, Limno Rsrch Ctr, Rsrch Sci 92-93; CSIRO, Rsrch Sci 91-92; Curtin U Tech, Perth, Rsrch Sci 89-90. Conct Pos: UN-Reno, Hydro Sci Prog, Adj Fac 02-present. Prof Affil: GSA since 82; AGU, SEPM, Sigma Xi, NZHS, NZRS, IAS, IAL, GS. GSA Serv: Extrnl Awrd Cmte 04-05; Limno Div Vice-Chr, 06-08, Secty 04-06, Nwsltr edtr 02-06. Addtnl Serv: Sedimentology assoc ed 95-99, Ground Water assoc ed 98-00. Honors/Awards: SEPM outstanding paper 97. Rsrch Int: Paleoclimate & geochemical evolution of saline lakes and playas, non-marine carbonate chemistry, sediment flux of organic contaminants in arid lakes. Statement of Interest: My goals are to build on the foundation of the past 6 years, specifically to increase funding for the Kerry Kelts Award, to grow our membership internationally, & to provide information and assistance to students so that limnogeology is considered as a career option for years to come. In addition, we can provide leadership for field activities & field trips as well as sponsor publications from our membership. Finally, the division needs to increase our sponsored sessions at GSA Annual Meetings, and this will be a high priority during my term.

Vice-Chair

Daniel M. Deocampo. Sedimentology; mineralogy; geochemistry. Educ: BA Geol Sci, Tufts U; MS Geol Sci, PhD Geol Sci, Rutgers. Prof Exp: Currently Georgia State U, Atlanta, Dept Geosci, Asst Prof; previous Natl Mus of Natural Hist, Smithsonian Inst postdoc; Natural History Museum, London, UK postdoc; USGS postdoc; Sacramento State U asst prof 3 yrs. GSA member since 1997. Rsrch Int: Although you may know him as "The Hippo Guy," Daniel now focuses on the mineralogy and sedimentary geochemistry of clays, carbonates, and other authigenic minerals in lakes, wetlands, and other terrestrial environments. His research centers on understanding the sedimentary record of water-mineral-biota interactions in Cenozoic terrestrial environments, and he has studied modern and ancient sediment in Tanzania, Kenya, Italy, the Great Basin, and southern California. He values interdisciplinary approaches to limnogeology, and is committed to promoting broad application of lake research to environmental, paleoenvironmental, water resources, and geological problems.

Michael F. Rosenmeier. Geochemistry, limnology, history of aquatic ecosystems & surrounding watersheds. Educ: BA Anthro, UW-Milwaukee; PhD Geol, U Florida. Prof Exp: U Pittsburgh, Dept Geol & Planetary Sci, Asst Prof 03-present, visiting lecturer 02-03; U FL, Dept Geol Sci, grad TA/RA 97-02, primary instr 00-02; UM-Duluth, Dept Geol Sci, grad TA/RA 95-97; UW-Milw, Field/Lab RA 92-95. Prof Affil: GSA since 96, Lim Div since 04; AGU, AQA, ASLO, IATAL. Rsrch Int: Employs stable isotope & geochem analyses of lake sediment cores to decipher the history of aquatic ecosystems and surrounding watersheds. This research is collaborative and multidisciplinary, involving sedimentology, palynology & microfossil analysis, radiometric dating, and archaeology. Recently initiated a multi-proxy reconstruction of environmental & land use changes from medieval aged reservoir & mill pond sediments in southern Burgundy, France. Direct comparison of reservoir & mill pond core data with known local land use histories & with independent regional climate records to examine direct cause-&-effect relationships between human activities, natural environmental changes, & long-term watershed dynamics. Mike also has active limnogeology/paleoenvironmental research programs in Greece, Kazakhstan, Mongolia, Russia, & the U.S. and has previously explored Holocene environmental change in the Maya lowlands of Petén, Guatemala.

Secretary. **Peter A. Drzewiecki.** Lacustrine & fluvial sedimentology and stratigraphy; sequence stratigraphy. Educ: BS Geol, U Notre Dame; MS Sedty Geol, PhD Sedty Geol, UW-Madison. Prof Exp: Eastern Connecticut State U, Dept Envtl Earth Sci, Assoc Prof 07-present, Asst Prof 02-07; ExxonMobil, Sr Geol 96-02. Prof Affil: GSA since 90; AAPG, SEPM, IAS, Sigma Xi. GSA Serv: Lim Div Secty & edtr since 06. Honors/Awrds: GSA/NC Sctn outstanding paper 89. Rsrch Int: Tectonic & climatic controls on Jurassic lacustrine stratigraphy; stratigraphic architecture & depositional controls of Jurassic braided river deposits. Statement of Interest: As secretary I would promote growth of the Division by providing logistical support to the management board, and by continuing the role of newsletter editor. I will strive to increase the number of "technical articles" in the Newsletter, and would like to start publishing the minutes from our division meetings.

Treasurer. **David B. Finkelstein.** Biogeochemistry; organic and aqueous geochemistry. Educ: BS Geol, MS Geol, U Mass; PhD Geol, U Ill. Prof Exp: U TN, Dept EPS, Asst Prof, 06-present; Indiana U, Dept Geol, Post-Doc Rsrch Flw 00-06; Miami of Ohio U, Dept Geol, Visiting Lecturer 99-00; U Ill, Dept Geol, Visiting Tchg Specialist 96-99. Prof Affil: GSA since 90; AGU, GS, IAL, SEPM. GSA Serv: Lim Div Treas since 04. Rsrch Int: Organic & aqueous geochem of evaporative lakes and playas, molecular organic signatures of wildfires. Statement of Interest: Another term as treasurer will allow me to continue our Board's work toward having the Kerry Kelts Fund for student research awards independently funded through the endowment rather than relying on division dues.

Ballot Instructions
This is the ballot for the election of 2008-2010 officers for the GSA **Limnogeology Division**. Candidate biographies are on the reverse side of this page. Vote for no more than one candidate for each office. Submit your vote in one of the following ways:

1) Vote on the paper ballot below. Complete the bottom section of the ballot. Mail the completed ballot to: Geological Society of America, PO Box 9140, Boulder, CO 80301, Attn: Division Ballot. Ballots must be **received at GSA by August 31, 2008** *or*

2) Vote on the paper ballot below. Complete the bottom section of the ballot. Fax the completed ballot to GSA, Attn: Division Ballot, at (303) 357-1074. Ballot must be **received at GSA by August 31, 2008** *or*

3) Vote online at https://rock.geosociety.org/ballot/vote.asp?Name=lim. Log onto the ballot using your GSA member number (given on your mailing label) or your e-mail address (which will work *only* if your e-mail address is in your GSA member record). For assistance, please contact GSA at gsaservice@geosociety.org or (303) 357-1000 (option 3) or tollfree in the U.S. at (888) 443-4472. Electronic votes **must be submitted by August 31, 2008**.

Ballot. 2008-2010 Officers for the Limnogeology Division
Two-year terms. Vote for one individual for each office.

Chair

- ❑ Michael R Rosen
- ❑ (or write-in) _____

Vice-Chair

- ❑ Daniel M. Deocampo
- ❑ Michael F. Rosenmeier
- ❑ (or write-in) _____

Secretary

- ❑ Peter A. Drzewiecki
- ❑ (or write-in) _____

Treasurer

- ❑ David B. Finkelstein
- ❑ (or write-in) _____

Your Name (printed) _____

Your Signature (required) _____

Your GSA Member Number (required)* _____

* Given at the top of your mailing label.
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