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The SEDIMENTARY Record

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with the Sedimentary Geology Division of GSA

INSIDE: BLACK MUDROCKS: LESSONS AND QUESTIONS FROM THE MISSISSIPPIAN BARNETT SHALE IN THE SOUTHERN MIDCONTINENT

PLUS: PRESIDENT'S COMMENTS
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1926 SEPM Society for Sedimentary Geology

SEPM BOOK STORE

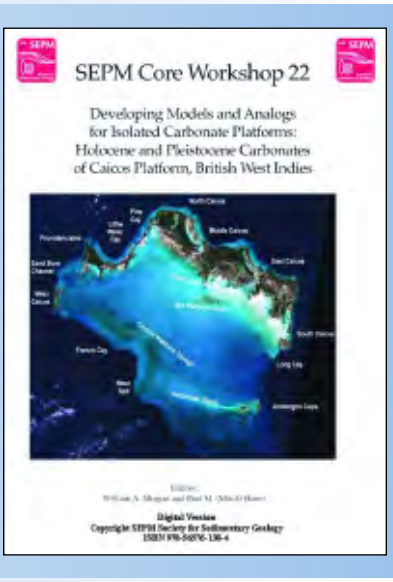
SEPM Core Workshop 22

Developing Models and Analogs for Isolated Carbonate Platforms - Holocene and Pleistocene Carbonates of Caicos Platform, British West Indies

Edited by: William A. Morgan and Paul M. (Mitch) Harris

For the past 30 years, Caicos Platform has been an important area for studies of Holocene and Pleistocene carbonate successions and a destination for numerous geoscientists interested in learning about modern carbonate sedimentary systems. During the past few years there has been a renewed interest in understanding the geology of the platform, stemming in large part from recognition in the petroleum industry that more refined reservoir models of carbonate systems are needed both in exploration and development. The impetus for the workshop and the publication was a desire to bring together both present and past Caicos Platform workers with those not familiar with the Platform to share knowledge on the Holocene and Pleistocene Sedimentology, diagenesis, platform evolution, and the applicability of the platform as an analogue for ancient isolated carbonate platforms. This volume should serve as an intermediate-term documentation of research efforts and a spur for additional studies to better understand controls on sediment distribution, diagenesis, and the evolution of platform growth, furthering the Caicos Platform as an analogue for ancient, isolated, carbonate platforms. (CD publication)

Catalog #70022 • SEPM Member Price: $48.00



SEPM Special Publication #88

Sediment-Organism Interactions: A Multifaceted Ichnology

Edited by: Richard G. Bromley, Luis A. Buatois, Gabriela Mangano, Jorge F. Genise and Ricardo N. Melchor

The field of Ichnology bridges the gap between the areas of paleontology and sedimentology, but has connections to many subdisciplines within these areas. Biogenic structures record the behavior of their tracemakers and provide valuable information in paleoecologic and paleoenvironmental analysis. As in situ ethologic structures, trace fossils or ichnofossils yield valuable insights into the paleoecology of ancient benthic communities and the environmental dynamics of depositional systems. Ichnology is truly a multifaceted field, and a broad selection of its facets is represented in the 28 papers of this volume. The papers are the product of Ichnia 2004, the First International Congress on Ichnology. Several symposium volumes, books, and short-course notes have been published in recent years and ichnology can be considered a particularly active research area in steady growth. The 28 papers herein are arranged in five groups that reveal the broad scope of ichnology.

Catalog #40088 • SEPM Member Price: $100.00

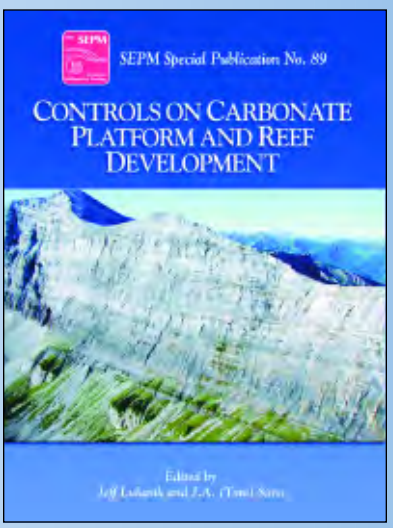
SEPM Special Publication #89

Controls on Carbonate Platform and Reef Development

Edited by: Jeff Lukasik and J.A. (Toni) Simo

Carbonate platforms and reefs emerge, grow and die in response to intrinsic and extrinsic mechanisms forced primarily by tectonics, oceanography, climate, ecology and eustasy. These mechanisms, or controls, create the physical, biological and chemical signals accountable for the myriad of carbonate depositional responses that, together, form the complex depositional systems present in the modern and ancient settings. If we are to fully comprehend these systems, it is critical to ascertain which controls ultimately govern the "life cycle" of carbonate platforms and reefs and understand how these signals are recorded and preserved. Extensive research on a wide variety of carbonate platform and reefal systems in the past few decades has provided the foundation and understanding necessary to take carbonate research to a new level. With assistance from rapidly advancing computer software and an increasing use of cross-disciplinary integration, carbonate research is shifting from description and morphological analysis towards a science that is more focused on the assessment of process and genetic relationships. The aim of this special publication is to present a cross section of recent research that shows this evolution from a variety of perspectives and scales using examples distributed throughout the Phanerozoic.

Catalog #40089 • SEPM Member Price: $90.00



Cover: Distribution of middle Mississippian Barnett and equivalent facies in the south-central U.S. and images of typical facies.

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Black Mudrocks: Lessons and Questions from the Mississippian Barnett Shale in the Southern Midcontinent

Stephen C. Ruppel and Robert G. Loucks
Bureau of Economic Geology
John A. and Katherine G. Jackson School of Geosciences
The University of Texas at Austin
University Station, Box X
Austin, TX 78713-8924

ABSTRACT

Although largely unstudied until recently, the Barnett Shale of the Ft. Worth Basin, Texas, has become one of the better known black mudrock successions in the world. Emerging results of new research on these rocks, based mostly on subsurface data, offer intriguing insights into fundamental aspects of mudrock formation. Among these insights is the recognition that mudrock facies are probably not widely continuous, that organic matter conversion to hydrocarbon may control distribution and abundance of nanoscale pores and thus permeability, that fracture distribution may be affected by mineralogical variations along a proximal-distal gradient, and that, based on trace element chemistry, the Barnett ocean may have been much more stratified than most other anoxic basins. Developing concepts of processes and products of mudrock formation being derived from Barnett research offer great potential for comparison to other mudrocks worldwide.

INTRODUCTION

Fine-grained siliciclastic rocks constitute as much as 75-80% of the sedimentary strata in the Earth's crust. These rocks, composed of varying amounts of silt- and clay-sized particles and including a wide range of textures, fabrics, and compositions, are variously referred to as shales, mudstones, claystones, siltstones, or mudrocks (*sensu* Blatt et al., 1972). Recently, economic successes in production of natural gas from such deposits have created a new wave of research on black "shales," or dark, organic-rich mudrocks. This explosion of interest in these mudrocks is delivering a wealth of new data and questions regarding every geological aspect of these rocks at scales ranging from regional to pore scale. Many data, especially 3-D geophysical data and cores, were previously unavailable; these new data offer exceptional opportunities for developing an understanding of this complex sedimentary system. Here we discuss emerging results of multidisciplinary studies of the Barnett Shale, a Mississippian-age succession in the Ft. Worth Basin, Texas (see cover), and one of the causes of this renaissance in mudrock research. The new data coming from studies of these rocks are equaled only by the questions that accompany them.

PREVIOUS STUDIES

Literature on mudrocks, like the rocks themselves, is voluminous. Most studies have until recently been focused on outcrops and ocean-bottom cores (DSDP, ODP). Compilations by Schieber et al. (1998 a, b) and Potter et al. (2005) provide an excellent overview of current knowledge. The April 2007 issue of the *AAPG Bulletin* is dedicated to recent studies of the Barnett Formation in the Ft. Worth Basin. Although preliminary, the volume provides insights into types of data being collected and questions being posed about Barnett mudrocks and related organic-rich mudrocks elsewhere.

KEY ISSUES IN MUDROCK CHARACTERIZATION

Our multidisciplinary team is investigating an array of geological issues in the Barnett. The work highlights many challenges to our understanding of the system that we think apply to mudrock systems. Some key issues are summarized here.

Facies and Depositional Setting

Despite their overt similarity, organic-rich mudrocks can accumulate in a wide range of depositional conditions (e.g., Potter et al., 2005). Basic attributes such as sediment-delivery mechanisms, oxygenation levels, and water depth are not well understood for many mudstone successions. Our Barnett studies reveal differences in texture, fabric, mineralogy, allochems, and chemistry that we think document changes in these attributes from more proximal to more distal settings. Distal Barnett mudrocks comprise several hundred meters of dominantly millimeter to submillimeter laminated, siliceous mudstones containing no evidence of infaunal or epifaunal biota and only rare indications of current reworking. These features suggest sedimentation by suspension settling and distal turbidity flow in a predominantly anaerobic, below storm-wave-base environment (Fig. 1). By contrast, more proximal facies contain evidence of infaunal activity, local traction sedimentation, and more abundant platform-derived faunal allochems. These attributes, as well as differences in pyrite morphology, suggest dysoxic or intermittently oxygenated conditions probably associated with shallower water. Although assignations of water depth are problematic, depths as great as 300 m have been suggested for distal Barnett and equivalent rocks (Gutschick and Sandburg, 1983; Loucks and Ruppel, 2007). More research is needed to explain the relationship between

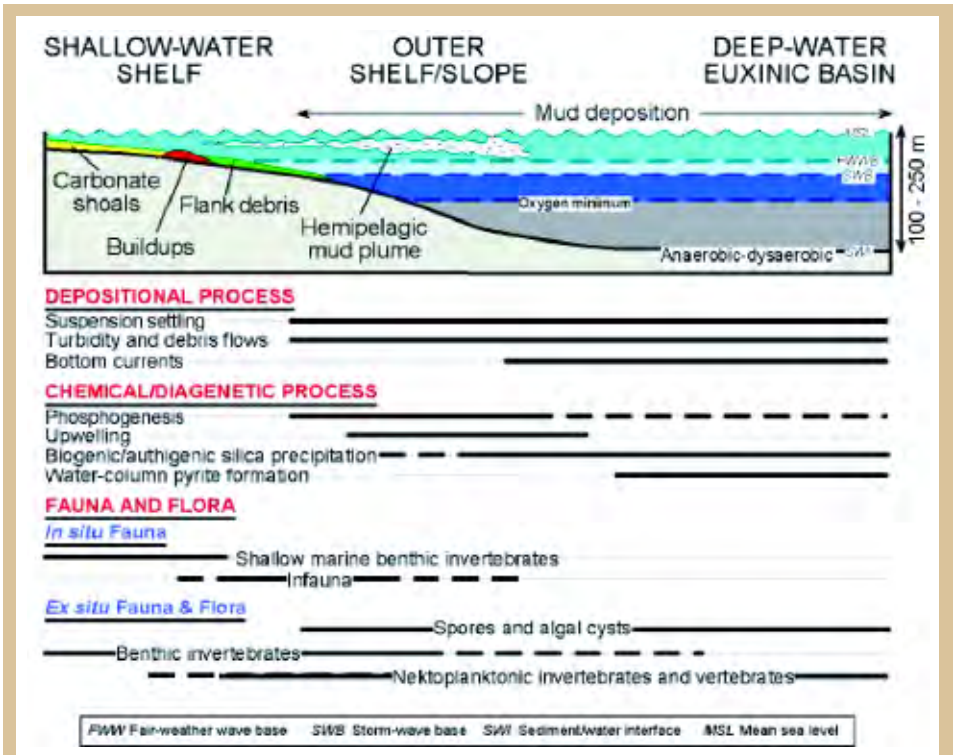

Figure 1. Model for deposition of Barnett Fm black mudrocks in the Ft. Worth Basin. Modified from Loucks and Ruppel, 2007.

water depth and sediment types, as well as to refine issues of basin geometry, sediment source area, and depositional processes.

Stratal Architecture

Understanding of the internal stratal architecture of mudrock deposits is crucial to interpreting depositional mechanisms and to correlation. Dark-colored, organic-rich mudrock successions commonly are considered by many to be composed of highly continuous units. Some workers have argued based on outcrop data that cycles can be defined and correlated over large areas using sedimentological criteria (e.g., MacQuaker et al., 1998; Brett et al., 2003). Others have interpreted subsurface data sets (e.g., wireline logs, seismic data) to indicate similar lateral continuity. (Bohacs, 1998; Algeo et al., 2004). Our work in the Ft. Worth Basin, however, suggests that sedimentological components within the Barnett are not widely correlative (W. Wright, personal communication, 2006; Loucks and Ruppel, 2007). Detailed description and comparison of 39 mostly continuous cores (900 m) reveal abundant vertical changes in texture and fabric, especially in more proximal areas of the basin, but few features that display systematic vertical stacking or other unique attributes permitting them to be laterally correlated. Our findings of limited continuity seem to be consistent with those of other workers who noted the abundance of local truncation, condensation, and differential compaction and diagenesis features at thin sections to hand samples scales (e.g., Schieber, 1998; Potter et al., 2005). Although some features could result from basinwide or even global events (e.g., eustasy, tectonics), their apparent lack of continuity suggests more local controls are common.

Recent studies of 3-D seismic data have provided documentation of larger-scale, karst-related stratal deformation of the Barnett succession. This research (McDonnell et al., 2007) has defined abundant subcircular areas of karst collapse in the underlying Lower Ordovician Ellenburger Group and showed that episodic reactivation of these features affected both the Barnett and overlying strata (Fig. 2). These findings imply that periods of reactivation and stratal collapse may have occurred before, during, and after Barnett mudrock deposition. No cores are available to examine this deformation directly; however, areas around these collapsed cave successions almost certainly contain widespread lithological and stratal discontinuities.

Pore-system Architecture

The need to better understand gas distribution and delivery mechanisms in hydrocarbon-bearing mudrocks has led to a new focus on size, distribution, and connectivity of mudrock pores. Results of recent studies at the Bureau of Economic Geology (e.g., Reed et al., 2007) show that most Barnett pores fall within the 5-200-nanometer (0.005-0.2-micron) range. This work, although preliminary, shows that pores can be reliably imaged only on flat, ion-milled surfaces. Previous work at lower magnifications and without these techniques must be viewed warily. Pores revealed by these studies are associated with organic matter (Fig. 3), implying that most pores may result from organic matter conversion to hydrocarbons. Barnett pores also seem to be poorly interconnected, suggesting that matrix flow through these rocks is limited. If organic matter conversion is the major cause of pore development, then its abundance and distribution may tie closely to mudrock permeability. The Barnett contains moderately high values of TOC (typically 4-10 %). Mudrocks with higher levels of TOC (e.g., Upper Devonian Woodford Fm of Texas and Oklahoma: up to 30% TOC) may be able to develop higher permeability and

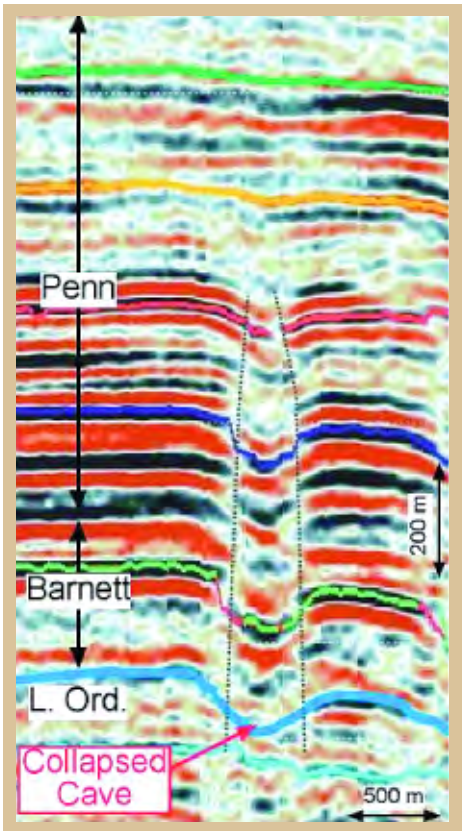

Figure 2. 3-D seismic section showing superstratal deformation in the Barnett and related strata over paleocaves. Image provided by A. McDonnell.

matrix flow. Further research is needed to (1) improve imaging techniques for nanoscale pore systems such as those that typify mudrocks; (2) define abundance, distribution, and origin of these pores; and (3) constrain the role that organic matter plays in pore formation.

Mineralogy, Chemistry, and Diagenesis

Basic X-ray diffraction studies reveal that besides clay minerals, quartz, feldspars, carbonates, phosphates, and pyrite are also common in mudrocks (Potter et al., 2005). Our studies suggest that these minerals vary in abundance across basins. In basin center areas (focus of Barnett gas production successes), mudrocks comprise subequal volumes of quartz and clay minerals (each averaging 35%) and subordinate amounts of carbonate and pyrite. Proximal, basin margin areas, by contrast, contain much higher volumes of clays (average 60%), abundant phosphate, and much less quartz (average 25%). Petrographic studies show that quartz composition also varies; detrital quartz is more common in proximal areas, whereas more distal rocks contain dominantly biogenic and authigenic quartz phases. These silica trends, which we have also seen in Upper Devonian (Woodford Fm) mudrocks in the Texas Permian Basin, document differential controls of upwelling and biogenic silica formation in distal areas vs detrital input from basin margin areas that probably characterize many mudrock successions.

Work is under way by Day-Stirrat et al. (in press; in review) to use limestone concretions (Fig. 4) common in many mudrock successions, including the Barnett, to better understand original fabric and textures. Formed during early shallow burial (e.g., Lash and Blood, 2004), these concretions can offer better insights into characteristics of uncompacted mud sediment, processes responsible for their deposition, and changes that occur during burial.

Much recent research is focusing on trace-element chemistry of Devono-Carboniferous black shales to interpret water-column chemistry and hydrography (e.g., Rimmer, 2004; Algeo et al., in press). Molybdenum seems to be an indicator of anoxia, basin geometry, and water circulation. Interestingly, current studies reveal much lower concentrations of Mo in the Barnett than in other mudrocks (Rowe et al., in press; in review). These findings indicate bottom-water restriction many times greater than modern anoxic, organic-rich, muddy basins and suggest that the Ft. Worth Basin may have differed significantly from comparable middle Paleozoic basins in the U.S.

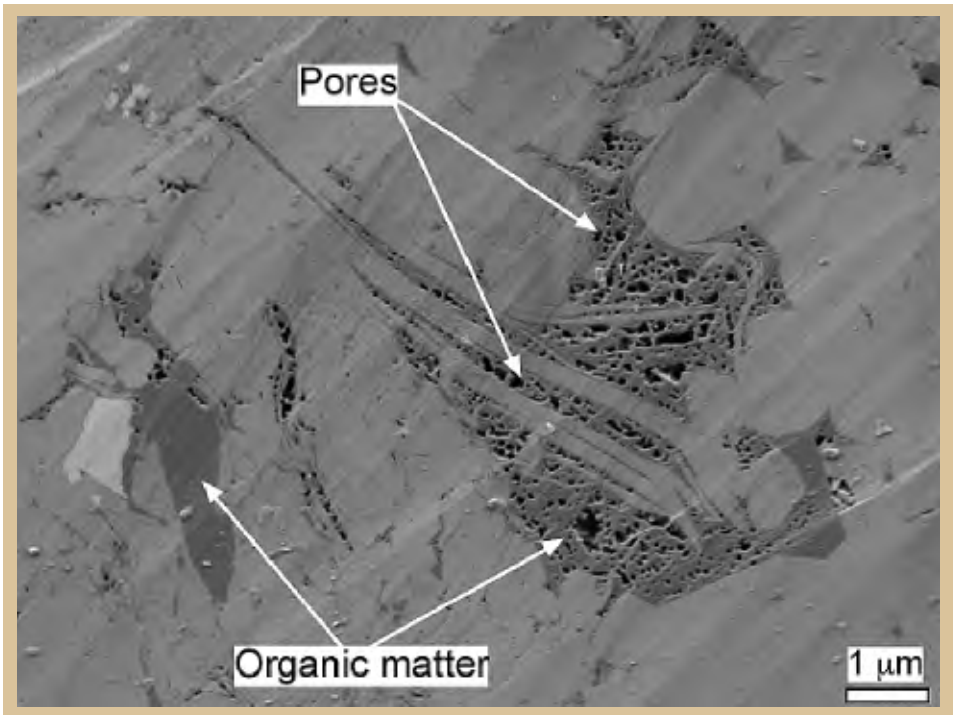

Figure 3. Field emission scanning electron photomicrograph of nanoscale pore architecture in the Barnett Formation. Image provided by R. Reed.

Fracture Development

Until recently, research into fracture development and roles that facies and tectonics play in their formation in mudrocks has been limited. Now, because of the importance of fracture formation and propagation in successful shale-gas production, new data are emerging. Gale et al. (2007) combined macro- and micro-scale fracture description of core samples with mechanical rock-property measurements to define orientation and size of natural fractures and thus infer fracture spacing, length, aperture, and connectivity. These studies reveal differences in apparent fracture abundance between mineralogically distinct proximal and distal Barnett mudrocks and also suggest that large open fractures may exist in clusters several hundred meters apart. Studies also show that clusters are oriented normal to present day in situ stress. A key question for further research is how mudrock variations affect fracture genesis.

Other emerging issues

Several other questions challenge mudrock researchers, including the relative roles that climate, eustasy, and tectonics play in controlling both architecture and lateral variations in mudrock properties. New findings of possible microbial control on mud accumulation and the mechanics of clay particle transports (e.g., Schieber, 2007; Schieber et al., 2007) show that our understanding of these enigmatic rocks is still in its infancy. New data from subsurface studies of potential shale-gas basins will provide new insights and questions for some time to come.

ACKNOWLEDGEMENTS

Mudrock research is a major element of multidisciplinary studies currently under way on sedimentary systems at the Bureau of Economic Geology and the Jackson School of Geosciences. Mudrock team members at the Bureau include the authors (stratigraphy and sedimentology), Dr. Julia Gale (fractures and tectonics), Dr. Rob Reed (SEM imaging), Drs. Angela McDonnell and Hongliu Zeng (geophysics), Dr. Kitty Milliken (petrography), Dr. Wayne Wright (stratigraphy and sedimentology), Dr. Ruarri Day-Stirrat (diagenesis), and Dr. Fred Wang (petrophysics and flow modeling). Also part of the team are Prof. Harry Rowe (University of Kentucky: trace element chemistry), Profs. Darwin Boardman (Oklahoma State University) and Jeffrey Over (SUNY Geneseo) (biostratigraphy), Dr. Jon Holder (University of Texas; rock mechanics), Dan Jarvie (Humble Geochem; organic chemistry), and Prof. Necip Guven (mineralogy). Cover art by Jamie Coggins.

Figure 4. Outcrop section of Barnett Shale containing limestone concretions. Inset shows similar concretion and surrounding mudrock in core.

Editing by Lana Dieterich. Publication authorized by the Director, Bureau of Economic Geology.

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Accepted May 2008

SEPM Presentation Winners

The awards listed were earned from presentations at the SEPM Annual Meeting in San Antonio, Texas, April 2008. The awardees will be recognized at the SEPM Annual Meeting in 2009.

Oral Presentation (Co-Awardees)

Sherry L. Becker
Lowstands on the Rise?

Linda Hinnov and James Ogg
Applications of the Sedimentary Record of Astronomically-Driven Paleoclimate Oscillations and Trends

Poster Presentation (Co-Awardees)

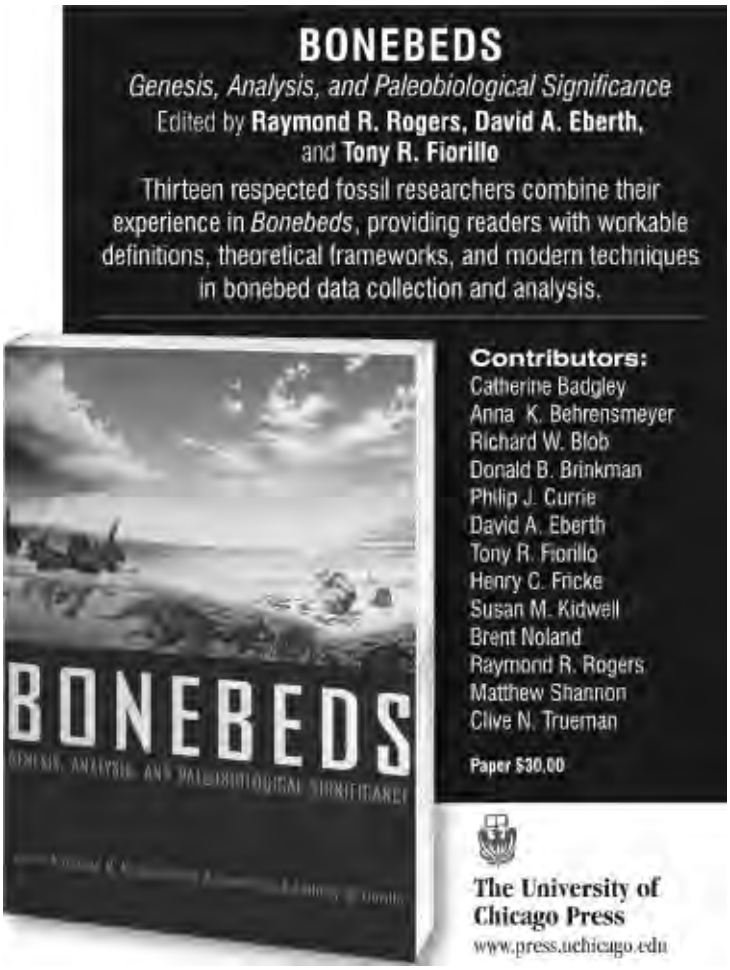
Beatriz Garcia-Fresca, Jerry Lucia and Charlie Kerans
Numerical Model of Reflux Circulation during the Deposition of the Permian San Andres Formation, Guadalupe Mountains and Algerita Escarpment

Martin P. Crundwell and Malcolm J. Arnot
Sub-Millennial Anatomy of Late Miocene Deep-Water Mass-Transport Deposits: Case Studies of the Use of Foraminifera to Decipher the Stratigraphic Significance of the Mount Messenger Depositional System, Taranaki Basin, New Zealand

Honorable Mention Posters

Christopher R. Mattheus and Antonio B. Rodriguez
Controls from Late Quaternary Valley Incision: a Look from Coastal-Plain Systems from the mid-Atlantic and Northern Gulf of Mexico Margins

Jamie L. Shamrock and David K. Watkins
Evolution of the Cretaceous Nannofossil Genus Eiffellithus and Its Biostratigraphic Significance



2009 Medalists

Medals and awards are an important part of the Society's mission. It is with great pride that we announce the 2009 awardees. They will be honored at the 2009 President's Reception and Awards Ceremony, during the SEPM Annual Meeting held in Denver, Colorado on June 9, 2009.

Twenhofel Medalist: Gene Shinn

Shepard Medalist: to be announced

Pettijohn Medalist: Hugh Jenkyns

Moore Medalist: Leo J. Hickey

James Lee Wilson Award: Amy Draut

Honorary Member: to be announced

Distinquished Service Award: John Southard

Steve Stanley receives the 2008 Twenhofel Medal from SEPM President Mary Kraus.

Call for 2010 SEPM Award Nominations

Do you know of someone who deserves special recognition?

Nominations are open for the following awards:

- Twenhofel Medal - for excellence in overall sedimentary geology
- Pettijohn Medal - for excellence in sedimentology
- Shepard Medal - for excellence in marine geology
- Moore Medal - for excellence in paleontology
- Wilson Award - for outstanding work at the beginning of a career in sedimentary geology
- Honorary Membership - for outstanding service and science in sedimentary geology

It is easy to nominate someone, just go to http://www.sepm.org/awards/nominationform.htm and fill out the form.

Once nominated a candidate will be considered for three years.

PRESIDENT'S COMMENTS

For my introductory communication in The Sedimentary Record, I want to bring up two points.

Experience Drain and Transition

Firstly, what are some of my concerns about the science of sedimentology and stratigraphy? I recently compiled an informal list of several sedimentogical colleagues, who in the last 2 years have been recruited by oil industry. Not fresh out of university! There are twelve individuals on the list. These are senior scientists, most with one to three full decades of research and teaching experience, who are sedimentogists, stratigraphers or comparable from university departments and government institutions. In my commentary, I do not fault the researchers; this is strictly an observation!

What is the problem? The resource industry, and I do not fault the industry, requires senior skilled, technical scientists to assist in the discovery and recovery of hydrocarbons. This is an undeniable societal need!

My big concern is the loss of this senior scientific and educational talent pool from the university system and government institutions. These are individuals whose role has been to train expert staff and conduct pure and applied research.

This recruitment of senior scientists from institutions is, in part due to the aging baby boom wave that is now heading to retirement. Over the past two decades, countless geology departments have cut staff, merged with other departments, and reduced the support of research programs. National research funding agencies (NSF, NSERC, NERC, etc.) have dramatically reduced funding of basic soft rock sciences in favor of modeling and earth-systems programs. The petroleum industry realizes that retiring Baby Boomers cannot be replaced solely from new graduates and the available pool to tap upon for experienced, expert resources are the institutions.

What is the impact? I believe that the industry's recruitment from Educational and Government institutions will continue. The result will be loss of senior scientific expertise, educators and mentors from the universities and government bodies. Yes, some of them will be replaced. However, long established research programs that train new scientists will be lost and have to be started over again with incoming new scientists, if they are replaced at all.

That there is demand for trained sedimentogists is illustrated by the industries' recruitment.

Finally, and knowing that many of my colleagues do not agree, I do not believe that it is necessarily the role of industry to fund education and train highly skilled staff; that is society's role to be fulfilled by governments and their educational institutions.

However, as an organization whose mission is to improve and disseminate the science, what can SEPM do to help this situation? Please contact Howard Harper or myself with any ideas.

SEPM Membership Drive Initiative

My second point is that SEPM membership continues to decline, not a lot, but it is still down. I carried out a straw poll at AAPG in San Antonio asking several professors if their graduate students were members of SEPM. Surprisingly and shockingly, I got the response of "I do not know, lets go ask them". Even more surprisingly, several students were not student members of SEPM - even at a lowly $25 fee. Following from this, and after discussions with several of you, I would like to get going on a few initiatives, working with you as SEPM members and the SEPM staff in Tulsa. These initiatives would expose SEPM to the most important groups of potential members: professionals in industry and government; professors; graduate students; and undergraduate students. But to make this effort really impactful, it will take the current SEPM membership, itself, to make it happen.

I am concerned that professors who are sedimentary geologists, paleontologists, and mineralogists are not strongly encouraging their students to join SEPM. I would like to get a one page poster created and send to all of our academic members along with a short e-mail encouraging professors to encourage students to join SEPM. The material, which would describe all of the SEPM student member benefits, could be posted on doors and bulletin boards in geology departments.

A second e-mailing would directly target current student members, asking them to encourage other students to become members of SEPM.

SEPM is also planning on participating in a new AGI initiative to encourage undergraduate students that have just become or are considering becoming geoscience majors. SEPM will be offering a free one-year membership to all of the new majors that participate in the AGI program. This program will be offering free or reduced memberships in many of the AGI member societies.

I also would like to do a similar mailing to all of our industrial, consulting and government members with a different poster targeted at this group. This mailing would ask these members to solicit and encourage junior staff and colleagues whom are sedimentary geologists, paleontologists and mineralogists to join SEPM.

The membership drive targeted at the universities is planned for the fall when everyone should be returning to classes. The professionals in industry and governmental careers will start over the summer, so please look for it in the coming months.

SEPM Staff has come up with a little incentive to entice everyone to actively participate. Any member who recruits five new members will receive a gift certificate for one free SEPM book.

Dale Leckie, President

NAMS

North American Micropaleontology Section, SEPM

CONFERENCE ANNOUNCEMENT

COGEOLOGIC PROBLEM SOLVING WITH MICROFOSSILS II

MARCH 15-18, 2009
UNIVERSITY OF HOUSTON, HOUSTON, TX USA

ABSTRACTS DUE OCTOBER 1, 2008

The North American Micropaleontology Section (NAMS) of SEPM invites you to attend the 2nd international conference on *Geologic Problem Solving with Microfossils*.

"Microfossils II" builds on the success of the March, 2005, Microfossils I and will again bring together a diverse range of geoscientists to showcase the problem-solving power of microfossils across a broad variety of geologic settings and stimulate the "cross-fertilization" of ideas.

We are seeking high-quality oral and poster presentations in which microfossils are integrated with related geologic data and contribute to solving significant geologic problems. Presentations that demonstrate new techniques or novel applications are encouraged, and studies of all geologic ages and geographic areas will be considered. Tentative session themes for the conference include:

- Microfossils and Problems in Eustasy and Tectonics
- Biostratigraphy and its Role in Sequence Stratigraphy
- Paleoceanography, Paleoecology, and Paleoclimatology
- Biochronologic Correlation
- Micropaleontologic Applications to Reservoirs and Drilling
- Micropaleontology Tools and Techniques
- Ecologic Analogs
- Environmental Analysis
- Roundtable Discussions of one or more topics based on participant interest

Presentations on the integration of micropaleontology into sedimentologic and stratigraphic studies are welcome. The conference committee is particularly interested in volunteers to organize theme sessions on these topics.

Authors should submit a preliminary presentation title by April 30, 2008 to the Technical Program Chairs, Ron Martin (daddy@udel.edu) or Pete McLaughlin (ppmclau@udel.edu). Full abstracts will be due October 1, 2008 and submitted online via the SEPM website. Information on abstract submission and format, registration fees, and hotel accommodations for the conference will be announced shortly on the NAMS and SEPM websites.

Upcoming SEPM Research Conferences

Geological Society of London and SEPM

Paleogeography: The spatial context for understanding the evolution of the earth system.

August 10-13, 2008, St Johns College, Cambridge, UK

Details at http://www.geolsoc.org.uk/gsl/gsl/events/listings/page2856.html

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SEPM

Clinoform Sedimentary Deposits: The processes producing them and the stratigraphy defining them

August 15-19, 2008, Rock Springs, WY, USA

Registration Open

Details at www.sepm.org

Geological Society of London (GSL) and SEPM

Rifts Renaisance: Stretching the crust and extending exploration frontiers

August 19-21, 2008, Houston, TX, USA

Registration Open

Please submit abstracts of 500 words or less to Kerri Deegan at the Geological Society of London kerri.deegan@geolsoc.org.uk. Details at www.geolsoc.org.uk

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NAMS and SEPM

Geologic Problem Solving with Microfossils II

March 15 – 18, 2009, University of Houston, Houston, Texas

Abstracts due October 1, 2008

Details at http://www.sepm.org/activities/researchconferences/microII/microIIhome.htm

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