

The

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# SEDIMENTARY

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# Record

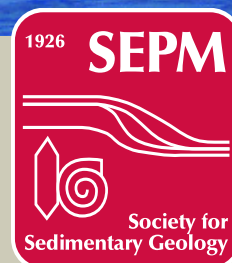


**INSIDE:** TEPHROCHRONOLOGY OF MARINE SEDIMENTS AROUND THE ISLAND OF MONTSERRAT, LESSER ANTILLES VOLCANIC ARC

PLUS: UPCOMING SEPM RESEARCH CONFERENCES

PRESIDENT'S COMMENTS

SEDIMENTARY GEOLOGY DIVISION, GEOLOGICAL SOCIETY OF AMERICA





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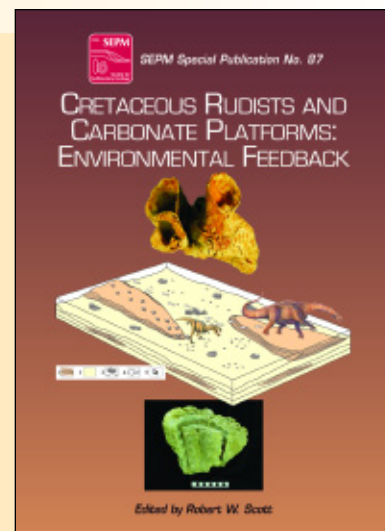
SEPM Special Publication #87

## Cretaceous Rudists and Carbonate Platforms: Environmental Feedback

*Edited by: Robert W. Scott*

Sedimentologists, stratigraphers and paleontologists will find new data in SP 87. The papers of the Proceedings of the Seventh International Congress on Rudists are organized into three themes: (1) Depositional Environments of Cretaceous Carbonates has been an overarching theme of the Working Group on Cretaceous Carbonate Platforms, Study of rudists, which produced great volumes of carbonate sediment, is central to understanding processes and reservoir prediction. Some of the world's great hydrocarbon reservoirs are rudist debris beds. (2) The Origins, Events, and Demise of Rudist Paleocommunities signal significant local and even global events in Earth systems. Rudist communities responded to oceanic anoxic events and to complex factors that lead to oxygenation of deep ocean water masses. (3) Theme Towards Rudists Taxonomy, Biogeography, and Phylogeny focuses on the paleobiology and systematics of rudists. The foundation of all interpretations of biogeography and paleoecology is solid taxonomy that is agreed upon by the majority of specialists. This is a core, ongoing scientific pursuit.

**Catalog #40087 • SEPM Member Price: \$85.00**



SEPM Miscellaneous #7, a joint SEPM/GSL publication

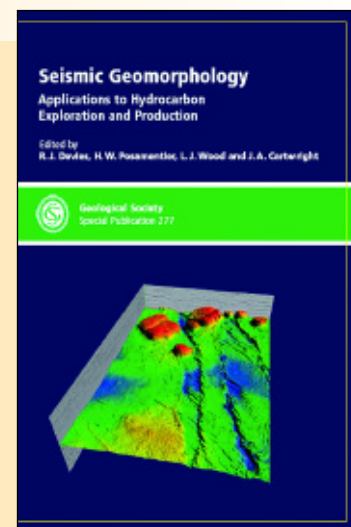
## Seismic Geomorphology: Applications to Hydrocarbon Exploration and Production

*Edited by: R. J. Davies, H. W. Posamentier, L. J. Wood, and J. A. Cartwright*

We are poised to embark on a new era of discovery in the study of geomorphology. In recent years an entirely new way of studying landscapes and seascapes has been developed through the use of 3D seismic data. Just as CAT scans allow medical staff to view our anatomy in 3D, seismic data now allows Earth scientists to do what the early geomorphologists could only dream of - view tens and hundreds of square kilometres of the Earth's subsurface in 3D and therefore see for the first time how landscapes have evolved through time. This volume demonstrates how Earth scientists are starting to use this relatively new tool to study the dynamic evolution of a range of sedimentary environments.

SEPM is the North American distributor for this publication. International orders need to be placed through the Geological Society of London.

**SEPM/GSL Member Price: \$70.00**



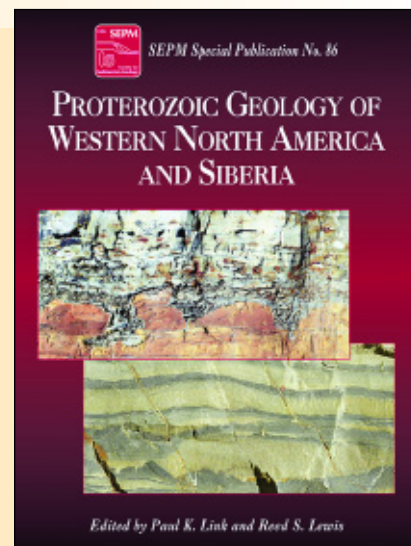
SEPM Special Publication #86

## Proterozoic Geology of Western North America and Siberia

*Edited by: Paul K. Link and Reed S. Lewis*

This volume is a compendium of research on the Belt Supergroup. It is an outgrowth of Belt Symposium IV, held in Salmon, Idaho, in July, 2003, in conjunction with the Tobacco Root Geological Society annual field conference. Because of the geographic extent and great thickness of the Belt Supergroup, years of work have been required before conclusions are "bona fide". The Mesoproterozoic Belt Supergroup of western Montana and adjacent areas is geologically and economically important, but it has been frustratingly hard to understand. The previous Belt Symposium volumes offer a historical view of the progress of the science of geology in the western United States. The advent of U-Pb geochronology, especially using the ion microprobe (SHRIMP) and laser-ablation ICPMS, has injected geochronometric reality into long-standing arguments about Belt stratigraphy. Several papers in this volume utilize these new tools to provide constraints on age and correlation of Belt strata (Chamberlain et al., Lewis et al., Link et al., and Doherty et al.).

**SEPM Member Price: \$98.00**





*Cover photo: The Soufrière Hills volcano in December 2007 when the dome in the crater was at its highest recorded level. The ruins of Plymouth are in the foreground with the central area covered by lahar deposits emplaced since the 1997 eruption and burying those parts of the town not already buried in ash.*

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Geological Society of America

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# Tephrochronology of marine sediments around the Island of Montserrat, Lesser Antilles volcanic arc

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We acknowledge the valuable contributions of the other members of the scientific party on the JR123 cruise, May 2005: Lawrence Amy (Bristol), George Boudon (Paris), Christine Deplus (Paris), Emma Doyle (Bristol), Nick Fournier (Trinidad), Anne Le Friant (Paris), Jean-Claude Komorowski (Paris), Emily J. Lock (Plymouth), Carole Pudsey (British Antarctic Survey) and Graham Ryan (Montserrat Volcano Observatory).

## ABSTRACT

The recent history of the Soufrière Hills Volcano, Montserrat, Lesser Antilles volcanic arc, is reconstructed using data obtained from recently drilled submarine cores. Tephra layers in these cores preserve a record of the volcanic history of Montserrat back to ~250 ka on the basis of micropaleontology and stable isotope stratigraphy. Stratigraphic relationships identified in the cores collected in 2002 and 2005 document the fate of both pyroclastic flows entering the ocean to the east of Montserrat and carbonate-rich turbidites sourced from the carbonate platforms surrounding the islands of the Lesser Antilles. Using oxygen isotope stratigraphy, micropalaeontological analysis and Carbon-14 dating, it can be shown that three significant volcanic events, including the on-going eruption, have occurred over the last 12 ka. Preceding this was a time of volcanic quiescence, with three carbonate-rich turbidite events being documented in many of the cores. Our data suggest that these events occurred during Marine Isotope Stage 2, following the Last Glacial Maximum (LGM) and onset of post-glacial sea level rise.

## INTRODUCTION

The island of Montserrat lies in the Lesser Antilles volcanic arc that formed as a result of the subduction of the Atlantic Plate beneath the Caribbean Plate. Arc volcanism was initiated at 40 Ma (Bouysse *et al.* 1990). To the north of Dominica, the arc is divided into two groups of islands (Figure 1). The outer group is older, with thick carbonate platforms covering a volcanic basement. The inner group consists of volcanic rocks younger than 20 Ma and includes all the active volcanoes (Bouysse *et al.* 1990), including Montserrat.

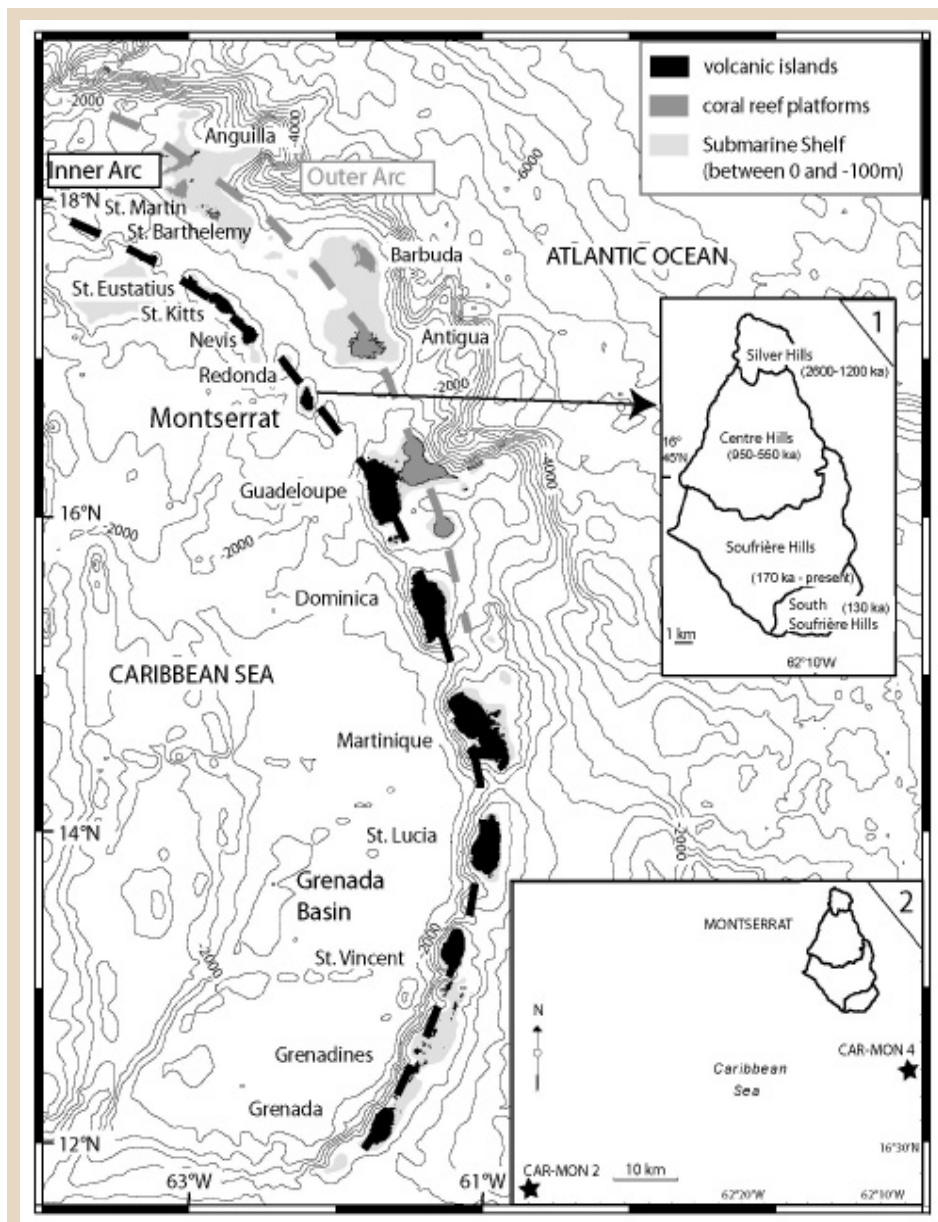
The island of Montserrat has a well-documented eruption history (Harford *et al.* 2002) based on dating of on-shore ash and other pyroclastic deposits. Andesitic rocks resulting from dome-forming eruptions dominate the geology with the island preserving remnants of lava domes, dome talus breccias, dome-collapse pyroclastic flow deposits, lahar and debris avalanche deposits (Harford *et al.* 2002;

Le Friant *et al.* 2004). Three volcanic centers have been identified: Silver Hills (2600 to 1200 ka), Centre Hills (at least c. 950 ka to c. 550 ka) and the South Soufrière Hills-Soufrière Hills complex (at least 174 ka to the present).

Prior to 1995 there had been no volcanic activity in recorded history and many non-geologists thought the volcano to be extinct. Earthquake swarms began in January 1992 and the eruptions began in July 1995. The first major eruption was on the 21st of August 1995 when Plymouth (the main town and centre of government) was blanketed in ash (the cloud of which caused 15 minutes of darkness). This was followed by dome growth in the crater during September 1995. Collapse of this dome and the formation of pyroclastic flows began in March 1996, and on the 17th September 1996 a series of dome collapses lead to the first magmatic explosion with an ash plume rising to 40,000 feet and ~600,000 tonnes of ash being deposited on the southern half of the island. Early in 1997 parts of Plymouth were buried and on the 1st July 1997 most of the town (now evacuated) was engulfed (Figure 2). In subsequent years the majority of the pyroclastic flows have travelled east into the Tar River Valley, burying the old airport. Since 1997 the dome has continued to grow and collapse (20th March 2000, 29th July 2001, 12th - 13th July 2003, 20th May 2006). After two years of continual dome-building activity the Soufrière Hills volcano produced the largest documented historic dome collapse for any volcano on the 12th - 13th July 2003. The collapse occurred over an eighteen hour period, yielding  $>210 \times 10^6$  m<sup>3</sup> of pyroclastic material which avalanched down the Tar River Valley and into the ocean (Trofimovs *et al.*, 2006, fig. 3). Since that eruption there was another large dome collapse on the 20th May 2006 (in less than one hour) which has been followed by the formation of a new, and even larger, dome (cover photo).

The Montserrat Volcano Observatory was established on 18th July 1995 and in January 2003 moved to a new purpose-built location. The Montserrat Volcano Observatory website [www.mvo.ms] provides a continuous record of the on-going eruption and a stunning picture gallery of the development of the volcano.





**Figure 1.** The geodynamic setting of Montserrat (West Indies). Contour interval is 250 m and 2000 m isolines are in bold. Volcanic islands are black and sub-aerial coral reef platforms dark grey. The < 100 m deep submarine shelves are light grey. The lower insert map shows the location of the CAR-MON 2 borehole.

Because almost 90% of the erupted material, ash and pyroclastic flows enter the surrounding ocean much of the research on the history of the volcano has switched from on-shore surveying to mapping of the ocean floor and coring of marine sediments.

## THE “CARAVAL” CRUISE (2002)

In February–March 2002 the “Caraval” cruise of the R.V. *L’Atalante* gathered marine survey data from the area adjacent to Montserrat and collected a number of cores. For our initial stratigraphical studies, core CAR-MON 2 (16° 27.699' N; 62° 38.077' W) was selected as it preserves the longest (575 cm) record and contains a number of

discrete ash-fall events within a pelagic carbonate succession. This core was sampled by taking a one centimetre wide quarter segment of the split core every five centimetres (except in the immediate vicinity of visible sedimentary events). Data from the CAR-MON 2 core are shown in Figure 3.

The samples collected for micropalaeontological investigation and stable isotope analysis were prepared at the University of Plymouth. At all stages in the processing, samples were soaked, washed and filtered using de-ionized water. This ensures that no dissolution of the delicate carbonate microfossils, particularly pteropods (holoplanktonic gastropods), occurred during preparation. Samples were washed on a 63 µm

stainless steel sieve. The <63 µm fraction was collected, dried and homogenized in an agate pestle and mortar to be used for stable isotope analysis. Samples for micropalaeontological analysis (>63 µm size fraction) were filtered, dried, weighed and stored. Counts of the foraminifera and the pteropods were undertaken on the >150 µm size fraction. The <150 µm size fraction was inspected for species content only.

The *Globorotalia menardii* complex (Figure 4) provides a record of climatically-induced migration events that can be used in the correlation of marine cores (see, for example, Reid *et al.* 1996, figs A1, A2). The *G. menardii* record (Figure 3) was established by counting a minimum of 300 planktic foraminifera in the >150 µm size fraction. The *G. menardii* zonal boundaries are identified at levels where the *G. menardii* component of the fauna drops below, or rises above, 1% of the total planktic foraminiferal fauna. The Z, Y, X, W and V zones are clearly delineated and are similar to those determined in core EN8 (16° 17.9' N; 62° 56.4' W) by Reid *et al.* (1996, fig. A2). The variations in the *G. menardii* population record a cyclical pattern that can be replicated in other cores. As *G. menardii* is normally more abundant in warm water, the distribution of this taxon records a number of warm/cool oscillations within MIS 5, a periodicity of ~8,000 years.

Stable isotope ( $\delta^{18}\text{O}$ ,  $\delta^{13}\text{C}$ ) analysis was performed at the NERC Isotope Geosciences Laboratory, British Geological Survey, Keyworth, and details of the equipment and procedures used are given in Le Friant *et al.* (2008). The homogenized <63 µm samples contain not only a range of calcareous nannofossils but include small/broken foraminifera, pteropod fragments, calcified dinoflagellates and other calcitic/aragonitic debris.

CAR-MON 2, located to the south-west of Montserrat, is the longest and most carbonate-rich of the boreholes recovered in 2002. By comparison to published data, the  $\delta^{18}\text{O}$  record (Figure 3) can be used to identify isotope ‘events’ down to Marine Isotopic Stage 8 (MIS 8.2), indicating that this core has a sediment record extending back to ~250,000 years b.p.. Using this  $\delta^{18}\text{O}$  record and the known ages of the various events and MIS boundaries, an age:depth curve has been constructed that allows our colleagues to document the changing activity and petrological character of the volcano through time (Le Friant *et al.*, 2008, fig. 6).

An interesting question that has yet to be



**Figure 2.** *The ruins of Plymouth Cathedral and the remains of the still active Soufrière Hills volcanic centre. This photograph was taken in May 2005 when access to the area was still possible during daylight hours. Barnaby Bear is not a resident of Montserrat but belongs to Montpelier Infants School in Plymouth (U.K.) and who went on the visit to Montserrat to help the children learn about volcanoes.*

answered is the effect of the ash falls on benthic and planktic organisms (see work by Hess & Kuhnt, 1996, on Mt Pinatubo). In December 2007, the R.R.S. *James Cook* (Cruise JC18) returned to the area to investigate both this issue and a range of other scientific objectives. Some of the cores recovered indicate that the major ash fall following the May 2006 eruption may have a 'kill layer' at its base in which much of the planktic fauna hit by the ash is now buried.

## INTERPRETATION AND DISCUSSION

Our on-shore/off-shore correlation (Le Friant *et al.* 2008) suggests that the Soufrière Hills and South Soufrière Hills magmatic system has been active in several discrete, intense pulses with much longer periods of either dormancy or a low-level of activity. We have observed that the critical marker bed of several basaltic scoria and ash layers (Figure 3, 270–330 cm) has also been identified as visible tephra layers in other cores. These tephra layers are correlated with the activity of the South Soufrière Hills volcano, that is constrained by several high quality age dates (Harford *et al.* 2002).

Our data define an eruptive history for the Soufrière Hills Volcano and the South Soufrière Hills Volcano extending back at least 250 ka. At least 14 eruptive periods have been recognised in the core CAR-MON 2. There is a good agreement between the on-land dome eruptions and the off-shore record, but new events have also been recognized from the marine data. Eight dome eruption periods have been identified from which several dome eruptions are new and have not yet been correlated with on-shore data. The three new dome eruptions have been identified at ~246 ka, 216–220 ka, and 43–45 ka. The absence of on-shore deposits can be explained by erosion but also by numerous flank-collapse events which occurred on the South Soufrière Hills- Soufrière Hills Volcano and which have destroyed some parts of the volcano (Le Friant *et al.* 2004).

## THE JR123 CRUISE

In May 2005 the R.R.S. *James Clark Ross* re-visited the Montserrat area, concentrating on the marine area to the east and south of the Tar River Valley. Over 50 vibrocores and a number of box cores were taken from a

range of locations. The thickness of tephra from the 12th–13th July 2003 eruption can be correlated (Figure 5) through the cores taken along the axis of the Bouillante-Montserrat Graben, although the final toe of the submarine flow was not sampled in 2005. Using the same borehole locations, an isopach plot of the cumulative thickness of the 1995–2003 Soufrière Hills deposits that have entered the sea via the Tar River Valley has been constructed (Trofimovs *et al.* 2006, fig. 3). These deposits clearly follow the submarine topography, especially adjacent to the two volcanic centres on the eastern side of the graben.

Each core recorded a number of events, both volcanogenic (turbidites formed through pyroclastic surges, and ash falls) and biogenic (calcareous turbidites formed as material has been shed off the nearby carbonate platforms) in origin. Through logging, grain size analysis, and component analysis these events have been fully documented and correlated throughout the cores (Figure 5). Primarily this dating has been undertaken using micropaleontology, high resolution oxygen isotope stratigraphy and a number of carbon-14 dates, as described for



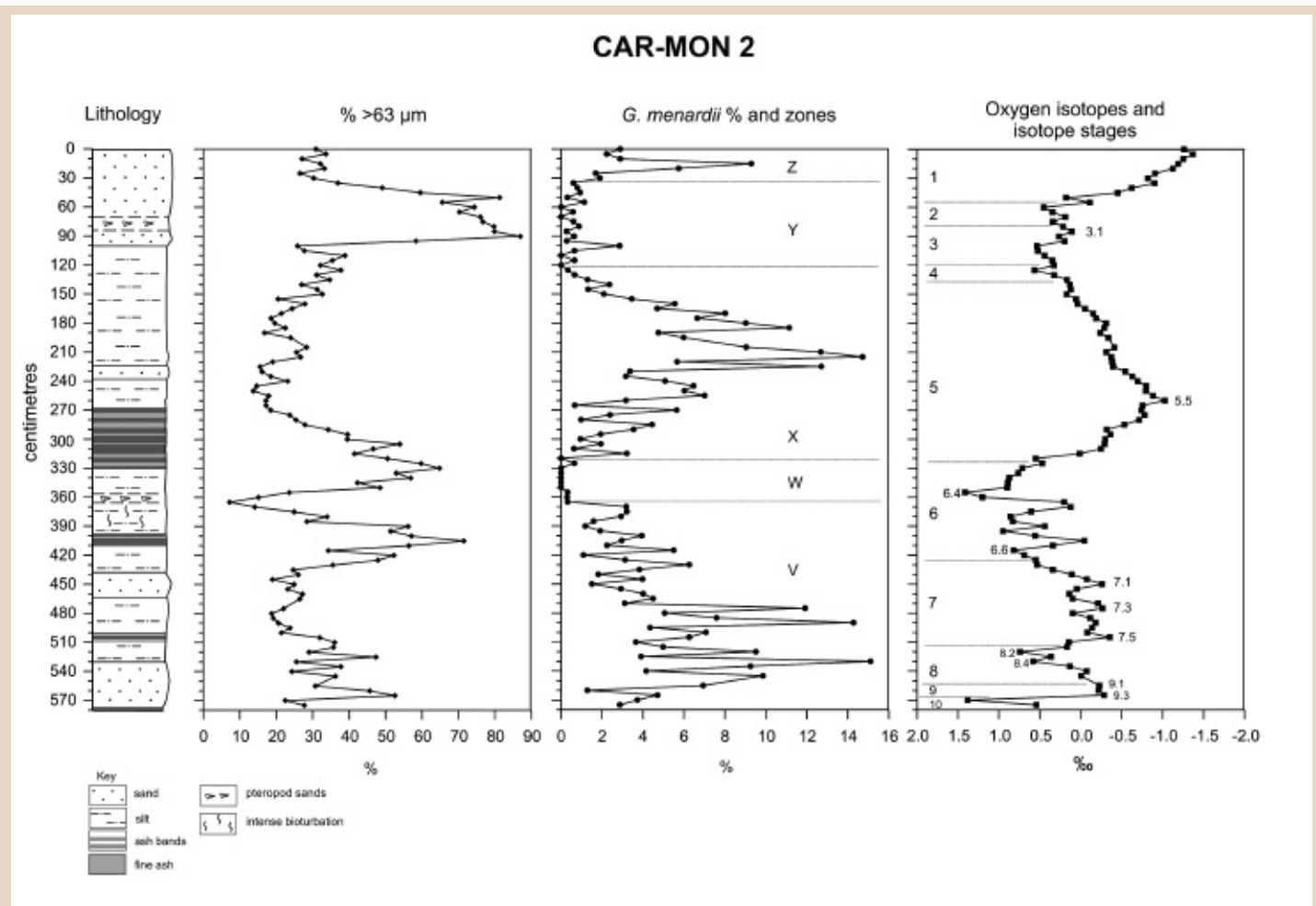


Figure 3. Sediment log, grain size chart,  $\delta^{18}\text{O}$  isotope record and *G. menardii* record for the CAR-MON 2 core.

the CAR-MON 2 core. These data have allowed us to constrain the ages of all these events and this work, once complete, will

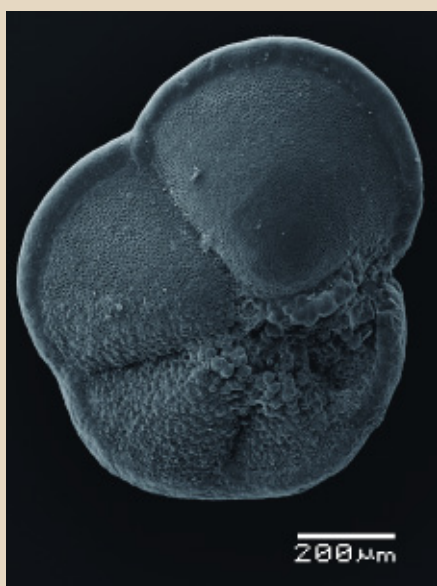


Figure 4. *Globorotalia menardii* s.l. typical of the specimens used in the construction of the V - Z zones shown in Figure 3.

provide a complete geochronology of the various events occurring around the volcanic island of Montserrat.

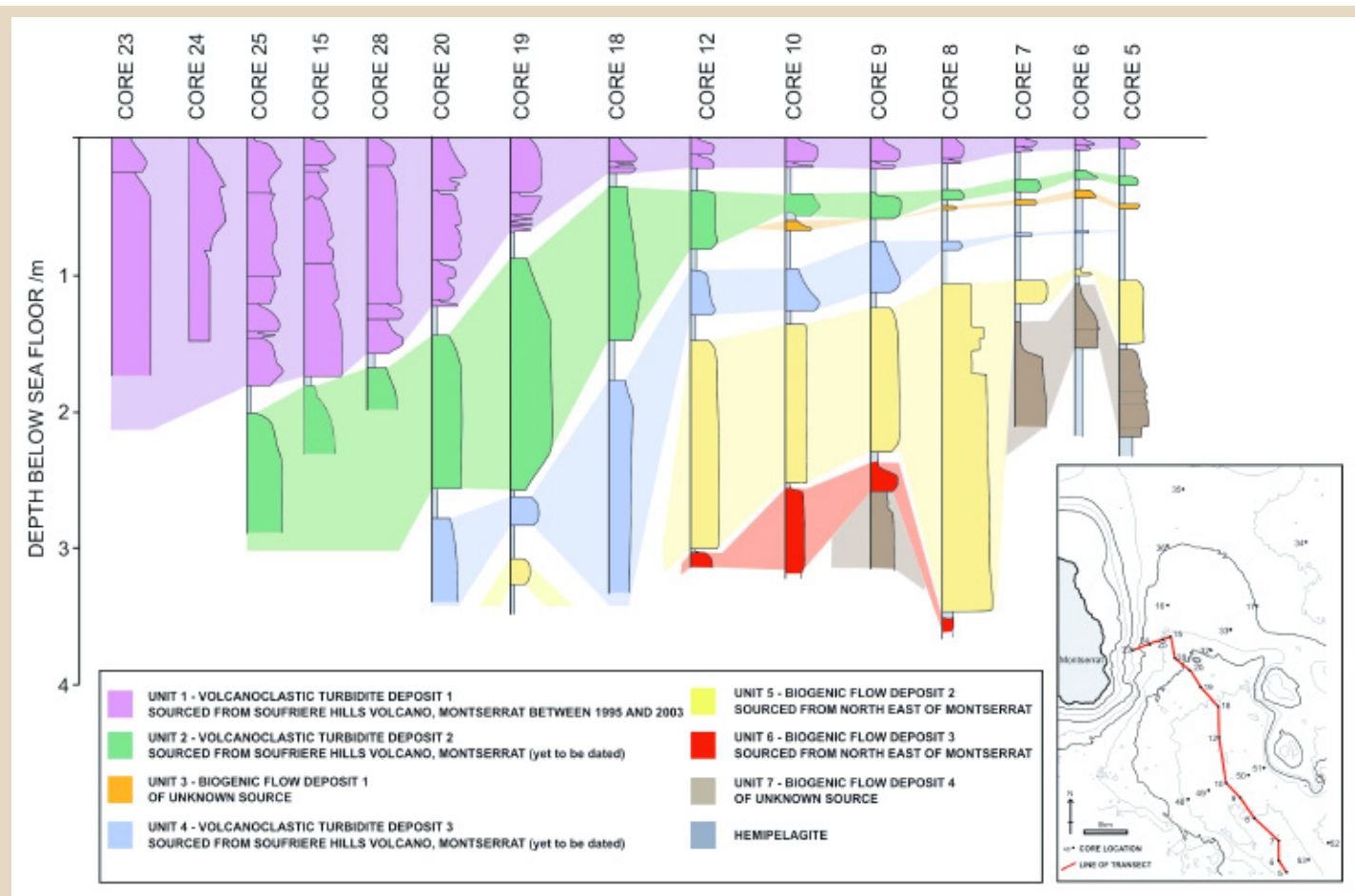
Data so far appear to indicate three periods of volcanic activity (including the recent phase) occurring over the last 12 Ka, during MIS 1. This activity was preceded by a period of volcanic quiescence. During this time three biogenic turbidites are observed and correlated within the cores, and have been dated to occur during MIS 2. This was a time of sea level lowstand this may have led to the generation of biogenic turbidites, as carbonate is known to have been shed from the platforms observed around the islands of the Lesser Antilles and elsewhere in the Caribbean Sea and Western Atlantic Ocean. Samples from these biogenic turbidites contain abundant coral fragments, bryozoans, gastropods and other shallow-water debris. In many samples abraded specimens of the benthic foraminiferid *Amphistegina* dominates the fauna indicating transport of sediment from environments more normally associated with 50-150 metres water depth. Work on the source of these turbidites is ongoing.

## SUMMARY

The eruptive history of the Soufrière Hills volcano, prior to its recent period of activity, was incompletely known from subaerial deposits that have been subjected to repeated destructive or erosional events. A multi-disciplinary study (micropaleontology, stable isotope stratigraphy, carbon-14 dating, igneous petrology and geochemistry) of recently drilled cores from the sea floor in the vicinity of Montserrat has shown that there has been intermittent, quite violent, activity separated by long periods of quiescence over the last 250 ka years.

## ACKNOWLEDGEMENTS

The JR123 cruise was supported by a NERC Research Grant (NER/A/S/2002/00963) to Sparks and Talling. RSJS acknowledges a Royal Society-Wolfson Merit Award. MBH, CWS and JKF acknowledge the support of a Research Grant (F/00 568/P) from The Leverhulme Trust.



**Figure 5. Correlation of cores along the axis of the Bouillante-Montserrat Graben.**

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### **Outcrops Revitalized: Tools, techniques and applications**

**June 22-28, 2008, Kilkee, Ireland**

Abstracts due March 15, 2008

Details at [www.sepm.org](http://www.sepm.org)

## SEPM

### **Cliniform Sedimentary Deposits: The processes producing them and the stratigraphy defining them**

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

Abstracts due March 31, 2008

Details at [www.sepm.org](http://www.sepm.org)

## Geological Society of London (GSL) and SEPM

### **Rifts Renaissance: Stretching the crust and extending exploration frontiers**

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

Abstracts due April 30, 2008

Please submit abstracts of 500 words or less to Kerri Deegan at the Geological Society of London  
[kerri.deegan@geolsoc.org.uk](mailto:kerri.deegan@geolsoc.org.uk). Details at [www.geolsoc.org.uk](http://www.geolsoc.org.uk)

## 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**

For details contact:

Paul Markwick ([pjm@getech.com](mailto:pjm@getech.com)), Roy Livermore ([roy@paleoworld.org.uk](mailto:roy@paleoworld.org.uk)) or  
Matthew Huber ([huberm@purdue.edu](mailto:huberm@purdue.edu))





## PRESIDENT'S COMMENTS

# Last Thoughts



Shortly after this is published, Dale Leckie will be the new President of SEPMP. Because this is my last President's Comments column, I want to take the opportunity to expand on several items raised in the *Sedimentary Record* over my past year as president, particularly the cost of membership and the ability of each member to give back to SEPMP in some way.

Both of these items relate, in part, to SEPMP publications, particularly to the journals *PALAIOS* and *Journal of Sedimentary Research*. One of SEPMP's key missions is the dissemination of scientific research, and the reputation of our journals is a major reason that the society is held in high regard by sedimentary geologists around the globe. Our standing as a leader in promoting sedimentary geology depends on maintaining excellent journals. At the same time, the Society must manage the costs and workload associated with *PALAIOS* and *JSR*.

Concerning cost, some members have complained about the new print fee for the journals. In the most recent *Sedimentary Record*, I noted that Membership in 2008 continues to cost only \$85 and that, for that fee, members receive online access to the journal of their choice. A print copy of either

journal costs an additional \$25 per journal in 2008, and the print fee will gradually increase up to \$50 over the next two years. SEPMP is committed to serving all its members, and we realize that some of you strongly prefer print copies of the journals. Unlike some other journals, SEPMP does not plan to abandon print copies for those members who truly want them; however, we can only afford to produce print copies if the true cost is covered by those members.

As regards giving back to the society, you and other members are critical for ensuring the quality of SEPMP journals. Both journals depend on peer review of manuscripts before publication, and as the *JSR* editors pointed out a year ago - peer review only works if peers review!! Some members serve as Associate Editors of the Journals and others help by reviewing manuscripts. We thank both groups for your efforts. But the editors have found it increasingly difficult to find people willing to help with the important review process.

Everyone is busy these days, but, if *JSR* or *PALAIOS* asks if you are willing to review a manuscript, please consider that request seriously. If you are not able to do the review, please let the editors know promptly so that they can keep the review process moving quickly. If you can suggest other qualified reviewers, especially young colleagues, please do so. This is one of the best ways to involve young colleagues in service to a professional society. Finally, if you agree to review a manuscript, please try and complete it in a timely manner. The biggest problem faced by the journals is speeding up the initial review period.

Also in the most recent *Sedimentary Record*, I urged members to help with

SEPMP awards. I am happy to report that Headquarters received a number of nominations for the Pettijohn Medal at the beginning of 2008. Thank you to each of you who has spent time putting together a nomination package or writing a letter of support for a particular nominee. And, please, remember that nominations can be made at any time during the year. Other SEPMP awards would still benefit if members consider submitting names and helping with the actual nominations. Take a few minutes to check the online nomination form at: <http://www.sepm.org/awards/nominationform.htm> or contact Michele McSpadden at Headquarters ([mmcspadden@sepm.org](mailto:mmcspadden@sepm.org)). As a society, it is essential that we promote sedimentary geology by acknowledging the leaders and outstanding individuals in our field.

Finally, I want to thank the many SEPMP people with whom I have had the privilege of working this year. I have enjoyed working with the staff at Headquarters, including Theresa Scott, Bob Clarke, Michele McSpadden, and Edythe Ellis; Executive Director Howard Harper; members of Council and members of the Headquarters and Business Committee; and all the other volunteers who ensure that SEPMP is a vigorous and well-organized society. Thank you for your hard work. I am looking forward to the Annual AAPG/SEPMP meeting in San Antonio. The annual meeting provides another opportunity for members to contribute to the society, and I thank the many SEPMP members helping to ensure the success of that meeting. I hope to see many of you there.

**Mary Kraus, President**

# Sedimentary Geology Division

GEOLOGICAL SOCIETY OF AMERICA

## GREETINGS SEPM AND GSA SEDIMENTARY GEOLOGY DIVISION MEMBERS!

Welcome to the new portal for news and information for the GSA Sedimentary Geology Division (SGD). Last year, the SGD executive committee requested that SGD and SEPM become more closely aligned so as to create a more unified voice for sedimentary geology, a proposal which both the GSA and SEPM councils approved! One of the many benefits of this closer association is to provide SGD news through SEPM's quarterly news journal, the *Sedimentary Record*. Initially, we will contribute information about GSA SGD events, activities, and initiatives twice a year to the *Sedimentary Record*. Other items of interest to the sedimentary geology community, such as new research opportunities, collaborations, or publications, may also be delivered through the SGD news section of the *Sedimentary Record*. The whole idea of this cooperation is to create a more united, singular voice for information and ideas of interest to the sedimentary geology community.

Given the hot job market, broad employment application of the discipline, and the new conceptual and technical developments, it is a good time to be a sedimentary geologist! These conditions also have boded well for SGD membership, which is up 10% over 2006. The increasing demand for sedimentary geologists and job opportunities in multiple areas of industry, government, and academia have, however, placed strain on the ability of academic institutions to keep pace with demand for new, well-trained graduates. This issue was dealt with in detail at a SGD- and SEPM-sponsored Seds and Suds forum at the 2007 GSA national meeting, a summary of which is presented below from John Holbrook. Other events of relevance to sedimentary geologists at the 2007 GSA meeting are also presented below along with a call for participation at the 2008 AAPG meeting in San Antonio this spring and the joint Geological Society of America, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, and Gulf Coast Association of Geological Societies in Houston this fall.

## ANNUAL MEETING SUMMARY

The 2007 GSA National Meeting in Denver was busy for the SGD as we sponsored or co-sponsored 16 topical sessions, as well as hosting our usual clastics, carbonate, and stratigraphy discipline sessions. The subject matter of the topical sessions ranged from impact craters and Mars to spring deposits and paleoclimates, including a mix of more typical sedimentary topics, such as gas shales and trace fossils. SGD also co-sponsored two field trips in conjunction with the Denver meeting, one pre-meeting trip on sedimentology and sequence stratigraphy of fluvio-deltaic, shoreface and shelf deposits of the Book Cliffs, Eastern Utah, and the other a day trip during and following the meeting of the Front Range between Golden and Morrison, Colorado, in which structural, volcanic, and economic geology and paleontology were examined. All of the sponsored field trips were full or nearly so.



Fig. 1 Overlook of the distal Cretaceous Castlegate Sandstone and overlying strata, north of Thompson Springs, Utah (Photo courtesy of Peter Flaig)

The Book Cliffs trip was led by Simon Pattison and Huw Williams, both of whom were extremely knowledgeable of the area and current stratigraphic studies. The emphasis of the trip was to examine the sedimentary facies, facies architecture, and sequence stratigraphic relationships of the Cretaceous seaway shoreline so as to address the nature of sequence boundaries and associated deposits, three-dimensional stratigraphic relationships from coastal plain to shelf environments, and cycle stacking patterns. Their presentation in the field and ensuing discussions challenged many aspects of seismic-based sequence stratigraphy and clarified the need for outcrop-based analysis in understanding sequence boundaries and stacking patterns.





Fig. 2 Theropod footprints in Dakota Group at Dinosaur Ridge, north of Morrison, Colorado (Photo courtesy of Chris Carroll).

The Front Range field trip was run twice, once on Sunday during the meeting and then again on Thursday after the meeting, by Chris Carroll, Norb Cygan, Tim Connors, and Harald Drewes. The leaders gave an exciting tour of a variety of exposures along the Front Range, emphasizing the Great Unconformity of Precambrian rocks overlain by Pennsylvanian Fountain Formation, Mesozoic rocks bustling at the seams with dinosaur fossils and trackways, and early Tertiary-age lava flows. The trip clearly demonstrated the wealth of geologic history within a stone's throw of downtown Denver.

During the meeting, the SGD sponsored a student poster session titled, "Explorations in Sedimentary Geology: Student Research." Nineteen high-quality posters were submitted by student authors, of which four were deemed superior by a group of 4 judges. The student authors of the four selected posters were given a monetary award (up to \$400) at the SGD business meeting and award reception.

The Joint Sedimentary Geology Division and Limnogeology Division Meeting welcomed 70 or so attendees, most of whom enjoyed a free beverage of their choice and munchies (many thanks again SEPM!), on Monday evening. After the Limnogeology business meeting and announcement of the Kerry Kelts Research award winners, the Sedimentary Geology Division events transpired. SGD Chair Mike Pope announced the vital signs for the division, which are all positive, and quickly moved to the awards. Along with the four student poster awards, the SGD was able to offer four Student Travel awards, and the Student Research Award, which was given to Dolores van der Kolk for her study of the "Sedimentology, Stratigraphy, and Paleoenvironmental Reconstruction of the Pebble Shale Unit within the Northeast Brooks Range, Alaska." As if that wasn't enough, we raffled off several SEPM publications and some cool field gear to students in attendance at the reception. Clearly, it pays to be a student member and attend the SGD business meeting and awards reception!



Dolores van der Kolk measuring section in the Cretaceous Pebble Shale Unit, north Brook Range, Alaska. (Photo courtesy of Peter Faig)

The Laurence L. Sloss Award was given to Mike Arthur for his many contributions in paleo-oceanography, paleoclimate, and sedimentary geochemistry as well as dedication to teaching and service to the geological community. Citationist, Brad Sageman gave a brief review of the highlights of Mike's career so far, then rather than read the citation response, Dr. Arthur serenaded the audience with his "Ode to Field Geology," accompanied by his trusty mandolin. The performance added a light and warm touch to the evening. Many thanks to Mike Pope for serving as the Sedimentary Geology Division chair during the past year. I also want to thank John Holbrook, Paul Link, and our JTPC representatives, Linda Kah and Julie Bartley, for all of their help in making the Sedimentary Geology Division sessions and events a success. All of us on the Management board thank Barb Echohawk for her administrative support at GSA.



Fig. 3 Professor Mike Arthur entertaining the audience at the GSA SGD Awards Reception. (Photo courtesy of Peter Faig)

Dan Larsen, 2008-2009 GSA SGD Chair  
<dlarsen@memphis.edu>

## 2007 GSA SEDS AND SUDS ICEBREAKER AND FORUM: A POPULAR AND LIVELY EVENT

Over 70 professionals and students attended the second annual "Seds and Suds" event at the Annual GSA Meeting in Denver, sponsored jointly by GSA-SGD, SEPM, and NCED. Participants enjoyed an icebreaker lasting just over an hour and a half where they had the opportunity to catch up with fellow members of the sedimentary geology community over refreshments provided by the generous, and much-appreciated, sponsorship of NEXEN, Inc. This was followed by an open forum for which 45 participants remained. The subject of the forum this year was, "Sedimentary education: are we properly preparing the next generation." With a diverse attendance from various industries, granting agencies, and universities, this discussion proved to be heated at times, reflecting strong and varied opinions on this and related topics. With the new alignment between SEPM and GSA Sedimentary Geology Division, it only seems fitting that a summary of this annual forum discussion be published here now and in the future.

The forum discussion was moderated by four panelists: Heather MacDonald, College of William and Mary; Tom Hickson, University of St. Thomas; Dale Leckie, NEXEN, Inc.; and Major Chris Gellasch, U.S. Army, Chief of Environmental Health Engineering Division. Each began the discussion with a short presentation. Heather and Tom discussed their ongoing research efforts in improving sedimentary education techniques. After posing some key questions regarding the needs and goals of sedimentary education, they discussed results of the recent NSF-sponsored workshop in Salt Lake City on this topic. Some priorities voiced by the faculty of sedimentary geology attending this workshop included: (1) readily available and sharable resources to help faculty improve teaching materials and techniques, (2) teaching must include the fundamentals of the field, but not necessarily be concentrated on details, (3) more quantitative and physical modeling work should be incorporated into curricula, and (4) teaching should provide examples of applying sedimentary geology to actual problems. They closed with an open request for exchange of ideas on sedimentary education from the community and keyed into some growing educational resources available on line. To add input to the discussion or to find these resources, visit their website (<http://serc.carleton.edu/NAGTWorkshops/sedimentary/index.html>).

Dale Leckie followed and discussed the needs of the resource industries, with particular attention to the daunting and immediate needs of the petroleum industry. Dale began by stressing that investment of hundreds of millions to billions of dollars in infrastructure are common place in the petroleum and mining industries, and that these investments are wasted if the geology upon which they are based is incorrect. Sedimentary geology is still one of the pivotal sciences expected from geologists serving these industries. Dale stressed some of the skills needed for

resource-based industry: (1) a broad-based education in geology and Earth systems, (2) field and subsurface mapping abilities, and (3) the ability to interpret geophysical data. Though Canadian companies commonly take B.S. students, he stressed the preference in the U.S. and Europe for students with graduate degrees. As well, he stressed the clear world-wide shortage of people with good training in fundamental geological skills needed for the resource industries, and that common wisdom is that these shortages will continue for years to decade to come.

Chris Gellasch then explained his experience as a traditionally trained sedimentologist working in the ever-evolving environmental field. Initially working with hydrology in the U.S. Army, he helped with soil and water contaminant clean up at industrial sites in Afghanistan and taught environmental geology for West Point. As head of the environmental division, he now oversees various hydrologic projects that are commonly executed by non-geologists. He is now deeply involved in the emerging area of medical geology, particularly in identifying and mitigating environmental threats to troop health. Chris stressed throughout his discussion that, though most all of what he does may not be traditionally considered sedimentology, his knowledge of sediments has served him well and underpins everything he does. He notes that the key to understanding the root causes of environmental health issues is in understanding the materials in the ambient soil and sediment, and particularly how contaminants may be mobilized in soil, water, and atmospheric media.

The discussion that followed the panel presentation ranged widely, and reflected the concerns of various individuals representing industry and academia. Two themes of the discussion, however, were recurrent. First, industry still focuses on the need for students with fundamental skills in geology (e.g., mapping and field observations, basic understanding of rocks and sediments, techniques in stratigraphy and paleontology, etc.). The need for students to develop problem-solving ability is also critical. Beyond this basic foundation, students need to be prepared to adapt to a highly diverse work experience over the course of their career. This was summed up well by Ray Ferrell who began the discussion by pointing out how some common paradigms emerge and change, and some (e.g., sequence stratigraphy, quantitative basin modeling, etc.) did not even exist when he learned sedimentology. The foundations in critical thinking and fundamental skills/technology learned by Dr. Ferrell were linked to later experience, and are now key to an education that has lasted a career. Second, it is apparent that the group felt that the increased need for geologists in industry has clearly not yet been met by the needed increase in training resources at the university level.

**The call is open for suggestions for future discussion topics at Seds and Suds. If you have a topic you feel fits this bill, please contact John Holbrook at [holbrook@uta.edu](mailto:holbrook@uta.edu). We also welcome sponsors for the next event at GSA in Houston.**

*John Holbrook, 2008-2009 GSA SGD Vice Chair*  
<[Holbrook@uta.edu](mailto:Holbrook@uta.edu)>



## A CALL FOR PARTICIPATION IN 2008 MEETINGS AND CONFERENCES

2008 portends to be another exciting year for meetings and activities in sedimentary geology. The AAPG/SEPM Annual meeting will be in San Antonio, Texas, this year on April 20-23. The themes reflect a broad spectrum of interests to the energy field, ranging from play development to global climate change and alternative energy. In addition to this broad range of topics, 25+ field trips and short courses will be offered. SEPM has two field conferences scheduled for 2008, one during June in Ireland on outcrop methods and techniques, and the other during August in Wyoming on clinoforms processes, geometry, and scale.

The annual GSA meeting will be held jointly with four other organizations in Houston, Texas, on October 5-9. Holding the meeting jointly with American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America offers great opportunity to emphasize the links between sedimentary and soil systems. SGD plans to sponsor or co-sponsor several topical sessions and field trips in which these linkages are explored. The meeting is also held jointly with that of the Gulf Coast Association of Geological Societies, so this is a great opportunity to renew and expand ties with colleagues investigating Gulf Coast sedimentary systems.

**Whatever your interests in sedimentary geology, please plan on attending one or more of these meetings and events, and help to foster growth in our science!**

## SGD PERSONNEL AND COMMITTEE ASSIGNMENTS FOR THE 2007-2008 YEAR.

- Daniel Larsen is the Chair.
- John Holbrook is the Vice-Chair.
- Paul Link is the Secretary/Treasurer.
- The current Joint Technical Program Committee (JTPC) representatives for SGD are Troy Rasbury, Mike Pope, and Julie Bartley.
- Becky Dorsey is the web manager.
- The Sloss Award Committee comprises: Mike Arthur, Brad Sageman, Teresa Jordan, Gerald Friedman, Tom Hickson, and Bob Garrison; the chair position has yet to be decided at this time.

### DIRECTOR'S CHAIR

## The Digital Journey Continues

SEPM has been carefully moving towards making all of its publications available in digital format. Both technical journals, *Journal of Sedimentary Research* and *PALAIOS* and *The Sedimentary Record* are online for members, including the archives.

With respect to SEPM books and especially our well respected Special Publications Series (the red books), we have been digitizing the out-of-print books only a few at time. So far we

have only nine SPs on CD but we are now working on a project to digitize the rest of the SEPM Special Publications from SP #1 on so that they will be available on CD/DVD and at some time online as well. Please look for more updates on this project on the website.

I have a request of the membership with regards to JSR online. When it was originally digitized, the technology used in the pre-1997 articles,

resulted in some poor digital images for photos and in some cases, where the articles are very large, only the first half of the article is actually online. Unfortunately, these two types of errors are scattered across the years, so if you run into either situation please let me know and we will get it corrected as soon as possible.

**Howard Harper**  
*Executive Director*  
[hharper@sepm.org](mailto:hharper@sepm.org)



# SEPM ACTIVITIES AT THE SAN ANTONIO ANNUAL MEETING

<b>Sunday, April 20:</b>	<b>SEPM Council Meeting</b>	<b>8:00 am-5:00 pm</b>
	<b>Exhibit Ice Breaker (Convention Ctr)</b>	<b>5:00 pm-7:30 pm</b>
<b>Monday, April 21:</b>	<b>AAPG/SEPM Student Reception</b>	<b>6:00 pm-9:00 pm</b>
	<b>SEPM Research Groups</b>	<b>7:00 pm-10:00 pm</b>
<b>Tuesday, April 22:</b>	<b>Luncheon &amp; Business Mtg (by ticket)</b>	<b>11:30 am-1:30 pm</b>
	<b>Foundation Reception (by invitation)</b>	<b>6:00 pm-7:00 pm</b>
	<b>President's Reception &amp; Awards Ceremony</b>	<b>7:00 pm-9:00 pm</b>

## A SPECIAL THANKS TO THE SAN ANTONIO SEPM ANNUAL MEETING ORGANIZING COMMITTEE

Janok Bhattacharya - SEPM Vice Chair  
John Holbrook - SEPM Oral Sessions Chair  
Beverly DeJarnett - SEPM Poster Sessions Chair  
Stephen Ruppel - SEPM Field Trip and Short Course Chair  
Mike Nault - SEPM Awards Chair

**Come by and visit the  
SEPM Exhibit Booth  
at the  
Henry B. Gonzalez  
Convention Center  
Booth #3007**

## THANKS TO ALL OF THE SEPM ANNUAL MEETING SPONSORS

ConocoPhillips • ExxonMobil • Shell E & P • Chevron • Nexen Inc.  
Jackson School of Geosciences, The University of Texas at Austin • EBY Petrography & Consulting Inc.

## SHORT COURSES

- #3 Seismic Expression of Structural Styles: A Modeling Approach - Martha O. Withjack (Rutgers Univ.) and Rolf Ackermann (Landmark/Halliburton)
- #9 Sequence Stratigraphy for Graduate Students - Vitor Abreu and Jack Neal (ExxonMobil) There are 5 slots for professionals!
- #10 3-D Seismic Interpretation for Geologists - Bruce Hart (McGill Univ.)
- #11 Core Workshop on Developing Models and Analogs for Isolated Carbonate Platforms - Holocene and Pleistocene Carbonates of Caicos Platform, British West Indies - William A. Morgan (ConocoPhillips) and Paul M. (Mitch) Harris (Chevron)
- #12 Siliciclastic Shelf Margins Revisited - Ron Steel, Andy Petter, and Cornel Olariu (Jackson School of Geosciences, The Univ. of Texas-Austin)

## FIELD TRIPS

- #2 Lower Cretaceous Carbonate Geology of the Edwards Plateau, San Antonio Area - Lowell Waite (Pioneer Nat Res), David Eby (EBY Petrography), Richard Koepnick (Consultant) and Robert T. Clarke (Consultant)
- #4 Central Belize Mixed Margins: Long-lived Isolated Carbonate Platforms versus Young Barrier Reef and Atolls - André Droxler (Rice Univ.), Eberhard Gischler (Johann Wolfgang Goethe Univ.) and Gregor Eberli (RSMAS-MGG, Univ. of Miami)
- #5 Geo-environments of Mustang and North Padre Islands, Texas: Status, Trends and Environmental Management of a Barrier-Island System - James Gibeaut (Harte Res Inst), Thomas Tremblay and Tiffany Hepner (BEG, Jackson School of Geosciences, The Univ. of Texas-Austin)
- #6 Barnett, Woodford and Related Mudrock Successions in Texas Cores, and Outcrops - Stephen Ruppel and Robert Loucks (BEG, Jackson School of Geosciences, The Univ. of Texas-Austin)
- #11 Comanchean Carbonate Shelf Margin: Unconventional Play Concepts - Robert Scott (Univ. of Tulsa), Lowell Waite (Pioneer Nat Res), Charlie Kerans (Jackson School of Geosciences, The Univ. of Texas-Austin)
- #12 Carboniferous Mound Architecture within a Sequence Stratigraphic Framework: Virgilian Holder Formation and Mississippian Lake Valley Formation, Sacramento Mountains, New Mexico - Xavier Janson (BEG, Jackson School of Geosciences, The Univ. of Texas-Austin) and Steve Bachtel (ConocoPhillips)