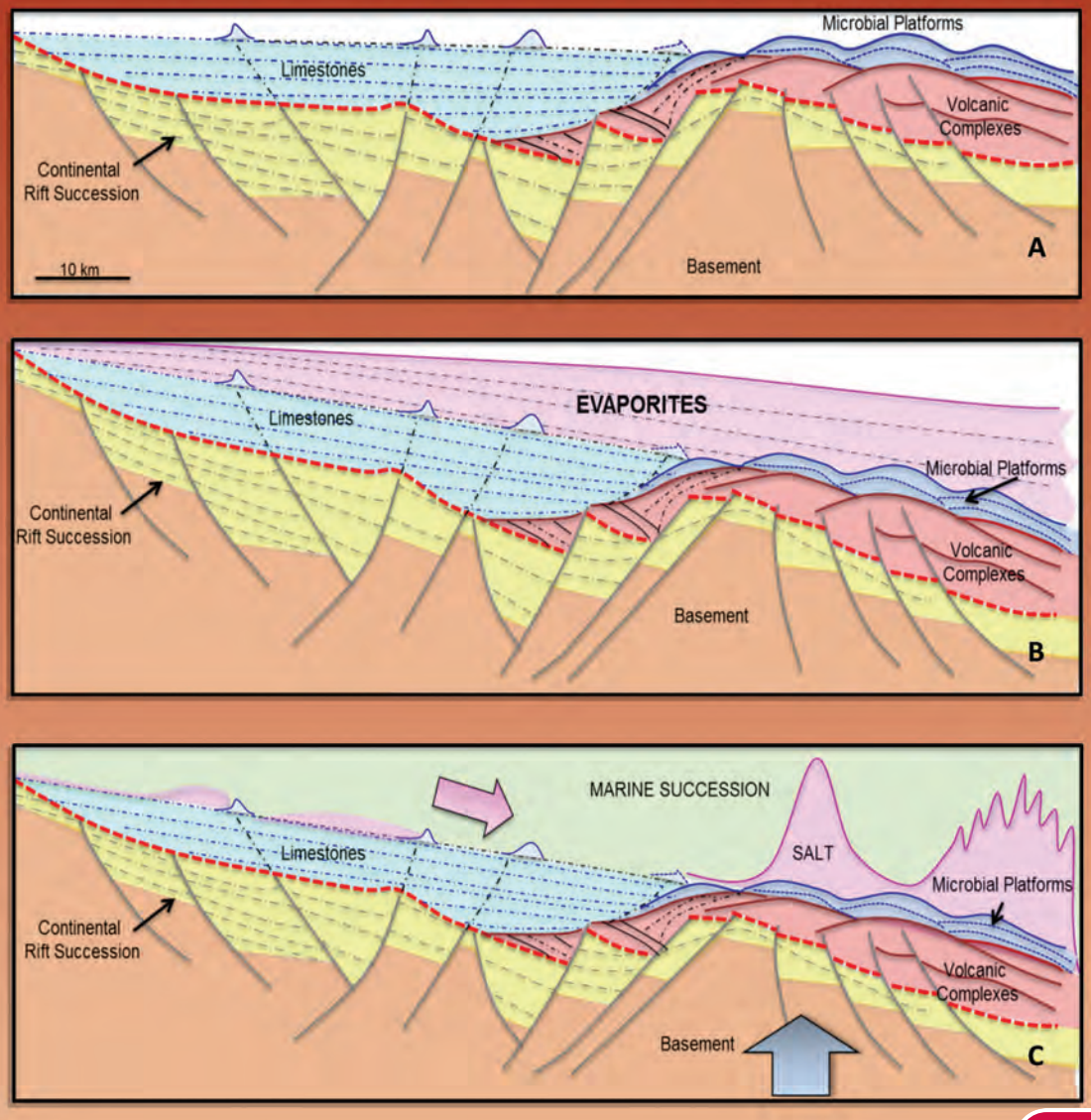
doi: 10.2110/sedred.2017.1
Volume 15, No. 1, March 2017

# The SEDIMENTARY Record

A publication of SEPM Society for Sedimentary Geology
with the Sedimentary Geology Division of GSA






**INSIDE:** EXPLORATION OPPORTUNITIES IN THE PRE-SALT PLAY, DEEPWATER CAMPOS BASIN, BRAZIL

PLUS: PRESIDENT'S COMMENTS, SGD NEWS, OUTSTANDING PAPERS, NEW SEPM COUNCIL MEMBERS, SEPM ACTIVITIES AT ACE - HOUSTON

1926 SEPM Society for Sedimentary Geology

# SEPM BOOKSTORE


**Concepts in Sedimentology and Paleontology 12**

## Mudstone Primer: Lithofacies Variations, Diagnostic Criteria, and Sedimentologic–Stratigraphic Implications at Lamina to Bedset Scales

*By: Remus Lazar, Kevin M. Bohacs, Juergen Schieber, Joe Macquaker, and Timothy Demko*

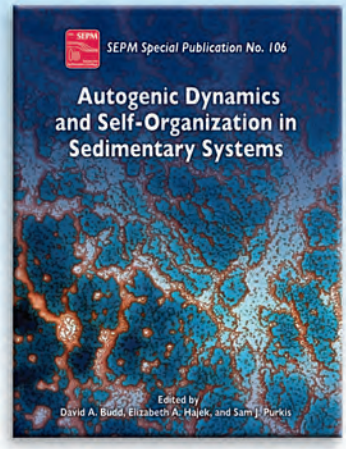
More than two-thirds of the sedimentary record is composed of rocks dominated by grains smaller than 62.5 micrometers. These fine-grained sedimentary rocks serve as sources, reservoirs, and seals of hydrocarbons, influence the flow of groundwater, and can be rich in metals. These rocks have long been mined for clues into the past global carbon, oxygen, sulfur, and silica cycles, and associated climate and oceanography. These rocks are heterogeneous at many scales and formed via a range of depositional processes. Recent developments in drilling and completion technologies have unlocked significant hydrocarbon reserves in fine-grained sedimentary rocks and have triggered an explosion of interest in the sedimentology, stratigraphy, and diagenesis of these rocks. This Mudstone Primer covers this variability to better characterization and interpretation of mudstones. Definitions of key terms and a naming scheme for mudstones are provided followed with practical steps for studying mudstones in thin sections. Additional guidelines and a set of tools that facilitate consistent, repeatable, and efficient (time wise) description and capture of mudstone variability at thin section, core, and outcrop scale are included in seven appendices. This Mudstone Primer includes hundreds of Paleozoic to Tertiary examples of physical, biological, and chemical features that illustrate mudstone heterogeneity at lamina to bedset scales. The authors hope that individual workers will take the provided examples and interpretations and use them to enhance their own investigation strategies.

**Catalog #85012 • Spiral Bound copy - SEPM Member Price: $57.00 • Hard Cover copy - SEPM Member Price: $69.00**

**Special Publication #106**

## Autogenic Dynamics and Self-Organization in Sedimentary Systems

*Edited by: David Budd, Elizabeth Hajek, and Sam Purkis*




Autogenic dynamics and self-organization in sedimentary systems are increasingly viewed as significant and important processes that drive erosion, sediment transport, and sediment accumulation across the Earth's surface. These internal dynamics can dramatically modulate the formation of the stratigraphic record, form biologically constructed depositional packages, affect ecological patterning in time and space, and impact aspects of geochemical sedimentation and diagenesis. The notion that autogenic processes are local phenomena of short duration and distance is now recognized as false. Understanding autogenic dynamics in sedimentary systems is thus essential for deciphering the morphodynamics of moderns sedimentary systems, accurately reconstructing Earth history, and predicting the spatial and temporal distribution of sedimentary and paleobiologic features in the stratigraphic record. The thirteen papers in this volume present exciting new ideas and research related to autogenic dynamics and self-organization in sedimentology, stratigraphy, ecology, paleobiology, sedimentary geochemistry, and diagenesis. Five papers summarize the current state of thinking about autogenic processes and products in fluvial-deltaic, eolian, and carbonate depositional systems, and in paleobiologic and geochemical contexts. A second group of papers provide perspectives derived from numerical modeling and laboratory experiments. The final section consists of field studies that explore autogenic processes and autogenically modulated stratigraphy in five case studies covering modern and ancient fluvial, deltaic, and shelf settings. This SP should stimulate further research as to how self-organization might promote a better understanding of the sedimentary record.

**Available at the SEPM Bookstore soon!**

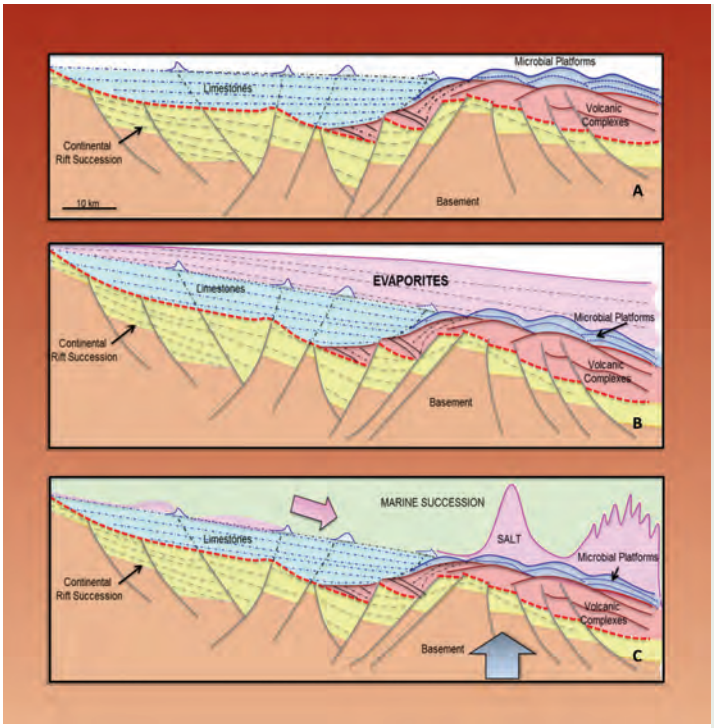
## New Books Coming Soon!

***New Advances in Devonian Carbonates: Outcrop Analogs, Reservoirs, and Chronostratigraphy****,
edited by Ted Playton, Charles Kerans, and John Weissenberger

***Latitudinal Controls on Stratigraphic Models and Sedimentary Concepts (joint volume with AAPG)****,
edited by Carmen Fraticelli, Allard Martinius, John Suter, and Paul Markwick

***Characterization and Modeling of Carbonates - Mountjoy Symposium 1****,
edited by Alex J. MacNeil, Jeff Lonnee, and Rachel Wood

As papers are finalized, they will be officially published to the SEPM Online First webpage.
SEPM Members will be able to view papers for free at the website. Pay-per-download is also available
https://sepm.org/OnlineFirst.aspx
*Papers from these volumes are currently posted at Online First.




***Cover image: Evolution Elena Kay Complex of leas and prospects. A: microbial deposition in association with hydrothermal circulation and volcanism; B: main evaporitic succession deposition; C: Late tilting and halokinetic flows (pink arrow) and inversion/uplift processes (gray arrow) delineating the final geometric configuration of the Elena Kay Complex.***

# CONTENTS



The Sedimentary Record (ISSN 1543-8740) is published quarterly by the Society for Sedimentary Geology with offices at 4111 S. Darlington, Suite 100, Tulsa , OK 74135-6373, USA.





www.sepm.org

# Exploration Opportunities in the Pre-Salt Play, Deepwater Campos Basin, Brazil

**Senira Kattah, PGS**

*Paper submitted in February-2017 to SEPM for publication on their Sedimentary Record magazine*


## ABSTRACT

Extensive acreage over the pre-salt hydrocarbon play in Brazil remains unexplored or underexplored with several conceptual models yet to be tested. Pre-Salt acreage discussed here includes exploration opportunities within the framework of the forthcoming 2017 ANP License Rounds.

Based on seismic interpretation of 3D PSDM surveys in the deepwater Campos Basin, we have identified several exploration trends and very large drilling opportunities in the sedimentary succession located immediately beneath the salt (totally 1,000 to 1,500 square kilometers of combined 4-way closures). As per analogies to other Brazilian pre-salt discoveries, these potential hydrocarbon accumulations are hosted by carbonate and siliceous microbialites. Sesmic facies analysis and external geometries indicates that several reservoir facies and facies trend belts could be encountered.

Large outboard microbial platforms nucleated on top of volcanic complexes could introduce a new, high-risk frontier play that can consist of very large 4-way closures just beneath the main evaporitic succession in distal segments of the Campos Basin. Besides reservoir presence/quality, exploration risks for the play in this area would be related to hydrocarbon generation and migration. As with other microbial limestone accumulations, there is a potential for a self-sourced system to mitigate this risk.


## INTRODUCTION

The discovery of the Lula Field by Petrobras and partners in 2006 opened a new E&P frontier in Brazil, the Barremian/Aptian pre-salt play in the offshore Santos and Campos basins. Several multi-billion-barrels discoveries have been made in carbonate reservoirs in the pre-salt sequences of these two producing Brazilian basins and their African counterparts. These recent Santos and Campos basin discoveries, after appraisal, are expected to add at least 10 Bboe to Brazilian proved reserves by 2022 (from ANP, 2014).

The Brazilian pre-salt play consists of rift/sag-sourced oils, accumulated in Aptian reservoirs (microbialites) in structural closures or paleo-topographic/depositional highs just beneath the salt (Figure 1). The overlying Aptian evaporites provide the sealing unit. In addition to the microbialites, deeper coquina reservoirs have become important exploration targets in the pre-salt succession of Campos and Santos basins as proven by successful well tests on the Búzios (previously referred to as Franco) and Libra pre-salt discoveries.

Based on available Santos Basin well data, observed seismic responses, as well as in published analytical studies of the major commercial and non-commercial pre-salt discoveries in Brazil (e.g. Fontes and Zalan, 2014 and Petersohn *et.al.*, 2013), two main reservoir targets are recognized for the pre-salt within the study areas:

a. late rift coquinas: lacustrine facies deposited at the Late Barremian to Early Aptian and,
b. the younger rift/sag microbial limestones or microbialites: mostly lacustrine units deposited during the Aptian just before the establishment of the major evaporitic sag basin between South America and Africa. Microbial limestones are currently the major producing reservoir units for the pre-salt play in both Campos and Santos basins.

The microbialites that occur just beneath the base salt can be interpreted as "organosedimentary deposits that have accreted as a result of a benthic microbial community trapping and binding detrital sediment and/or forming the locus of mineral precipitation" (Burne and Moore, 1987, pp. 241–242). Microbialites formed in large, mostly lacustrine, settings due to the activity of extremophilic micro-organisms surviving in potential hypersaline and hydrothermal conditions during the Aptian thermal sag phase that followed the syn-rift deposition.

## DATASET AND METHOD

PGS 3D PSDM multi-client surveys constitute the main database for this study (Figure 02; total PSDM 3D area – ca. 46,000 sq. km; 34,000 sq. km in the Santos Basin and 12,000 sq. km in the Campos Basin).

In the Santos Basin, the pre-salt succession was mapped within the PGS BMS-50/52 and BS-1_South 3D PSDM seismic surveys and the PGS 3D PSDM survey Santos Phase I: merged/reprocessed, covering partially the Gato-do-Mato, the Florim and the Búzios

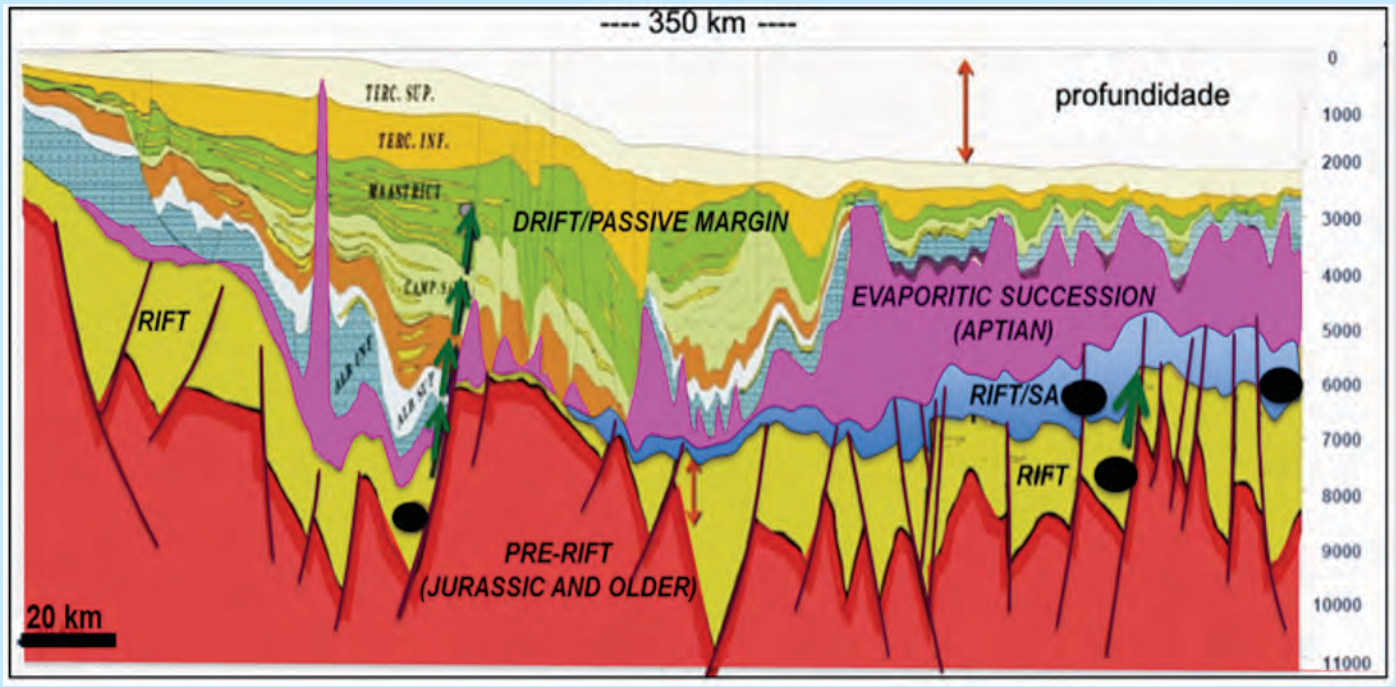



*Figure 1: Pre-salt Play Summary: schematic cross-section, for Santos Basin. From IBP internet site, session compiled by Marco Antonio Pinheiro Machado (Cainelli, pers.com.).*

(Franco) discoveries. The PGS BMS-50/52 (phases I and II) are located on the exploration trends of the Carcará and Sagitário discoveries. These multi-client surveys include both conventional and broad-band 3D seismic data and have been tied to the main control wells, the pre-salt discoveries and the producing fields through about 1,420 linear km of 2D regional PSDM broad-band seismic (Figure 02).

In the Campos Basin, the pre-salt succession was mapped and the exploration opportunities delineated within the PGS merged and reprocessed 3D PSDM survey from older conventionally-acquired datasets (Campos reprocessing phases I, II, III and IV). The Southwestern portion of this seismic data, Campos Phase IV, covers a recent pre-salt discovery in the Block BM-C-33 (Pão de Açucar) and from this discovery the extension of the pre-salt reservoirs can be carried out onto the deeper water areas.

The Figure 2 also shows the main interpreted Environments of Deposition (EOD's) for the pre-salt microbial succession in the Campos and Santos basins based on the seismic interpretation, available well control and analogues, both recent settings and outcrops of older rocks.

## MICROBIAL SUCCESSION IN THE DEEPWATER SETTINGS OF THE CAMPOS BASIN

The pre-salt play within this survey area can be considered frontier. No

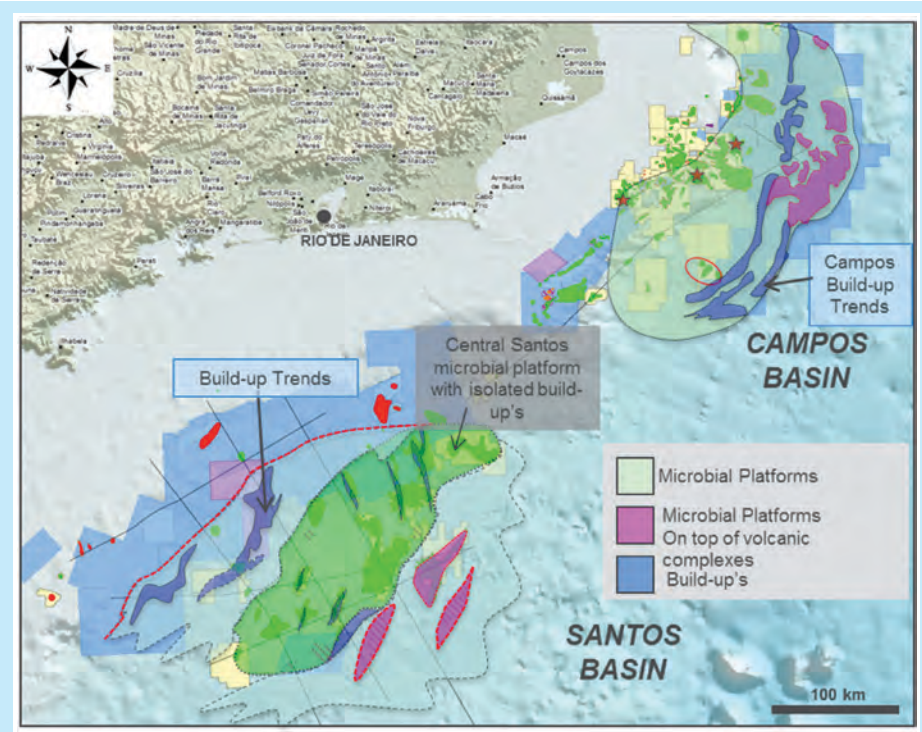



*Figure 2: Location, Seismic dataset and pre-salt Environments of Deposition (EOD's) for the Santos and Campos basins.*

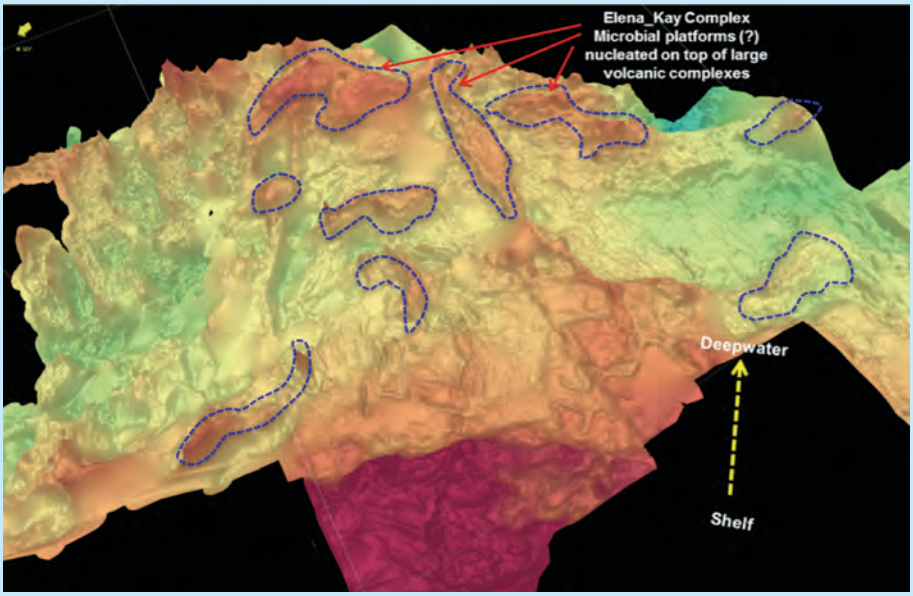



*Figure 3: 3D perspective of the base salt structural map in the Campos Basin deepwater with pre-salt opportunities overlain as polygons.*

pre-salt well penetration was available to calibrate the interpretation. The presented results are based on analogies with the Santos and the Kwanza basin discoveries. 3D seismic interpretation of the pre-salt section at the southern sector of the deep water Campos Basin has allowed the delineation of several pre-salt exploration segments.

3D seismic interpretation of the pre-salt section at the southern sector of the deepwater Campos Basin has allowed the delineation of several pre-salt sub-plays:

i) Structural 4-way closures in coquinas and microbialites (Late Rift to Sag);
ii) Stratigraphic/Combination Play in coquinas (Late Rift to Sag);
iii) Microbial Build-up Play on rift shoulders (Sag microbialites) and;
iv) Microbial Platform nucleated on top of and around large volcanic complexes (Figure 3).

Coquinas targeted exploration should be focused in the western part of the surveyed area while microbial reservoirs with potentially good permo-porosity properties seems to be located towards the present-day ultra-deep waters in the eastern part of the survey.

## EXPLORATION OPPORTUNITIES

The announced 2017 ANP (Agência Nacional do Petróleo) license rounds will offer opportunities within pre-salt acreage studied in this work.

A complex of large hydrocarbon exploration opportunities (4-way closures related to paleo-topographic/depositional highs at the base salt, here named Elena Kay Complex, Figures 3 and 4) were identified within the offered for the one of the ANP 2017 bid-rounds.

The interpreted depositional architecture indicates that the large microbial platforms were nucleated on top of volcanic complexes. This Late Barremian/Aptian volcanic event formed due to relatively young rifting processes on largely extended continental crust as shown Figure 4. Well control and analogues demonstrate that the main reservoirs in these platforms are potentially carbonatic (and/or siliceous) microbialites.

Main orientation of the Elena Kay Complex and the external seismic geometries of the individual leads

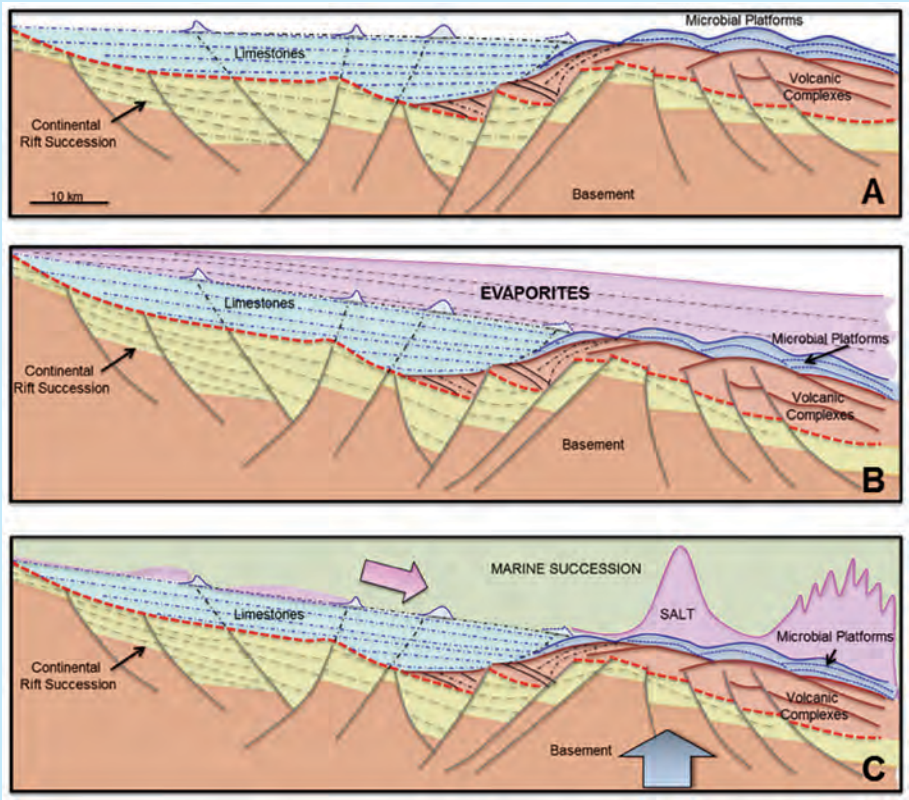



*Figure 4: Evolution Elena Kay Complex of leads and prospects. A: microbial deposition in association with hydrothermal circulation and volcanism; B: main evaporitic succession deposition; C: Late tilting and halokinetic flows (pink arrow) and inversion/uplift processes (gray arrow) delineating the final geometric configuration of the Elena Kay Complex.*

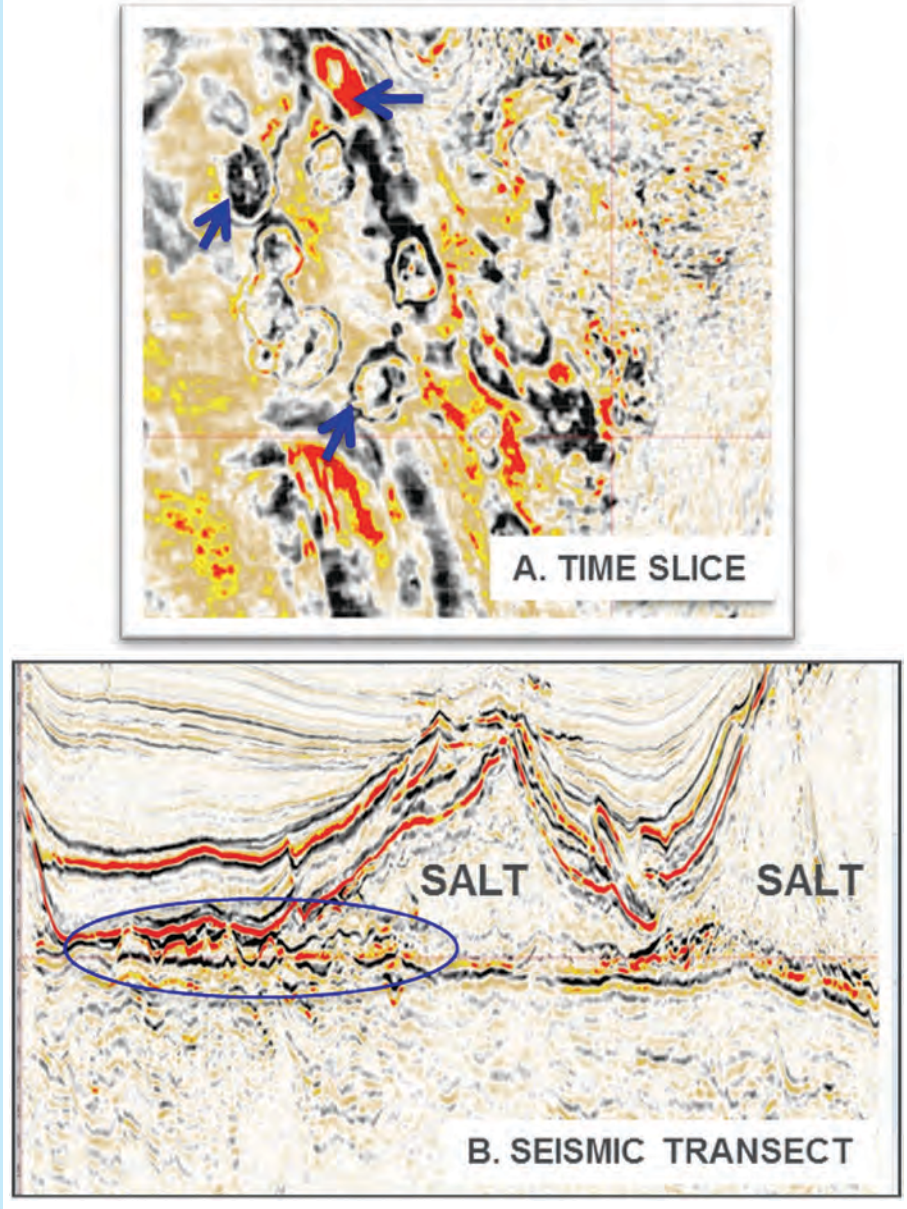



*Figure 5: Seismic examples of potential hydrothermally-triggered microbial build-up's.*

and prospects combined with pre-existing fault-control suggested that hydrothermal fluids controlled the different reservoir facies distribution (Figure 5).

Significant hydrothermal structures found in Yellowstone Lake consists of hard, porous siliceous material protruding vertically from crater-like depressions. These irregular, conically-shaped "spires" discovered in Bridge Bay in 1997 could be used as a potential recent analogue to this pre-salt setting in the Campos Basin and the Kwanza Basin (Casier *et.al*, 2014). The silicilythes in South Oman could also represent viable analogues to the proposed siliceous microbial reservoir models proposed in this study (Al-Siyabi, 2005).

## MAIN PETROLEUM SYSTEM ELEMENTS

A qualitative to semi-quantitative analysis of the petroleum system elements for aforementioned exploration opportunities is presented.

Structural closures (e.g. Figure 6) are expected to be low-risk as there is high confidence in the time-depth conversion for the mapped PSDM surveys. Uncertainty could be related to the size of the opportunities that could range from ten's to a few hundred's square kilometers.

Trap integrity/seal capacity will carry a low risk due to the presence of a thick evaporitic succession (top seal) and this is supported by analogues in African and other Brazilian pre-salt discoveries.

Reservoir presence and quality combined would be of low to moderate risk as demonstrated by inboard well controls (BCM-33 well penetrations and wells in the Marlin, Albacora, Caratinga fields), the observed seismic continuity of the EOD's into the Campos Basin deep water area and seismic geometries.

Source rock presence could represent the highest risk elements for these opportunities as seismic data indicates that the rift/sag successions are potentially dominated by volcanic rocks. However, by analogy, with other microbial reservoir units in Brazil and Oman, this risk can be mitigated by inferring a self-sourced system in which microbialites deposits (silica or carbonate) in addition to being the reservoir would also contain a high organic content to generate large volumes of hydrocarbons in order to fill these traps. Source-rock maturation would also be of low to moderate risk, although this should be properly evaluated and taken into account any overlaying thick salt which could impact on the geothermic and maturation.

The presence of large amounts of $CO_2$ in the fluid could also represent a moderate to high risk on the more distal prospects/leads where a more attenuated continental crust is expected.

With no pre-salt well penetration in the studied area, we have estimated that the POS (Probability of Success) for the introduced exploration opportunities would be on the average of 15 to 20% with expected volumes reaching multi-billion barrel level as per other similar pre-salt discoveries in Brazil.

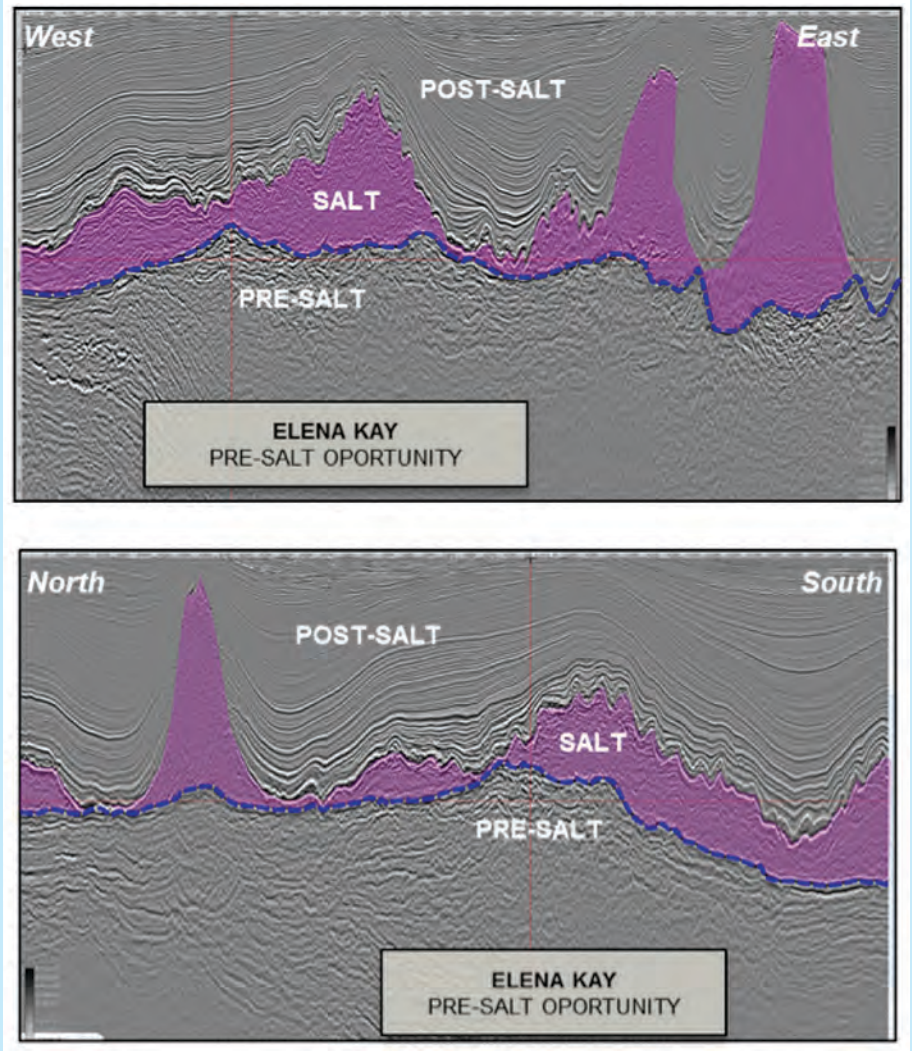



***Figure 6: Seismic transects for one of the large hydrocarbon exploration opportunities in the Campos Basin deep water settings.***

## CONCLUSIONS

Since 2006 exploration in the Santos and Campos basins has been a success story for the pre-salt play. Additional Campos and Santos basin pre-salt acreage is still available for future exploration efforts;

In the study area, several large pre-salt exploration opportunities were identified. Some of them are in acreage that will be offered by ANP in 2017 bid-rounds;

The target reservoirs of the pre-salt succession are lacustrine carbonatic or siliceous microbialites and coquinas which can be recognized and mapped by their external geometries and internal seismic facies characteristics;

Large outboard microbial platforms nucleated on top of volcanic complexes could potentially introduce a new, high-risk frontier play that could reveal very large hydrocarbon volumes just beneath the main evaporitic succession in distal segments of the Campos Basin.

Besides reservoir presence/quality, exploration risks for the pre-salt play in the studied area would be related to source-rock presence and maturation.

As for other hydrocarbon accumulations in microbial reservoirs, we could contemplate the possibility of a self-sourced system to mitigate the source-rock presence risk.

## ACKNOWLEDGEMENTS

Displayed seismic data is proprietary to PGS Investigação Petrolífera Limitada.

The authors would like to thank PGS for the permission to use its multi-client seismic data and present the results of this interpretation work.

We also would like to thank our colleagues in the GeoHub, Rio de Janeiro for the many fruitful discussions on the subject and our PGS Reservoir colleagues in Weybridge for their review.

## REFERENCES

AL-SIYABI, H.A., 2005, Exploration history of the Ara intrasalt carbonate stringers in the South Oman Salt Basin. GeoArabia, v. 10, no. 4, p. 39-72.

BURNE, R. V., AND MOORE, L., 1987. Microbialites; organosedimentary deposits of benthic microbial communities. Palaios, 2, 241–254.

CAZIER, E.C.; BARGAS, C.; BUAMBUA, L.; CARDOSO, S.; FERREIRA, H.; INMAN, K.; LOPES, A.; NICHOLSON, T.; OLSON, C.; SALLER, A.; AND SHINOL, J.'2014, Petroleum Geology of Cameia Field, Deepwater Pre-Salt Kwanza Basin, Angola, West Africa, Search and Discovery Article #20275 (2014), 11pp.

FONTES, C.A.O.; AND ZALÁN, P.V., 2014, Santos Basin: Pre-Salt Discoveries Post-Mortem Analysis, GeoHub, Rio de Janeiro, 202 pp.

PETERSOHN, E.; ABELHA, M.; PEDROSA, L., 2013, ANP Presentation: Libra – Avaliação Geológica e Diretrizes Ambientais. Slides 1-90.

REISER, C., BIRD, T., GIRARD, L., VARTAN, A., 2013, Improved reservoir imaging and understanding with Dual-Sensor Streamer in deepwater Santos Basin. SBGf 13th. International Congress of the Brazilian Geophysical Society. Rio de Janeiro, Brazil, August, 2013.

TAYLOR, P.N.; AL-HARRASI, A.; EDEN, C.V.; AND AL_GHAMMARI, M., 2010, Hydrocarbon Charge and Reservoir Pressure History of the Carbonate Stringer Play in South Oman - Implications for Pre-Drill Pore Pressure Risking, Poster session GEO 2010, EAGE.

**Accepted February 2017**

## PRESIDENT'S COMMENTS

Dear colleagues,

I will use this column to give you an update on the progress of our collaboration with IAS and on our plans for an SEPM international meeting. SEPM Council has previously approved to plan for an SEPM-operated larger meeting (200-700 attendees) for 2020, called the SEPM International Sedimentary Geology Congress (ISGC). Planning for this meeting is part of my Presidential Project, including the involvement of IAS in the planning process.

After a few face-to-face meetings and several emails with IAS President Adrian Immenhauser, following up on our previously approved MOU with IAS, these are the tasks we have agreed upon to keep developing our collaboration. IAS and SEPM will have mutual representatives attend the SEPM Council meetings and IAS Bureau meetings. These representatives will be ex officio and will not be voting members. IAS has chosen Tracy Franks (University of Nebraska) to represent them at SEPM Council meetings and IAS will cover her travel costs. I was appointed by the SEPM Council to represent us in the IAS Bureau meetings as a continuation of my Presidential Project. Other items discussed and approved were:

- SEPM appointed a representative (Janok Bhattacharya) to the 2018 ISC (International Sedimentological Congress) in Quebec City and is working with them on having SEPM in the program.
- An IAS representative (Vincenzo Pascucci - University of Sassari, Italy) has been assigned to help SEPM in the organization of the 2020 ISGC.
- General agreement with IAS on a good plan for international meetings is to alternate every 4 years, for example:
  - 2018 ISC - IAS led with SEPM contributions
  - 2020 ISGC – SEPM led with IAS contributions
  - 2022 ISC – IAS led with SEPM contributions
- Look at a possible 'joint' membership option for current members of both organizations
  - This is complicated as IAS incorporation in EU has some specific legal issues with receiving or sending money outside the EU, but we are looking into this and other options, like a discount of some type for books and scientific events.
  - Looking at possible review of membership rolls to see how many are already joint members.
- General discussions on jointly holding smaller research conferences

As part of our agreement with IAS, SEPM will be responsible the majority of the technical program and 100% of the financial responsibility for the SEPM/IAS 2020 ISGC. The location for the 2020 ISGC will be proposed by the conference committee that was formed this month.

SEPM council approved the following committee for organizing the 2020 ISGC:

**Committee members – permanent until 2020:**

- Vitor Abreu– Chair
- Andrea Fildani– Vice-Chair
- Vincenzo Pascucci– IAS Representative
- Maria Mutti– current President-Elect
- Mike Blum (sedimentology)
- Dave Bottjer (paleontology)

**Plus:**

- Research Councilor – currently Liz Hajek (2016-2018)
- Staff member – Howard Harper

Subcommittees for specific tasks will be organized as needed, such as: technical program, short courses; field trips; social event; exhibits, and other activities. Please let us know if you have ideas about venue, technical program or special activities for our 2020 conference. Engagement of SEPM members will assure the success of the event!

***Vitor Abreu, SEPM President***

**SEPM Society for Sedimentary Geology**
***"Bringing the Sedimentary Geology Community Together"***
***www.sepm.org***

THE GEOLOGICAL SOCIETY OF AMERICA®
SEDIMENTARY GEOLOGY DIVISION

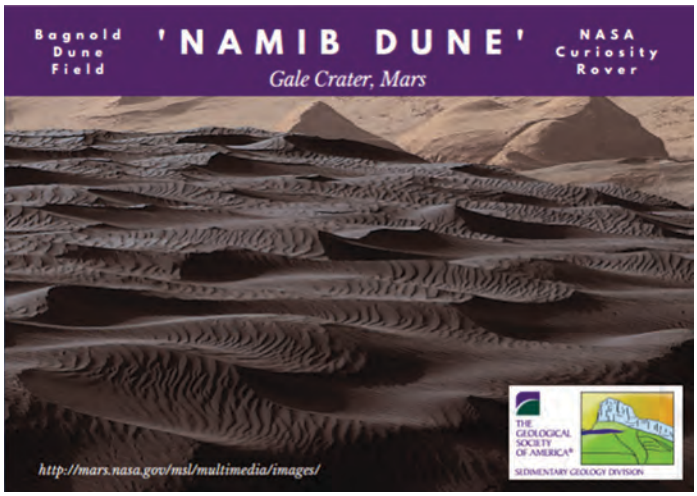
## Sedimentary Geology Division Spring 2017 Newsletter

Sedimentary salutations for 2017, the Year of the Fire Rooster! In this issue we want to reflect on some of the 2016 accomplishments of GSA's Sedimentary Geology Division (SGD) and alert you to what to look forward to in 2017. Our membership remains at an elevated level at ~1736, which is up a bit from 2015. We want to continue to grow, especially by adding new student members and to serve the membership better! So please pass along your suggestions for improvement directly to the division officers or better yet ***Get Involved (which is a trait of all Fire Roosters)!***

## 2016 GSA Annual Meeting in Mile High Denver, Colorado Recap

The SGD had an excellent turnout at our many sponsored events at the 2016 Annual GSA Meeting in Denver, Colorado. The SGD sponsored a whopping 53 topical sessions covering a very diverse spectrum of sedimentary-related science. The SEPM/SGD sponsored student poster session "New Insights into the Dynamics of Stratigraphy and Sedimentation" featured 22 student poster presenters. The posters were judged for scientific and presentation quality and the top 4 winners were honored at the SGD Awards Ceremony.

## 2016 SGD Postcard




Several 1000 of this year's SGD feature postcard "Namib Dune, Gale Crater, Mars" were handed out at the GSA booth at the annual meeting.

The newly combined SGD Awards Ceremony & Seds and Suds was held on Tuesday evening of the meeting and was highly attended. SGD honored **Dr. Timothy (Tim) Lowenstein**, of Binghampton University as the 17th recipient of the **Laurence L. Sloss Award** in recognition of his ground-breaking contributions to the understanding of the Earth's history and processes from the sedimentary and geochemical study of chemical sediments/sedimentary rocks.

**Dr. Tim Lowenstein (2nd from the left), 2016 Lawrence L. Sloss Award winner with citationists Kathleen Benison (left) and Robert Demicco, Sean Brennon (right).**

**Lauren Colliver** was selected as our **2016 Student Research Award Recipient**. She is a M.S. student at Purdue University. Her project is entitled "Regional Sediment Transport and Basin Development at the Crossroads of the Appalachian and Cordilleran Orogenies; Detrital Zircon Geochronology of the Big Bend Region, West Texas, U.S.A."


**Lauren Colliver (left) was this year's winner of the SGD Student Research Grant pictured with SGD Chair Kate Giles (right).**

## SEPM-SGD Outstanding Student Poster Winners:

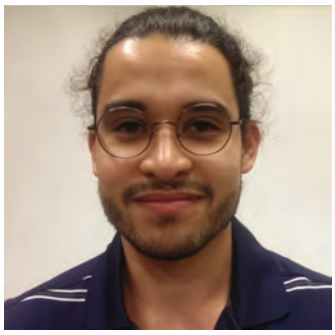
This year's 2016 SEPM/SGD "New Insights into the Dynamics of Stratigraphy and Sedimentation" student poster winners (receiving $500 each) were:

**Rachel Fliflet** of the University of Wisconsin-Eau Claire for her poster "Diagenetic history of Cambrian sandstone units in western Wisconsin"

**Angela Norman** of Texas Tech University for her poster "Investigating the provenance of black sand in Iceland: local vs. distal sources"

**Nicholas David Risedorf** of Fort Lewis College for his poster "Potential constraints on the timing of halokinetic megaflap deformation; biostratigraphy and paleoecology of Permian/Pennsylvanian carbonates, Big Gypsum salt anticline, SW Colorado"

**Cody Stopka** of New Mexico State University for his poster "U-Pb detrital zircon geochronology, modal composition, and paleoflow trends from Upper Cretaceous nonmarine strata in southern New Mexico"



**Sebastian Cardona** is the **2016 Laubach Structural Diagenesis Research Award** recipient.

**Sebastian Cardona** of Colorado School of Mines was selected for the **2016 Stephen E. Laubach Structural Diagenesis Research Award** given by Structural Geology & Tectonics (SGT) division this year. His research project is "Assessing the seal capacity of mass-transport deposits: An outcrop-based study to investigate the spatial variations in microstructure and microfabric and implications for seal capacity."

## In Memoriam -

The evening ended with a tribute to SGD members that we lost in 2016 that have been important leaders in the sedimentary community as well as friends: Curtis Elder, Beth Gierlowski-Kordesch, Paul Heller, Kenneth Johnson, Tom Laudon, Dan Livingstone, Robert Merrill, Richard Norris, Lloyd Pray. Weldon Rau, Roderick Tillman, John Whitmer, and Edward Winterer

## What's New for 2017?


Plan on joining us for the **128th GSA Annual Meeting in Seattle, Washington** in October 2017. SGD has sponsored a very diverse group of sessions this year, so be sure to get your abstracts in by August 1, 2017. We will also be running our annual SGD/SEPM sponsored

poster session for student researchers. Students please consider submitting to this session where you'll meet other dynamic student researchers and enjoy a fun networking opportunity all while competing for cash prizes!


## We've Joined Social Media!

Find us on Facebook, Instagram and Twitter @GSA.SGD!

We will hold a competition every month for the best sedimentary geology photo posted on our Facebook page! The photo that receives the most 'likes' will be featured on our SGD postcard distributed at the Seattle meeting.

## Get Involved in 2017 with the Sedimentary Community!

We could use your help and ideas in making SGD a dynamic and vibrant research community. Consider proposing a Penrose Conference or a Thompson field Forum (www.geosociety.org/penrose or www.geosociety.org/fieldforums/), nominating leaders in our community for the Sloss Award (rock.geosociety.org/sed/SGD_Awards2.html#Sloss) or serve on a SGD committee.

This spring we will be looking for candidates to run for the Vice Chair of SGD position. We will also be looking for a new SGD student representative this fall. If you're interested in either of these leadership roles in SGD please, contact Kate Giles or Gary Gianniny!

## 2017 SGD Officers:

**Chair – Kate Giles** (kagiles@utep.edu)

**Vice Chair – Gary Gianniny** (gianniny_g@fortlewis.edu)

**Secretary Treasurer – Linda Kah**

**Student Representative – Rachelle Kernen**

**Webmaster – Stefania Laronga**

*Wishing all the best to our former webmaster of 10 years, Kelly Dilliard. Thanks for all your hard work Kelly, we really appreciate your exceptional service to SGD!*

***A special "Thank you" to all those who served on our 2016 SGD Committees***

# Journal of Sedimentary Research

## Outstanding Paper Awards for 2017* (tie)

To be awarded at the 2017 SEPM President's Reception, Tuesday, April 4. 2017, Four Seasons Hotel, Houston, TX

MASS-BALANCE CONSTRAINTS ON STRATIGRAPHIC INTERPRETATION OF LINKED ALLUVIAL–COASTAL–SHELFAL DEPOSITS FROM SOURCE TO SINK: EXAMPLE FROM CRETACEOUS WESTERN INTERIOR BASIN, UTAH AND COLORADO, USA.
**HAMPSON, G.J., DULLER, R.A., PETTER, A.L., ROBINSON, R.A. AND ALLEN, P.A., 2014.** *Journal of Sedimentary Research*, 84(11), pp.935-960. DOI:10.2110/jsr.2014.78

LATE DEVONIAN CARBONATE MARGINS AND FORESLOPES OF THE LENNARD SHELF, CANNING BASIN, WESTERN AUSTRALIA, PART A: DEVELOPMENT DURING BACKSTEPPING AND THE AGGRADATION-TO-PROGRADATION TRANSITION. **PLAYTON, T.E. AND KERANS, C., 2015.** *Journal of Sedimentary Research*, v. 85(11), pp.1334-1361. DOI:10.2110/jsr.2015.84 & Part B: DEVELOPMENT DURING PROGRADATION AND ACROSS THE FRASNIAN–FAMENNIAN BIOTIC CRISIS. *Journal of Sedimentary Research*, 85(11), pp.1362-1392. DOI:10.2110/jsr.2015.85

*Note that *JSR* Outstanding Paper Awards are arrived at using a 5-year window and the top scoring papers based on multiple measures are then reviewed by the award committee.

# PALAIOS

## Outstanding Paper from 2015*

To be awarded at the 2017 SEPM President's Reception, Tuesday, April 4. 2017, Four Seasons Hotel, Houston, TX

THE IMPACT OF MICROBIAL MATS AND THEIR MICROENVIRONMENTAL CONDITIONS IN EARLY DECAY OF FISH.
**MIGUEL INIESTO, CELIA LAGUNA, MAXIMO FLORI´N, M. CARMEN GUERRERO, ALVARO CHICOTE, ANGELA D. BUSCALIONI, AND ANA I. LO´ PEZ-ARCHILLA.**
*PALAIOS*, 2015, v. 30, 792–801, DOI: http://dx.doi.org/10.2110/palo.2014.086

### Honorable Mentions (2)

HERBIVOROUS AND DETRITIVOROUS ARTHROPOD TRACE FOSSILS ASSOCIATED WITH SUBHUMID VEGETATION IN THE MIDDLE PENNSYLVANIAN OF SOUTHERN BRITAIN.
**HOWARD J. FALCON-LANG, CONRAD LABANDEIRA, AND RUTH KIRK.**
PALAIOS, 2015, v. 30, 192–206, DOI: http://dx.doi.org/10.2110/palo.2014.082

AN ICHTHYOSAUR CARCASS-FALL COMMUNITY FROM THE POSIDONIA SHALE (TOARCIAN) OF GERMANY. **DANIEL G. DICK.**
*PALAIOS*, 2015, v. 30, 353–361, DOI: http://dx.doi.org/10.2110/palo.2014.095

**PALAIOS* determines the Outstanding Paper by only considering those published in a single year – 2 years prior to the award to allow sufficient time for a paper to gain exposure.

# NEW SEPM COUNCIL MEMBERS

The results of the Society's council election have been finalized. The new Council members will officially take office on April 1, 2017 at the next Council meeting. The election results:

- **President-Elect—Gary Nichols** g.nichols@nautilusworld.com
- **Sedimentology Councilor—Laura Zahm** LAZ@statoil.com
- **Paleontology Councilor—Chuck Savrda** savrdce@auburn.edu
- **PALAIOS co-editor –Martin Zuschin** martin.zuschin@univie.ac.at
- **Special Publications Editor—JP Zonneveld** zonnevel@ualberta.ca
- **Student Councilor—Xiaowei Li** xwli@stanford.edu

Please feel free to contact them with your congratulations.

Please also recognize these candidates that volunteered to help SEPM but were not elected to this Council– all of the voting was very close.

- **Morgan Sullivan:** MORGANSULLIVAN@chevron.com
- **Shahin Dashtgard:** sdashtgard@gmail.com
- **Tony Fiorillo:** Tony.Fiorillo@perotmuseum.org

# SEPM Exhibit Booth
# THE PLACE AT ACE
## #1125
## SEPM Book Inventory Special Sale

Over 40 SEPM classic and newest titles in print or CD at tremendous discounts

Special Publications, Concepts volumes and others

SEPM PLINKO


Great prizes – no real skill necessary!


**2017 Mountjoy Conference – Mountjoy II**
June 26-29 in Austin, Texas at the UT Learning Commons and Austin Core Research Center, Austin, TX, USA
Sponsored by
SEPM (Society for Sedimentary Geology) and CSPG (Canadian Society of Petroleum Geologists)

**Registration for the Conference will open in April**

▶**Technical Sessions** – oral and poster that address the overall theme of the Conference -
*Carbonate Pore Systems*

- **Sedimentological, Stratigraphic, and Diagenetic Controls on Development of Carbonate Pore Systems**
- **Microporosity in Conventional and Unconventional Carbonate Reservoirs**
- **Multiscale Prediction and Upscaling of Carbonate Porosity and Permeability**
- **Interactions in Multi-Modal Pore Systems**
- **Visualization, Quantification, and Modeling of Carbonate Pore Systems and Their Fluid Flow Behavior**

▶**Field Trips** - Included in the Conference fee is a choice of 1-day field trips - details on the registration website. Participants may choose one from the following four trips until a trip is full:

- ***Albian-Age Pipe Creek Rudist Build-Ups and Impact of Touching and Non-Touching Vugs on Reservoir Characterization*** — Leader is Laura Zahm | Statoil
- ***Fractures and Pores within Evaporite Paleokarst Systems: An Example from the Cretaceous of Texas*** – Leader is Chris Zahm | BEG University of Texas
- ***Fractures, Faults, and Karst Caverns: Architecture of the Non-Matrix Reservoir Elements*** – Leader is Bob Loucks | BEG University of Texas
- ***Fault Zone Deformation and Displacement Partitioning in Mechanically Layered Carbonates: The Hidden Valley Fault, Central Texas*** – Leaders are David Ferrill, Alan Morris and Ronald McGinnis | Southwest Research Institute

▶**Core Workshop** - included in registration fee, at the Austin Core Research Center (CRC) with cores representing a spectrum of geologic time and depositional settings, as well as unique diagenetic environments.

▶**Field Trips** - **Optional Pre- and post-Conference** - at additional cost - details at the registration site.

- Pre-conference trip: **Upper Cambrian Microbial Mounds in Central Texas** – Leaders are Andre Droxler | Rice University, Paul (Mitch) Harris| University of Miami / Rice University, and Bill Morgan | Morgan Consulting
- Post-conference trip: **Classic Outcrop Exposures of the Permian Guadalupe Mountains** – Leaders are Charles Kerans | University of Texas, Chris Zahm | BEG University of Texas, and Paul (Mitch) Harris | University of Miami / Rice University

PLAN TO JOIN US FOR THIS TIMELY AND SUBSTANTIAL CONFERENCE.
PLEASE CONTACT ANY OF THE MEETING ORGANIZERS BELOW WITH QUESTIONS.

**General Chair** - Paul (Mitch) Harris (pmitchharris@gmail.com)
**Oral and Poster Sessions** - Don McNeill (dmcneill@rsmas.miami.edu) and Gene Rankey (grankey@ku.edu)
**Core Workshop** - Laura Zahm (LAZ@statoil.com)
**Field Trips** - Astrid Arts (Astrid.Arts@cenovus.com) and Chris Zahm (chris.zahm@beg.utexas.edu)
**Social Events** - Jean Hsieh (jhsieh@repsol.com)

Additional Sponsors

Shell

# SEPM Activities at ACE, Houston

**Friday, March 31**

- Field Trip #3: Fluvial and Coastal Clastic Sedimentology and Ichnology in Modern Environments. Starts in Houston-Day 1 of 2 – Ends in Houston

**Saturday, April 1**

- SEPM Council Meeting: (Four Seasons)
- Short Course #3: Sequence-Stratigraphic Analysis of Shales: Key to Paleoclimate Archives, Subsurface Fluid Flow and Hydrocarbon Source, Reservoir and Seal, Day 1 of 1 (Four Seasons Hotel, Highland Rm.)
- Short Course #10: Sequence Stratigraphy for Graduate Students, Day 1 of 2 (Four Seasons, Fairfield Rm.)
- Short Course # 11: Advanced Sequence Stratigraphy for Professionals, Day 1 of 2 (Four Seasons, Whitney Rm.)

**Sunday, April 2**

- Short Course #10: Sequence Stratigraphy for Graduate Students, Day 2 of 2 (Four Seasons, Fairfield Rm.)
- Short Course # 11: Advanced Sequence Stratigraphy for Professionals, Day 2 of 2 (Four Seasons, Whitney Rm.)
- SEPM NAMS Council Meeting (Four Seasons, Bridgeport Rm.)
- SEPM Booth – Exhibit Hall Ice Breaker – 5:00-7:30 pm

**Monday, April 3**

- SEPM Booth - Exhibit Hall: 9:00 am – 6:00 pm
- AAPG/SEPM Student Reception: 6:00 pm – 8:00 pm (Open Event) Hilton-Americas Hotel
- SEPM Research Group Meetings & Reception: 7:00 pm – 10:00 pm (Open Event) Four Seasons Hotel

**Tuesday, April 4**

- SEPM Booth Exhibit Hall – 9:00 am – 6:00 pm
- SEPM Research Symposium: How Seismic and Sequence Stratigraphy Have Advanced: 40 Years after AAPG Memoir 26 and 30 Years after SEPM Special Publication 42 (Morning and Afternoon Oral Sessions)
- SEPM Luncheon: Can we do Big Science in a Petroleum-Rich Basin, John Snedden – 12:00 pm – 1:00 pm (Ticket required -$55) G.R. Brown Convention Center
- SEPM Foundation Reception (Invitation Only) Four Seasons Hotel
- SEPM President's Reception and Awards Ceremony – President Vitor Abreu – 7:30 pm – 9:30 pm (Open Event) Four Seasons Hotel, Ballroom B

**Wednesday, April 5**

- SEPM Booth Exhibit Hall – 9:00 am – 2:00 pm
- Field Trip #8: Revised Stratigraphic Framework for the Cutoff Formation and Implications for Upper Bone Spring and Avalon Reservoirs – Starts in El Paso - Day 1 of 4 Ends in El Paso

**Thursday, April 6**

- Field Trip #10: Modern Galveston Island and the Brazos River Delta as Reservoir Analogs – Starts in Houston- Day 1 of 1 Ends in Houston
- Short Course #16: Rock & Seismic Sequence Expression of Carbonate Systems (Day 1 of 2)- Four Seasons, Bridgeport Rm.

**Friday, April 7**

- Short Course #16: Rock & Seismic Sequence Expression of Carbonate Systems (Day 2 of 2)-Four Seasons, Bridgeport Rm.

1926 SEPM Society for Sedimentary Geology