Wednesday, October 27, 2010

Petroleum Club • 800 Bell (downtown)
Social 11:15 AM, Luncheon 11:30 AM

Cost: $30 pre-registered members; $35 for non-members & walk-ups; Emeritus/Life/Honorary: $15; Students: FREE

To guarantee a seat, you must pre-register on the HGS website (www.hgs.org) and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

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Death of the Sequence Boundary: Applying Modern Concepts to the Cretaceous Interior Seaway of North America

The use of arbitrary boundaries in defining lithostratigraphic units in the 1950s resulted in a confusing proliferation of different names for lithofacies of the same age. Early versions of sequence stratigraphy also failed, because of insistence on definitions using arbitrary vertical cutoffs. Seismic stratigraphy fundamentally transformed the science of stratigraphy by providing vastly superior images that allowed correlation of genetically related chronostratigraphically significant units. Reflection seismic data thus provided the key technological breakthrough that provided continuous cross-sectional views of stratigraphic basin fills and fundamentally revitalized the science of stratigraphy.

Seismic stratigraphy fundamentally transformed the science of stratigraphy

Sequence stratigraphy solved the basic problem that was genetically related, but different lithofacies were routinely assigned to different lithostratigraphic units defined by arbitrary vertical and horizontal cutoffs. Sequence stratigraphically important lapout relationships can be observed in seismic data and can be documented in continuous outcrops, such as in the deserts of the Western Interior of North America and in closely-spaced well log data sets. Finding good isochronous stratigraphic datums, such as bentonites or condensed sections, is key. Not all surfaces defined by lapout boundaries are readily identifiable in 1D sections, and in well logs lapout relationships must be interpolated. This introduces uncertainty in correlation and designation of sequences and systems tracts and their associated surfaces.

The uncertainty in dating of fluvial terrace deposits is shown by use of detailed facies architectural studies, combined with Wheeler analysis, as well as recent modeling and Quaternary studies. These studies call into question the assumed chronostratigraphic significance of many so-called sequence boundaries identified in the rocks of the Cretaceous Interior Seaway of North America, such as the boundary between the Blackhawk-Castlegate formations in Utah, and suggest that they may have far higher diachroneity than has previously been assumed. Although a glacio-eustatic origin for Cretaceous sequences is still highly debated, modern glacio-eustatic falls of sea-level are commonly prolonged and irregular, whereas rises are typically very short lived. Sequence boundaries formed during such prolonged falls may be less chronostratigraphically significant than the transgressive surfaces formed during rapid rises. As a consequence, flooding surfaces are both theoretically more significant and also have greater utility as allostratigraphic boundaries.

Tectonic unconformities are also common in the Cretaceous Western Interior. Tectonics produces differential lithospheric deformation, which results in angular unconformities. In the Cretaceous Interior Seaway of North America, such unconformities may be expressed by marine erosion in basin distal settings. Regional isochronous bentonite beds provide useful regional marker beds that clearly illustrate angular discordance. In the fluvial realm, such tectonic discontinuities are indicated by changes in paleocurrent orientations as well as by provenance changes.

Although sequence stratigraphy provides a powerful methodology and theoretical framework for correlating and understanding the evolution of stratigraphic successions in the context of changing accommodation, allostratigraphy remains the only accepted scheme for formal naming of stratigraphic units based on bounding discontinuities. However, whatever type of sequence stratigraphy or allostratigraphy one prefers, it is key in all cases to recognize that sequence stratigraphy, at its heart, is the re-ordering, correlation, and sometimes renaming of stratigraphic units on the basis of bounding discontinuities and their correlative surfaces, as opposed to the arbitrary lithofacies–oriented approach using broad facies "shazams" or arbitrary cutoffs, such as is used in traditional lithostratigraphy. ■ **HGS General Luncheon** *continued from page 25*

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Biographical Sketch

Dr. Janok P. Bhattacharya is the Robert E. Sheriff Professor of Sequence Stratigraphy at the University of Houston. His research interests include deltaic sedimentology and sequence stratigraphy, the local control of structure on stratigraphy and reservoir architecture of clastic depositional systems.

He received his B.Sc. in 1981 from Memorial University of Newfoundland, Canada. Following his Bachelors degree, he worked at ESSO Resources Calgary, before completing his Ph.D. in 1989 from McMaster University, Hamilton, Ontario, Canada. Following a Natural Sciences and Engineering Research Council post-doc at the Alberta Geological Survey in Edmonton, Dr. Bhattacharya worked for the Bureau of Economic Geology at Austin, ARCO Research in Plano, Texas, and the University of Texas at Dallas before joining the University of Houston in the fall of 2005.

He is an American Association of Petroleum Geologists (AAPG) Grover Murray Distinguished Educator, AAPG Distinguished Lecturer, and AAPG SW Section Distinguished Educator. He was the 2008 Gulf Coast Section of the Society of Sedimentary Geology (GCSSEPM) President, and has served on various AAPG Convention committees. He is also co-chair of the AAPG Education Committee. He has been awarded the 2004 AAPG Certificate of Merit, the 2004 Dallas Geological Society Professional Service Award, the 2004 Canadian Society of Petroleum Geologist (CSPG) Best Oral Presentation Award, the 2002 Frank Kottlowski Memorial Presentation Award, the 2002 Houston Geological Society Best Oral Paper Award, and the 2001 AAPG "Al" Cox Award for best poster at an AAPG SW section meeting.

He is an associate editor for the *Journal of Sedimentary Research* and has also served as associate editor for the *AAPG Bulletin*. He has authored or co-authored more than 100 abstracts and over 50 technical papers. He also co-edited SEPM Special Publication 83 *"River Deltas: Concepts, Models and Examples"*. He is an active member of AAPG, Society for Sedimentary Geology (SEPM), Geological Society of America (GSA) and International Association of Sedimentologists (IAS).