Monday, February 27, 2012

Westchase Hilton • 9999 Westheimer
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $28 Preregistered members; $35 non-members/walk-ups

To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.
Pre-registration without payment will not be accepted.
Walk-ups may pay at the door if extra seats are available.

Dr. Bruce S. Hart
ConocoPhillips

Source-rock Plays and Sequence Stratigraphy: What Makes the Best Part of the Best Plays?

Stratigraphic analyses of a variety of mudstone-dominated units demonstrate that the best production from source-rock plays i.e., the reservoir is also the source rock, is usually from thermally mature, pelagic-rich strata that can be assigned to the transgressive systems tract (TST) and a condensed section (CS). They are often referred to as "black shales" although clay minerals can form 20% or less of the rock. A high Total Organic Carbon (TOC) content of typically Type I/II kerogens made these strata potential source rocks, and biogenic silica and/or carbonate produced "brittle" rock that is suitable for hydraulic fracture stimulations. Where deposition from suspension dominated, relatively thin (< 10 m thick) stratigraphic units can be correlated over several to many tens of km and generally show draping to divergent/convergent geometries. Rock properties are therefore unlikely to change significantly over the length of a typical horizontal completion, say ~ 1 km in these suspension deposits, unless other complications such as fractures, are present. However, changes in thickness, mineralogy, thermal maturity or other stratigraphic/geologic parameters over distances of several km to tens of km will affect hydrocarbon generation, storage and production.

The lithologic and stratigraphic characteristics of the strata differ considerably from progradational mudstones of the highstand systems tract (HST) and the lowstand systems tract (LST). The latter are characterized by higher clay contents and more detrital silicate/carbonate as silt or coarser grain sizes. The clay content generally makes these shales less brittle than the TST/CS units. These HST/LST mudstones have lower TOC contents than the TST/CS mudstones, and the organic matter is relatively enriched in terrestrial Type III kerogen constituents. These strata tend to be more heterolithic than the TST/CS mudstones, and may be arranged into submarine failure complexes, prodelta lobes or other stratigraphic features that can show rapid lateral variations in lithology and thickness. These characteristics generally make these HST strata poorer source rocks and more complex to development using horizontal wells than TST/CS mudstones.

Although the descriptions and interpretations presented above have general applicability i.e. they are the "simple case", these concepts commonly need to be modified to account for the wide variability in depositional setting, depositional history, and geologic age, represented by gas-productive mudstones. ■

Chonchoidal fracture, a brittle response, in organic-rich mudstones. The depositional processes responsible for making these rocks organic rich are also responsible for making them brittle.

Biographical Sketch

Dr. Bruce S. Hart is a Principal Geologist with ConocoPhillips. He received Bachelor's, Master's and Doctoral degrees from universities in Canada, and worked for the Geological Survey of Canada, Penn State, the New Mexico Bureau of Mines, and McGill University prior to joining ConocoPhillips in 2008. He is an AAPG/SEG Distinguished Lecturer, a CSPG Visiting Lecturer and AAPG SW Section Distinguished Educator. He has authored/co-authored over 50 peer-reviewed publications on topics that include seismic attributes, clastic sedimentology, fractured reservoirs, and stable isotopes. His digital textbook *An Introduction to Seismic Interpretation* was released by AAPG in fall 2011. His current assignment is with ConocoPhillips' Global Unconventional New Plays group.