Monday, January 13, 2014

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

Cost: $30 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.

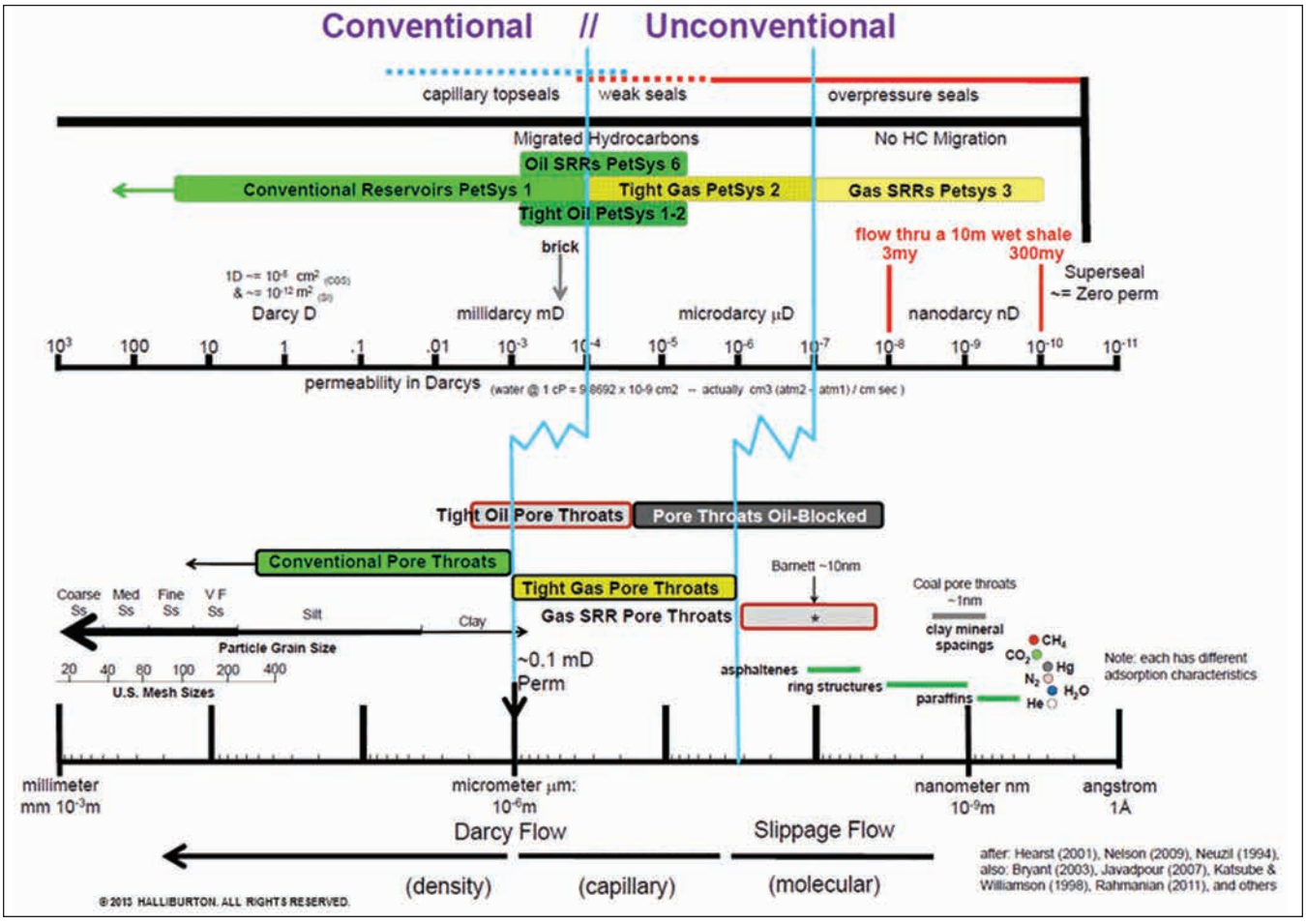
Kenneth E. Williams
ken.williams@halliburton.com

Source Rock Reservoirs are a Unique Petroleum System

Three distinct types of petroleum systems can be defined based on the difference in the basic physics of hydrocarbon accumulation. Conventional petroleum systems (Type 1) have the traditional components of source, seal, reservoir, trap, and timing that must be evaluated and that must be favorable for a hydrocarbon accumulation to be present. Hydrocarbons migrate from the source rock to the reservoir and trap based on the density difference between oil, gas, and water. Continuous basin-centered accumulations (Type 2) trap migrating hydrocarbons in tight rocks by relative-permeability conditions that develop between the hydrocarbons and interstitial water. Reservoir conditions, therefore, also define the seal and the trap. Source rock reservoirs (SRRs, Type 3) have a much lower permeability and much smaller pore throats than even continuous accumulations. The unexpelled and unmigrated hydrocarbons that remain in the porosity of the SRR are available to be produced if sufficient fracture conductivity is induced by hydraulic fracturing. Coal-bed methane, oil sands, and oil SRRs are variations on, and composites of, the three basic petroleum system end members.

Hydrocarbons migrate from the source rock to the reservoir and trap based on the density difference between oil, gas, and water.

HGS General Dinner *continued on page 27*



HGS General Dinner continued from page 25

The physics of gas flow in SRRs are different from other petroleum systems at the small pore throat sizes that are present in the secondary oil or gas-wet pores within the kerogens and their associated microfractures, from in the water-wet portions of the SRR, or in the migration pathways. In the absence of water within the nanopores, gas is present in a number of diffuse systems. Adsorbed gas is present as a diffuse layer on the surface of the organic porosity. If there is a gradient along that surface, diffusion occurs in a linear fashion. The free gas in the pore space moves from high concentration to low concentration by slippage flow, as described by Knudsen diffusion. There is free interchange between the free and adsorbed gas molecules by "hopping" from one diffuse system to the other. Gas is absorbed within the kerogen matrix and diffuses out to become adsorbed. The relative contribution and rates of flux in these various systems are an active research topic, but the high deliverability of gas from SRRs is a result of the different physics of gas flow. ■

Biographic Sketch

Kenneth E. Williams got into the oil business back in the third quarter of the last century (1974) and spent 28 years with Texaco. Time at Texaco was well spent in various exploration and managerial roles including six years on the Worldwide Exploration Risk Committee. He got involved in basin modeling and petroleum systems analysis in the mid-1980s and used those tools in the study of basins around the world trying to follow the oil from source to reservoir. After retiring from Texaco, he worked for seven years using basin modeling for overpressure analysis for Knowledge Systems Inc. (KSI) before the company was bought by Halliburton. At that time, the focus of the modeling turned around and began looking back at the source rock to model what was retained and not expelled and trying to understand how that works. He has authored 22 publications and 37 abstracts and holds two patents (with seven pending).