Monday, February 24, 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.

HGS Joint North American and International Dinner Meeting

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An Overview of Pre-Devonian Petroleum Systems – Unique Characteristics and Elevated Risks

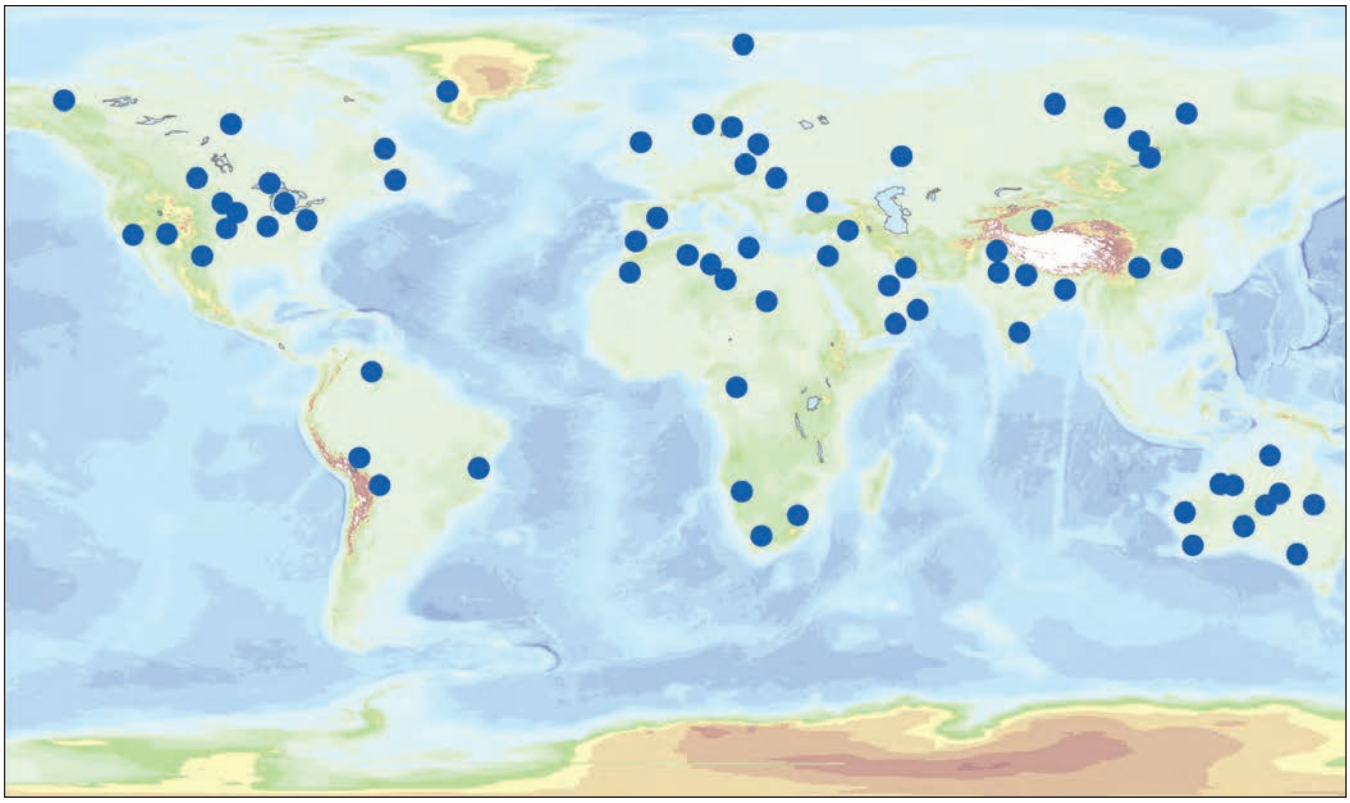

Figure 1. *Locations of Pre-Devonian Source Rocks. Potential source rocks as old as 1.69 billion years, such as the lacustrine Barney Creek Formation, have been identified in Australia. Pyrobitumens have been recovered from rocks as old as 2.7 billion years in the Witwatersrand basin (McKirdy and Imbus, 1992). Resource estimates for the Upper Proterozoic ranging from 665 to 1050 billion barrels of oil and 1236 to 2472 trillion cubic feet off gas have been published (Kontorovich et al 1991).*

Conventional hydrocarbon resources have been associated with pre-Devonian petroleum systems across the globe (**Figure 1**). These include the Neoproterozoic–Infracambrian Huqf Supergroup of the Oman basin, the Riphean - Vendian sequences of East Siberia, the Cambrian of the Sirte basin, the Ordovician of the Tarim basin, and the Silurian Qasaiba of Saudi Arabia. Although individual accumulations can be quite significant (e.g., Hassi Messaoud in Algeria has proven reserves of approximately 6.4 billion barrels), the relative importance of pre-Devonian-derived oils is limited compared to the global conventional resource-base. With growing interest in unconventional resources, the relative importance of these systems is expected to increase as plays such as the Ordovician Utica Shale of the Appalachian basin, the Cambrian of China, and the Silurian of Central and Eastern Europe develop.

The ages of these systems result in unique properties and amplify risks that may not exist in younger petroleum systems. Differences in the nature of the biomass contributing to pre-Devonian source rocks give rise to oils which may display unique geochemical characteristics. For example, there are some Precambrian oils where C_{29} steranes dominate even though land plants were absent. There are also Ordovician source rocks dominated by Gloeocapsamorpha prisca, a primitive prokaryote, which yield oils containing limited amounts of C_{20+} components and nearly lack pristane and phytane.

HGS Joint North American and International Dinner *continued on page 31*

HGS Joint North American and International Dinner *continued from page 29*

The potential for unconventional reservoirs in pre-Devonian systems may also be highly dependent upon the age of the system, as biological evolution influences the availability and nature of biogenic silica, an important factor controlling brittleness and fracability. Literature has shown that biogenic silica from different sources displays varying degrees of resistance to diagenesis, which builds the silica network and influences brittleness. For example, radiolaria developed during the Cambrian are more resistant to diagenesis than diatoms, which did not evolve until the Jurassic.

Risks associated with preservation of hydrocarbons may be amplified in pre-Devonian petroleum systems. Many such systems have been exposed to significant thermal stress resulting in cracking of oil and wet gas. Others have had complex tectonic histories potentially resulting in breaching of seals or changes in pressure-volume-temperature (PVT) conditions that may result in gas loss. Gas loss may also occur through diffusion from conventional reservoirs as a result of long residence times. ■

Biographical Sketch

Barry Katz received his B.S. in geology from Brooklyn College in 1974 and his Ph.D. from the University of Miami in 1979 in marine geology and geophysics. After receiving his doctorate, he joined Texaco's Bellaire Research Center where he held numerous technical and supervisory positions. He continued with Chevron after the merger in 2001, where he has been part of Chevron's Energy Technology Company. He currently serves as a team leader for hydrocarbon charge. His work has focused on the applications of geochemistry. He has been engaged in both research and technical support activities and has worked in approximately 50 basins onshore and offshore on six continents.

Dr. Katz has authored more than 75 papers and has edited five books. He serves as editor and reviewer for 10 journals, including editor-in-chief of the *Open Geology Journal,* and as a senior associate editor of the *AAPG Bulletin.* He has been chairman of International Ocean Discovery Program's (IODP) Environmental Protection and Safety Panel for the past decade. His honors include being named a Chevron Fellow and being named an Honorary AAPG Member. He served as Elected Editor for Houston Geological Society and currently serves as President of the Houston Geological Society.