**Monday, January 11, 2010**

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, you must pre-register on the HGS website 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.**

*John T. Etgen*

# What's New in Seismic Imaging?

From a geophysicist's perspective, the better the seismic image, the easier it is for the geologists to do their job. So in a sense, we are working hard to trivialize you! Of course in the hydrocarbon exploration and production business we're collectively always working on the frontiers: geologically, geographically, technically, scientifically, etc. So our ability to image and interpret things we want to understand is constantly challenged. Do recent geophysical trends have the potential to revolutionize the relationship between geophysical data and geological understanding and interpretation of the interior of the Earth? Maybe. I'll talk about these trends, which are the product of the incredible advances in computing power available for processing seismic data combined with clever thinking about how we collect seismic data.

*…regional and temporal variations in the phase relationships between sedimentary and glacioeustatic cycles may not be consistent with basic assumptions about stratigraphy…*

For a variety of reasons, the deepwater region of the Gulf of Mexico is one of our favorite proving grounds for geophysical technologies. There, industry faces many technical challenges around developing subsalt reservoirs. A few years ago BP pioneered two new seismic acquisition methods that when coupled with advances in seismic processing have made substantial improvements in our understanding of these reservoirs. I'll show you some examples of these methods applied to BP assets. One of the keys to motivating these advances was the use of seismic forward modeling. The ability to simulate realistic synthetic data and test hypotheses has become a critical part of geophysical science. We have even come to the point now where the same technology used to simulate data to the best of our ability is being used to process the data we actually acquire in the field. The future holds not only more clever ways of acquiring data, but ways of acquiring a lot more data.

If you hang around geophysicists enough, you're certain to hear them discuss "seismic velocities". We need good estimates of the speed that waves propagate in the subsurface to apply our imaging methods. We take great pains to do this quickly and accurately. However, many of the methods we used in the past are based on substantial simplifications to the way waves propagate. Recently, a method called "Waveform Inversion" has been gathering a lot of excitement. Historically the velocity "models" that geophysicists have created were lacking in information content at intermediate scales. We could find sharp changes in velocity, because they give rise to reflection events. We could find very long wavelength trends in the speed of wave propagation through travel-time tomography. Variations in wave speed that were tens to a few hundred meters in scale were not recovered. When we can recover features with velocity expressions at those scales, the results are dramatic in terms of connecting geology to geophysics. I'll show some examples of this technology and explore its potential for the future. ■

### Biographical Sketch

**John T. Etgen** received a B.S. in geophysical engineering from the Colorado School of Mines in 1985 and a Ph.D. in geophysics from Stanford University in 1990. From 1990 through 1998 he worked for Amoco Production Research Company in Tulsa, Oklahoma. From 1999 through the present he has worked for BP as a Senior Scientific Advisor for seismic imaging. His research interests include numerical wave propagation, seismic modeling and migration, and velocity estimation. In the spring of 2007 he took a sabbatical from BP and was a visiting associate professor at Stanford, supervising a research group in seismic imaging and teaching a seismic imaging class. In 2008 he and colleague Carl Regone were awarded the Virgil Kauffman Medal of the Society of Exploration Geophysicists for their work on wide-azimuth marine seismic.