Monday, November 3, 2003

Westchase Hilton • 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 Nonmembers & Walk-ups

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North American
Dinner Meeting

*by **Joshua Rosenfeld,** Yax Balam, Inc., Granbury, Texas and*
***James Pindell,** Tectonic Analysis Ltd., Cokes Barn, West Burton, West Sussex, England*

Early Paleogene Isolation of the Gulf of Mexico from the World's Oceans? Implications for Hydrocarbon Exploration and Eustasy

Deeply incised and backfilled paleo-canyons in lower Paleogene shelf strata along the western and northern Gulf of Mexico margin attest to large relative sea-level fluctuations but pre-date the accepted age for the onset of Cenozoic continental glaciation. Using Pleistocene canyons as a crude yardstick, the scale of these paleo-canyons suggests relative sea-level changes at least as large as the Pleistocene fluctuations. Therefore, we speculate that the water level in the Gulf of Mexico was drawn down while the Gulf was isolated from the world ocean during the Late Paleocene/Early Eocene interval. We suggest that the cause for isolation was the progressive collision of the Cuban arc with the Yucatán and Bahamas carbonate platforms, thereby temporarily closing off the southeastern Gulf of Mexico. In the Miocene Mediterranean and the Holocene Black Sea examples of marine basin isolation, evaporation greatly exceeded rainfall and runoff, and our examination of the Gulf of Mexico case suggests that the water level may have dropped at least once by at least several hundred meters, and possibly much more, below the level of the world ocean.

The recognition that the early Paleogene relative sea- level changes seen in the Gulf may pertain to basin isolation is grounds for treating "eustatic" curves derived for or from the Gulf with suspicion.

Implications for geology and hydrocarbon exploration in the Gulf may include

• bypass of enormous quantities of coarse detritus into the deep basin;
• seaward collapse of exposed clastic shelf margins;
• triggering and/or acceleration of salt evacuation (basinward "squeegee" effect of slumping sediments);
• release of gas hydrates from sediments under shallower and warmer water, thereby contributing to the ~100,000-year-long worldwide Paleocene/Eocene boundary heating event;
• development of secondary porosity in both platform and deep water carbonate sections by dissolution and phreatic diagenesis - (e.g., the Golden Lane/Poza Rica area of Mexico);
• hypersalinity and possible sea-bottom stagnation with source rock deposition in areas left marine;
• deposition of fine-grained condensed sections (seal and source rock) during flooding period(s) when connection with the world ocean was re-established, creating stratigraphic traps at canyon flanks and turbidite reservoirs within the canyons.

The recognition that the early Paleogene relative sea-level changes seen in the Gulf may pertain to basin isolation is grounds for treating "eustatic" curves derived for or from the Gulf with suspicion. In addition, catastrophic basinward transfer and collapse of mass near the shelf edges would have caused isostatic unloading (rebound) of shelf margins that was proportional to the mass transfer. In the case of a discreet slumping event, such as the Lavaca "Megaslump" event of south Texas, this effect may have caused uplift of several to a few tens of meters of footwall areas within about 100 km from the slump. Larger downslope movements such as that related to the collective Wilcox fault province would have caused far larger isostatic rebounds on the shelf, perhaps in excess of 100 m if sedimentation did not keep pace with faulting.

A body of circumstantial evidence continues to grow in support of this hypothesis, whose potential implications, both academic and commercial, merit further **North American** *continued on page 17*

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investigation. Integration of information from Cuba, Mexico, the United States, and the Bahamas will be required to fully test the hypothesis. ■

Biographical Sketch

Joshua Rosenfeld earned his bachelor's degree at the City College of New York in 1960, his master's degree at the University of Miami in 1978, and his PhD at the State University of New York – Binghamton in 1981. His early career included geological reconnaissance, mineral exploration, and mining geology in Central America followed by 19 years of petroleum exploration experience with Amoco plus 2 years with Veritas. Most of this time was spent studying areas in and around the Gulf of Mexico within the United States, Mexico, Guatemala, and Belize. He is presently semi-retired in Granbury, Texas.