Monday, April 28, 2008

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

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

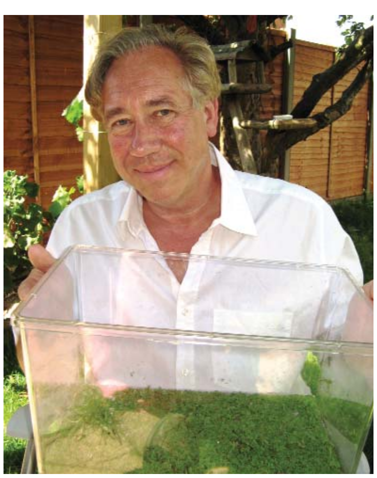
The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476 (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

by ***Dr. Jonathan Bujak***
Bujak Research Limited

From Greenhouse to Icehouse—The Azolla Trigger: Implications for Climate Change and Arctic Petroleum Source Rocks

The modern icehouse world is characterized by bipolar glaciation, resulting from relatively low levels of atmospheric CO_2 and thermal isolation of the poles from lower latitude warm oceanic currents. In contrast, the Mesozoic greenhouse world had no permanent glaciation at either pole, with the greenhouse state continuing through the K/T boundary into the Paleocene.

At the end of the Paleocene, the Paleocene-Eocene Thermal Maximum was triggered by extreme levels of greenhouse gases due to extensive volcanism and the expulsion of submarine methane hydrates. This resulted in the highest temperatures known for the Cenozoic, characterizing a super-greenhouse state that persisted through the Early Eocene. It is therefore surprising that various independent parameters indicate that the supergreenhouse was truncated in the earliest Middle Eocene by the initial shift toward modern icehouse. Estimates of atmospheric CO_2 values show a major decrease at this time, but this cannot be explained by "normal" sequestration processes. Instead, a unique geological event is proposed to explain this fall, centered on processes within the Arctic Ocean Basin.



"The Azolla Model" is based on Arctic Coring Expedition (ACEX) cores from Lomonosov Ridge plus unpublished data from 65 Arctic petroleum exploration wells (Bujak Research non-exclusive well studies). The model combines oceanographic reconstructions for the basin with a major decrease in greenhouse gases during the middle Eocene. The Early Eocene Arctic Ocean Basin was largely enclosed following uplift of the Greenland Mantle Plume, with elevated temperatures, evaporation and precipitation leading to increased runoff and the development of extensive surface freshwater layers. These were colonised in the earliest Middle Eocene by floating mats of the opportunistic freshwater fern Azolla, which persisted for up to 800,000 years as a series of repeated cyclical events.

The model also indicates the deposition of potentially widespread petroleum source rocks across the Arctic due to the massive carbon drawdown.

Modern Azolla is one of the fastest growing plants on the planet and draws down large quantities of carbon and nitrogen. Calculations of carbon drawdown combined with the large potential areas of Azolla development in the Arctic, plus the 800,000-year time frame indicate levels of CO_2 sequestration that are easily sufficient to shift the world from Mesozoic—Early Eocene greenhouse towards the modern icehouse world. The model also indicates the deposition of potentially widespread petroleum source rocks across the Arctic due to the massive carbon drawdown. It is currently being tested by multidisciplinary teams at ACEX and various universities worldwide, and it has already attracted considerable attention including articles in *National Geographic* (May 2005), *Nature* (June 1, 2006), and the *New York Times* (November 20, 2004).

Biographical Sketch

Jonathan Bujak received his BS and PhD at the University of Sheffield and has worked with Mobil Oil, Petro-Canada and the Geological Survey of Canada. He has been involved in Arctic exploration and research since 1973, including the Lomonosov Ridge (LOREX) and Arctic Coring (ACEX) expeditions. Dr. Bujak has affiliations with various universities worldwide, more than 100 scientific publications, and is senior partner of Bujak Research International, specializing in biostratigraphic consulting related to petroleum exploration and climate change. He can be contacted at jonathan@bujakresearch.com.