Monday, May 20, 2002

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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International Explorationists Dinner Meeting

by Christopher R. Scotese, PALEOMAP Project, University of Texas at Arlington

3D Paleogeographic and Plate Tectonic Reconstructions: the PALEOMAP Project is Back in Town

Figure 1. *Reconstruction of present-day bathymetry and topography in paleo-coordinates for the late Miocene.*

The PALEOMAP Project is known for its synthesis of the plate tectonic, paleogeographic, and paleoclimatic history of ocean basins and continents during the last 1,100 million years, and the illustration of Earth history through maps, computer animations, and Geographic Information Systems (GIS). In this talk, Chris will present his latest 3D paleogeographic and plate tectonic maps and animations *(see cover illustration of Paleo Topography and Bathymetry of the Late Cretaceous 80 MMYA)*.

Global plate tectonic, paleogeographic and paleoclimatic reconstructions will be presented for the early Miocene, Late Cretaceous, Permian, and Devonian. These reconstructions use 3D paleotopographic and paleobathymetric information to represent the surface of the Earth and the shape and depth of the ocean basins. Each map is composed of over 6 million pixel-points that capture digital elevation information at a 10 x 10 km geographic resolution and 40 meter vertical resolution. This quantitative, digital approach to paleogeographic modeling permits new ways to visualize and analyze the changing surface of the Earth through time using standard GIS (ESRI 3D Analyst, Spatial Analyst), 3D modeling, and computer animation techniques.

The process of building a 3D paleogeographic map begins with the digital topography and bathymetry compiled by NOAA, the BEDMAP Project, and the IBCAO Arctic Project. The topographic and bathymetric information is gridded at a 6-minute resolution, and the individual data points (pixel-points) are

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rotated back to their paleopositions using the global plate tectonic model of the PALEOMAP Project. The resulting map is reconstruction of present-day bathymetry and topography in paleo-coordinates (late Miocene, Figure 1).

In the next processing steps, the digital elevation and bathymetric values are corrected to take into account the complex effects of thermal subsidence, glacial rebound, tectonic and volcanic activity and erosion. The result is a revised global paleotopographic and paleobathymetric surface. To complete the 3D paleogeographic model the new topographic surface is digitally "flooded" by raising or lowering sea level according to the estimates from eustatic sea level curves.

The new paleogeographic map raises interesting geological questions. For instance, the shorelines shown in the early Miocene map (Figure 2) are familiar but not identical to today's coastlines. Florida is flooded, as are the molasse basin of the Alps, the Persian Gulf foredeep and the peri-Caspian region. But surprisingly, so are the Amazon and Parana basins. Conversely, if sea level were higher, one might expect that Southeast Asia would be flooded. However, geologic evidence indicates that Southeast Asia was emergent during the early Miocene. This suggests that dynamic plate tectonic forces associated with subduction in the Java-Sumatra trench may be "pulling-down" the leading edge of Indonesia.

The digital topographic and bathymetric models presented here are currently being used for paleoclimatic and paleoceanographic simulations. They provide the framework and foundation for a detailed and quantitative modeling of Earth surface processes since the late Precambrian.

Biographical Sketch

CHRIS SCOTESE is professor of geology at the University of Texas at Arlington, where he teaches global tectonics, basin analysis, and GIS. For more than 25 years, he has been making maps and animations showing the plate tectonic, paleogeographic, and paleoclimatic evolution of the continents and ocean basins. His maps can be found in *National Geographic*, *Scientific American* as well as in numerous scientific books and journals.

He received his PhD at the University of Chicago, started the PLATES Project at Institute for Geophysics (Austin), was a senior research geologist at Shell Development Company (Houston), and together with Malcolm Ross developed GIS software to produce plate reconstructions (PALEOMAP Foundation). His award-winning website, www.scotese.com, describes with maps and animations the current research work of the PALEOMAP Project.

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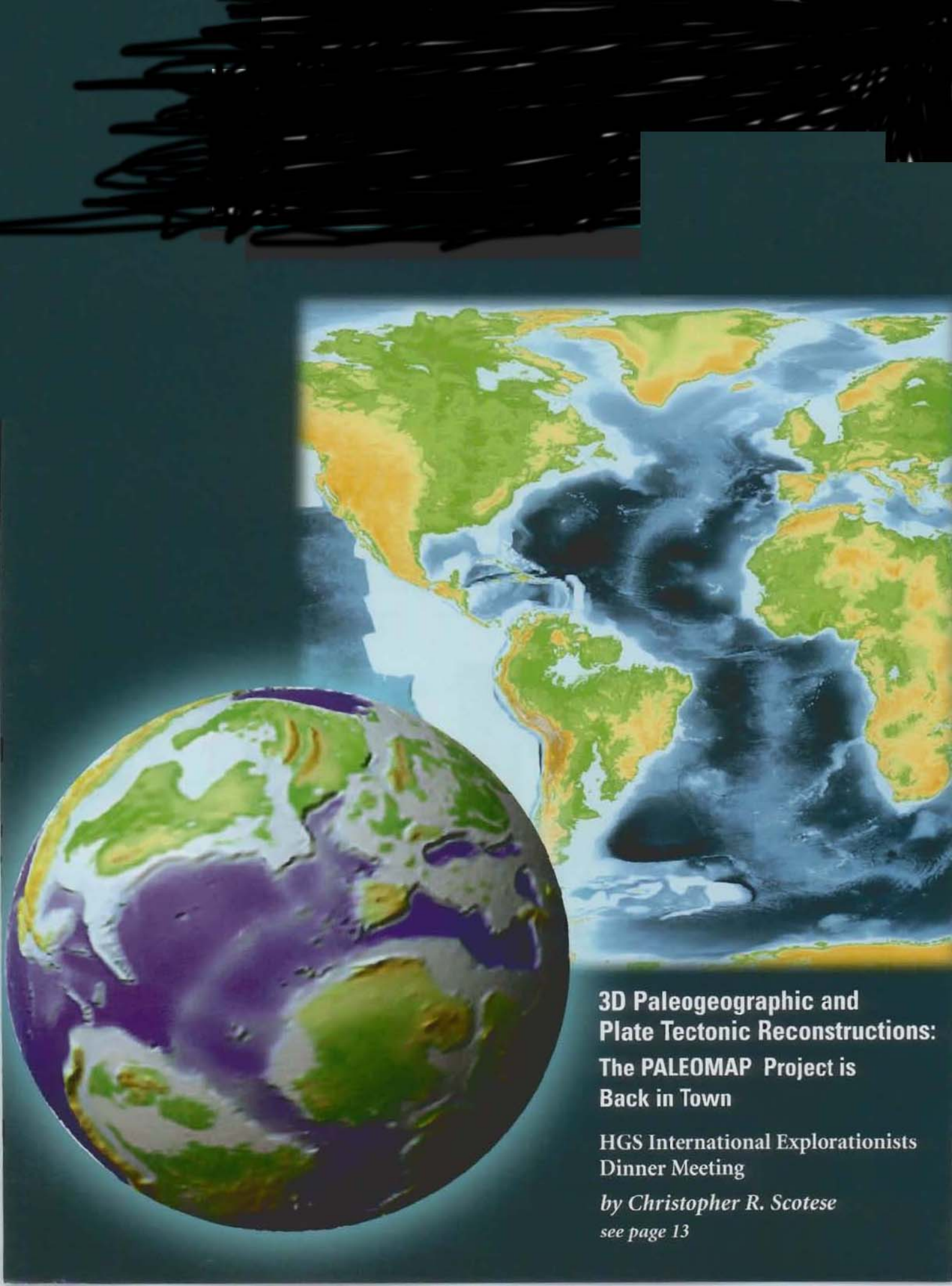
Figure 2. *Paleobathymetry and topography for the early Miocene.*



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