EDITORS' CHOICE

edited by Gilbert Chin

GEOPHYSICS

The Effects of Deglaciation

Our knowledge of the motion of Earth's major tectonic plates, which move at velocities of up to several centimeters per year, has come primarily from observations and dating of marine magnetic anomalies. As mid-ocean ridge magmas cooled, they locked in magnetic signatures that recorded the orientation of Earth's magnetic field and allowed the spreading and the geometry of ocean crust to be reconstructed. More recently, global positioning system (GPS) measurements, which have been made for about 20 years, have provided comparable resolution and perhaps a better indication of current plate motions.

Sella *et al.* provide a synthesis of GPS data from the past decade and compare it with the best estimates from magnetic anomalies. Overall, the agreement is good, although there are differences in the motions across the North American, South American, and Caribbean plate boundaries. The resolution of the GPS data is sufficient to show that the current plate motion for the Antarctic, North American, and Eurasian plates has been perturbed by the melting of the major ice sheets during the past 15,000 years. — BH

J. Geophys. Res. **107**, 10.1029/2000JB000033 (2002).

EVOLUTION

A Northerly Migration

Many groups of organisms have members in both Africa and South America. These disjunct distributions are commonly attributed either to an origin on the Gondwanan supercontinent before its breakup around 100 million years ago (Ma) or to long-distance dispersal across the widening Atlantic Ocean.

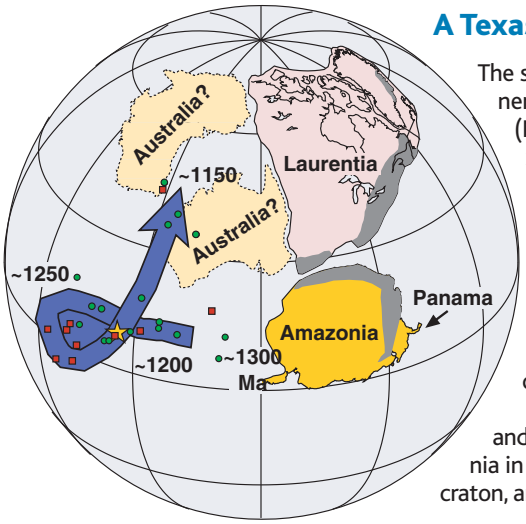
In a molecular phylogenetic analysis of the plant family Malpighiaceae, Davis *et al.* provide evidence for a new scenario. The Malpighiaceae are a family of trees, shrubs, and lianas occurring throughout the tropics, with a peak of diversity in the New World. Their analysis indicates that the family originated in what is now northern South America about 64 Ma, well after the breakup of Gondwana; at least six separate transoceanic dispersal events would have to have taken place to produce the current distribution, which seems unlikely. Instead, Davis *et al.* propose that the early Malpighiaceae spread mostly overland across the Northern Hemisphere Laurasian supercontinent, during the climatically favorable thermal maxima in the Eocene and Miocene epochs. — AMS

The paddle-shaped petal of Malpighiaceae.

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.102175899 (2002).

GEOLOGY

A Texas-Sized Collision



Collision between Amazonia and Texas (southernmost gray shading in Laurentia), with polar wander path in blue.

The supercontinent Rodinia, an accretion of all the continents, existed between 1200 and 600 million years ago (Ma). One piece of ground truth for this tectonic puzzle is the Grenville Province, a region of metamorphism and deformation that runs from Labrador to the Llano Uplift in Texas and formed the coastline of Laurentia. About 1200 Ma, the Grenville province collided with a cratonic piece (Amazonia) of South America. The rocks in the uplift provide evidence for this long-ago collision; however, it has been difficult to identify which piece of Amazonia collided with this proto-Texas region.

Tohver *et al.* studied a large sequence of gabbros and basalts from the Nova Floresta formation of Rondônia in western Brazil. These rocks are part of the Amazon craton, and Ar-Ar dating indicates that they are 1200 million years old. Magnetic characteristics of the rocks were used to determine the paleomagnetic pole and to fix the paleogeographic position of Amazonia. It appears that around 1200 Ma, one corner of this craton (oriented roughly 180 degrees from its present-day position) collided with the proto-Texas region and created the Llano Uplift. — LR

Earth Planet. Sci. Lett. **199**, 185 (2002).

MICROBIOLOGY

Getting Enough Air to Survive

After infection by tubercle bacteria, the host battles the invader to a standoff, at least as long as the immune system functions effectively. Upon entry, the pathogen subversively invades the immune system through inactivated macrophages; the distressed and infected host cells then emit signals that recruit activated macrophages to encapsulate the site of infection in a characteristic granuloma, or tubercle. Nitric oxide (NO) produced by these macrophages controls pathogen growth by inhibiting aerobic respiration in the bacteria and contributing to the formation of toxic peroxynitrite. Tubercle bacteria do not have flavohemoglobins (which other pathogens use to detoxify NO) but instead have three types of distinctive truncated hemoglobins (trHbs). Ouellet *et al.* have found that the trHbs act in concert in mycobacteria to acquire enough oxygen to support the conversion of NO into innocuous nitrate. — CA

Proc. Natl. Acad. Sci. U.S.A. **99**, 5902 (2002).

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