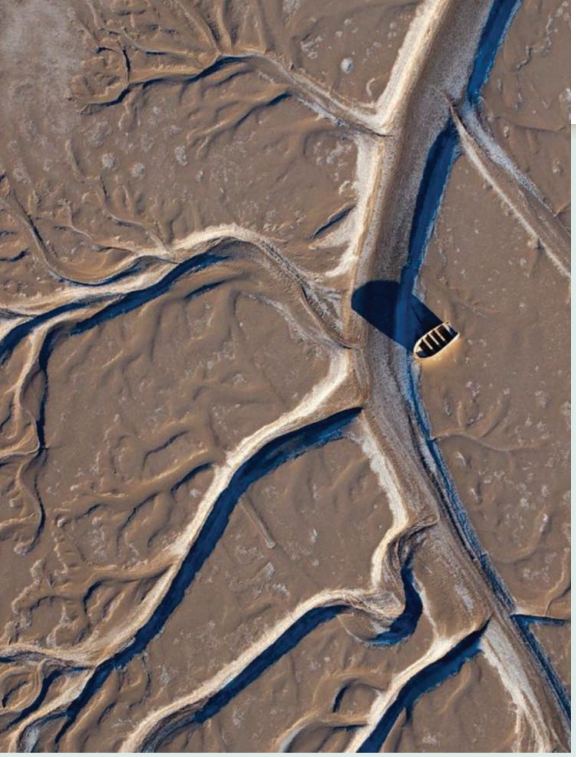
EDITED BY CAROLINE ASH AND MARIA CRUZ



<< River Food Chains

Food chain length, or the number of organisms involved in any eat-or-be-eaten relationship, is a key property of aquatic habitats that regulates nutrient cycling, energy flow, and carbon exchange between aquatic ecosystems and the atmosphere. Investigating river food webs in North American watersheds, **Sabo *et al.*** (p. 965, published online 14 October) found discharge variation governed the link between ecosystem size (watershed area) and food chain length. River-drying truncated food chain length because intermittent streams have much higher discharge variation than perennial rivers. These results could be important for the management of rivers as drought and climate change may increase the frequency of river drying and discharge variability.

The Making of Amazonian Diversity

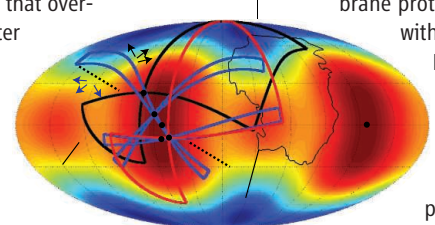
The biodiversity of the Amazon Basin is legendary, but the processes by which it has been generated have been debated. In the late 20th century the prevalent view was that the engine of diversity was repeated contraction and expansion of forest refugia during the past 3 million years or so. **Hoorn *et al.*** (p. 927) analyze findings from a diverse range of disciplines, including molecular phylogeny, ecology, sedimentology, structural geology, and palaeontology, to offer an overview of the entire history of this region during the Cenozoic era (66 million years ago). The uplift of the Andes was a pivotal event in the evolution of Amazonian landscapes because it continually altered river drainage patterns, which in turn put a variety of pressures on organisms to adapt to changing conditions in a multiplicity of ways. Hence, the diversity of the modern biota of the Amazon has more ancient origins than previously thought.

The Power Behind P450

Drugs, toxins and a range of metabolic substrates are detoxified in the liver by family of iron-containing enzymes called cytochrome P450. The iron component transfers oxygen to compounds that are often highly resistant to chemical reaction, but we know very little about the mechanism of this vital detoxification process. **Rittle and Green** (p. 933; see the Perspective by **Sligar**) have managed to capture the P450 reaction intermediate by freezing a solution of the enzyme as it reacts with an oxidant. Spectroscopic techniques and kinetic studies then revealed an iron(IV)oxo intermediate that passes its oxygen along to the substrate with remarkable speed.

Liquid Rock Beginnings

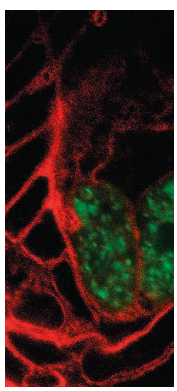
It has long been known that the lunar farside highlands constitute the highest region on the Moon. **Garrick-Bethell *et al.*** (p. 949) show that the topography and crustal thickness variations of this elevated region obey a single, simple mathematical function that overall describes one-quarter of the Moon. The key to explaining this find may lie with a similarity between the hot, ancient Moon and one of the icy moons of Jupiter, Europa. Like today's Europa, the Moon's crust once floated on a subsurface ocean, except that it was made of liquid rock, not water. The same tidal effect that operates on Europa's crust, caused by Jupiter's gravitational force, would have also operated on the early Moon because of Earth's influence, and would have produced a pattern of crustal thickness variations similar to that observed in the farside highlands.



Adding CCA

Translation of a gene sequence into protein is mediated by transfer RNA (tRNA), which has a specific cytosine-adenine (CCA) tail to which amino acids attach and is recognized by enzymes. The tail, however, does not have a DNA template, and instead CCA-adding enzymes bolt on the additional nucleosides. Crystal structures have shown how these enzymes achieve specificity for cytosine, but we did not know how they select the final adenine until **Pan *et al.*** (p. 937) described CCA-adding enzyme structures captured at several stages of the reaction. Crystallized enzymes were complexed with a tRNA mimic and the respective cytosine or adenine triphosphate. The final adenine was discovered to be incorporated by the mediation of a single Mg^{2+} ion in the enzyme, but no more cytosine could be attached because its triphosphate could not then get into the right position for the reaction.

Fungal Invasion or Pollination?



When pollen finds a compatible flower, it grows a pollen tube which must find the egg cell and release the sperm it carries. In searching for genes that affect pollen tubes in *Arabidopsis*, **Kessler *et al.*** (p. 968; see the Perspective by **Govers and Angenent**) found a gene previously implicated in susceptibility to powdery mildew infection (the *NTA* gene). The *NTA* gene encodes a seven-pass transmembrane protein, which, in combination with a receptor-like kinase called Fer, is needed for successful pollen tube growth; both sets of proteins are also needed for successful powdery mildew invasion. These processes hence share common mechanisms of cell invasion, but where they diverge is in the outcome: embryogenesis or pathogenesis.

Odd Magnetar

Magnetars are neutron stars that are widely thought to be powered by extremely high magnetic fields. Using data from three different x-ray observatories, **Rea *et al.*** (p. 944, published online 14 October) show that a previously known magnetar has a magnetic field that is much smaller than those of other magnetars. A strong magnetic field is thus not a necessary requirement for a neutron star to show magnetar-like behavior, implying that this population is wider than was previously thought.

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