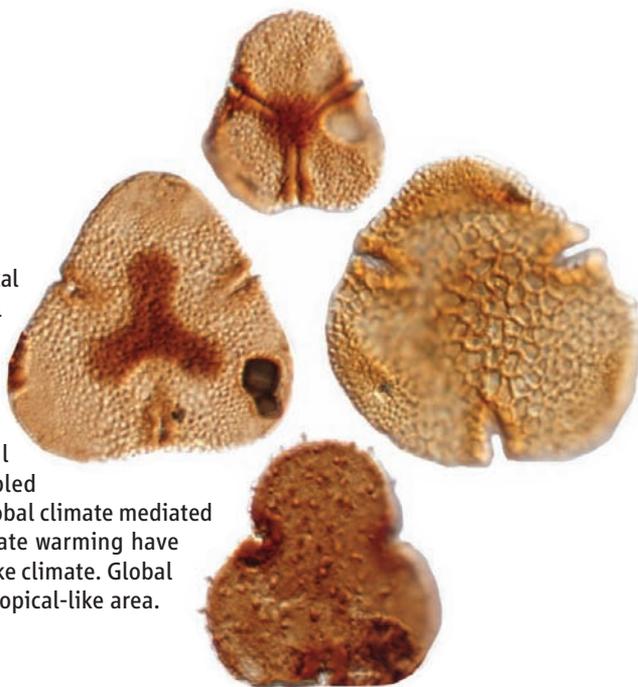


Ancient Tropical Forest Diversity

Understanding how the high plant species diversity of tropical forests arose has been hampered by the scant fossil evidence of lowland tropical rainforest species diversity in the geological record. **Jaramillo *et al.*** (p. 1893) now present a 45-million-year time series of plant diversity in the Neotropics with an unparalleled resolution. Changes in tropical-biome area were the main factor driving local tropical diversity. The observed diversity pattern resembled reconstructed global temperatures, which suggests that global climate mediated the change in tropical-biome area. Past episodes of climate warming have driven local speciation by increasing the area of tropical-like climate. Global cooling, however, drove local extinction by reducing the tropical-like area.

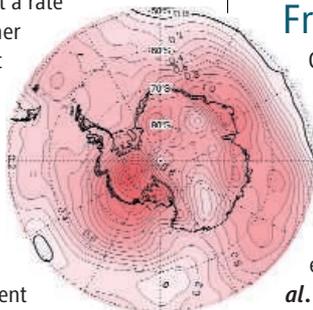


Fast Spinning

Pulsars are fast-spinning neutron stars that emit flashing twin radio beams. For the last 23 years, the speed limit was set by the first such pulsar discovered, which rotates at 642 hertz. **Hessels *et al.*** (p. 1901, published online 12 January; see the Perspective by **Grindlay**) have now found an even faster pulsar that spins 716 times a second. This extreme pulsar was found with the giant Green Bank Telescope during a survey of the globular cluster Terzan 5. From the pulsar's rotation speed, the star's diameter is calculated to be less than 16 kilometers, and limits can be placed on mechanisms for braking of the system by gravitation radiation. The faintness of this pulsar suggests that even faster ones await discovery.

Up in the Middle

Meteorological observations show that surface temperature of the western side of the Antarctic Peninsula has increased at a rate faster than that of any other region on Earth in the last 50 years. However, there have been few statistically significant surface temperature changes across the rest of Antarctica, which may even have cooled slightly in some places during recent decades. In order to help provide a more complete picture of how temperatures in the Antarctic troposphere have changed, **Turner *et al.*** (p. 1914) examined recently released radiosonde data from 1971 to 2003. The Antarctic middle troposphere has warmed by 0.5°C or



more per decade during the winters during that time. Although this rise has been detected, its cause is still unknown.

Uplifting Off Sumatra

Rupture of the Sunda megathrust during the giant earthquake of 28th March 2005 with a moment magnitude of 8.7 produced spectacular tectonic deformation along a 400-kilometer strip of the western Sumatran archipelago. **Briggs *et al.*** (p. 1897; see the Perspective by **Bilham**) combine measurements of uplifted coral and continuous satellite records to map the pattern of deformation in the region. They reveal belts of uplift as high as 2.9 meters parallel to the trench and a 1-meter-deep subsidence trough between the islands and main Sumatran coast. Two barriers to the propagation of this earthquake are identified.

Frictionless Spinning

One of the principal changes in moving a chemical system from the gas to solution phase is a huge increase in collision frequency. Constant bombardment by solvent molecules tends to quickly equilibrate any excess energy that a solute may acquire, for example, by photoexcitation. **Moskun *et al.*** (p. 1907) show that if a solute is given a sufficient burst of angular momentum, it can transiently push aside the surrounding solvent and rotate for picoseconds as if it were in a collisionless gas phase environment. Rapidly spinning CN fragments were generated with specific energies by ultraviolet photolysis of ICN

in alcohol or aqueous solution. The persistent coherent rotation was well reproduced by simulating CN rotors in liquid argon, which suggests that solvent structure had little impact on the initial phase of nearly frictionless spinning.

High-Performance Superconducting Wires

Potential applications of high-temperature superconductors have included high-efficiency power transmission and levitating trains. However, these applications require wires that can carry huge currents and still remain superconducting in high magnetic fields. **Kang *et al.*** (p. 1911; see the news story by **Service**) have fabricated so-called second-generation superconducting wires, flexible metal substrates coated with thick high-temperature superconducting material, and show that they can meet the performance targets that have been set by industry for many applications.

Drying Streams

Africa is particularly vulnerable to the tragic consequences of drought, and climate models project that the mean annual rainfall in the northern and southern sections of the continent will decrease significantly during this century. **De Wit and Stankiewicz** (p. 1917, published online 2 March) examine what effects these expected changes in precipitation will have on perennial stream flow using a continent-wide database of all of the rivers and lakes in Africa and the fields of precipitation projected by a collection of climate

change models. Perennial drainage could be significantly reduced in 25% of Africa by the end of the century, which would place an even greater burden on already struggling populations.

Highlighting the Niche

Replenishment of hair, skin, mucosal surfaces, and blood all depend on a steady supply of replacement cells that are generated by a small population of quiet but dedicated stem cells. These sorts of stem cells seem to reside in particular physical locations, or niches, within the organism. **Moore and Lemischka** (p. 1800) now review stem cell niches, including what they look like and how they direct the function of the stem cells, and also explore some of the questions about them that remain open.

Kaposi's Virus Entry Receptor

Kaposi's sarcoma-associated herpes virus (KSHV) is responsible for causing the debilitating life-threatening lesions often observed in patients with HIV/AIDS. **Kaleeba and Berger** (p. 1921) now identify human xCT, the light chain of human cystine/glutamate transporter as a receptor for the virus necessary and sufficient for its entry into target cells. Recombinant xCT rendered otherwise nonpermissive target cells susceptible to KSHV glycoprotein-mediated cell fusion and to KSHV virion entry, and antibodies to CT blocked KSHV fusion and entry with naturally permissive target cells.

A Mitotic Function for Lamin B

Nuclear lamins line the nuclear envelope to make up the nuclear lamina, which helps to maintain the structure and function of the nucleus. During cell division, the nuclear lamina disassembles, and the role for the lamins, if any, in mitosis is unclear. **Tsai et al.** (p. 1887, published online 16 March) now show that lamin B is required for the formation of the mitotic spindle. In cell extracts, lamin B formed a matrix with which spindle-assembly factors (which promote assembly of microtubules) were associated. Thus, lamin B is a key part of the so-called "spindle matrix," a structure known to be associated with assembly of the spindle but whose molecular constituents have not been described.



Accentuate the Positive

The cytokine interleukin-2 (IL-2) facilitates proliferation of naïve T cells, but several studies have shown that antibodies that bind IL-2, which at first glance should be inhibitory, can promote the expansion of subsets of memory CD8⁺ T cells. Thus, IL-2 somehow might inhibit suppressive T cell populations that would otherwise prevent memory CD8⁺ T cell expansion. **Boyman et al.** (p. 1924, published online 16 February; see the Perspective by **Prlic and Bevan**) now show that instead, binding of antibodies to IL-2 augments the direct activity of the cytokine on memory CD8⁺ T cells themselves. Immune complexes form that focus local levels of IL-2 through presentation by Fc receptors. These observations could be important to consider in therapies that involve the manipulation of IL-2 and other cytokines, such as bone marrow transplantation and tumor immunotherapy.

Keeping the Wheat Near the Chaff

Wild grasses tend to release their mature seed fairly easily to facilitate widespread propagation. Domesticated grasses, such as wheat, rice, maize, and oat crops, do not release their grain as easily, and indeed would be of little value if the grain were to fall willy-nilly to the ground. **Li et al.** (p. 1936; see the cover and the Brevia by **Tanno and Willcox**) describe a one-nucleotide substitution in a rice gene that encodes a putative transcription factor that appears to account for this difference. The gene is expressed late in grain development at the junction between the seed and the mother plant.

The Making of Complex Carbohydrates

The cell walls of grasses differ from those of other plants in that they contain a particular type of polysaccharide, glucan. **Burton et al.** (p. 1940; see the Perspective by **Keegstra and Walton**) have now identified the (1,3;1,4)- β -D-glucan synthase genes of rice, which are critical for production of the grain-specific glucan. The rice gene was identified by comparison with quantitative trait loci of barley that affect its malt quality. Improved understanding of the complex carbohydrate biochemistry behind cell walls could lead to modifications tailored for specific purposes, whether as fuel, food, or fiber.

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