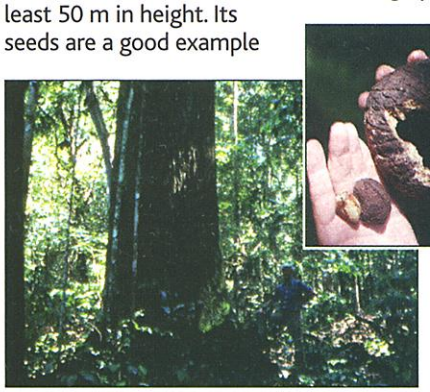
EDITORS' CHOICE

edited by Gilbert Chin

ECOLOGY

No Shortage of Nuts

The Brazil nut tree, *Bertholletia excelsa*, is a large Amazonian forest tree that can reach at least 50 m in height. Its seeds are a good example of an economically important nontimber forest product, offering potential for conservation incentives: Where forest is destroyed surrounding *Bertholletia* trees, the fall in pollinator populations can severely reduce the crop. Even in relatively undisturbed forest, however, Brazil nuts can be gathered with such efficiency that doubts have been raised about the long-term sustainability of the crop if insufficient seeds remain to produce viable new trees. To assess the impact of exploitation on tree populations, Zuidema and Boot examined the demography of *Bertholletia* in Bolivian forests where the nuts have been harvested for many decades. Despite extraction rates of >90% of the nuts, a matrix population model suggests that the population levels of seedlings and saplings will be sufficient to sustain the crop for several decades, if not longer. — AMS



***Bertholletia* and its eponymous nut.**

J. Trop. Ecol. **18**, 1 (2002).

GEOPHYSICS

Turn and Lift

The western coast of South America trends to the north along much of Chile but then turns to the northwest near Arica, at the Peru-Chile borders. Abundant paleomagnetic data have indicated that this bend formed by rotation of this part of South America, presumably in association with subduction along its western margin. But the timing of this rotation—subduction has continued for tens of millions of years here—and its relation to the uplift of the Andes has been uncertain. Rousse *et al.* analyzed rocks with ages from 18 to 6 million years ago to resolve the timing and origin of the bend. Their data imply that most of the bending and rotation took place between 7 and 9 milllion years ago, at a time when the Andes were uplifted rapidly. — BH

Geology **30**, 75 (2002).

MATERIALS SCIENCE

Stabilized Self-Assembly

Colloidal crystals show tremendous potential in the areas of photonics and catalysis, because it is possible to create repeating structures with a tailored periodicity. A key to realizing this potential is the development of a fabrication technique that causes the colloidal particles to assemble in a controllable fashion into the desired structure. One approach is to use solutions of highly charged colloids in which the interparticle distances can be varied by adjusting the charge density through the addition of more particles. The mechanical strength of the crystals that form, however, is limited by the dispersion medium, and the crystals are highly sensitive to temperature and ionic impurities. Lellig *et al.* have overcome this limitation by the in situ polymerization and cross-linking of a polyacrylamide hydrogel to immobilize the colloidal crystals once they have assembled. The stabilized crystals were then used as a template for the electrodeposition of silver from solution, which formed a hexagonal array around the colloidal particles. — MSL

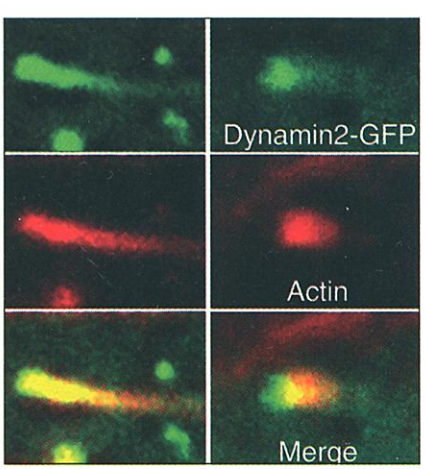
Angew. Chem. Int. Ed. **41**, 102 (2002).

CELL BIOLOGY

Dynamin and Propulsive Comet Tails

The guanine nucleotide triphosphatase dynamin was found several years ago to form spectacular spiral collars on the cytoplasmic surface of deeply invaginated indentations (or pits) of the plasma membrane. Subsequent studies have tried to elucidate the functional contribution of dynamin to the process by which these pits are pinched shut, releasing endocytic vesicles into the cytosol.

Lee and De Camilli, and Orth *et al.*, both suggest that dynamin may also have a role to play in the regulation of actin dynamics, which may, in turn, relate to its importance in regulating endocytosis. When the pathogen *Listeria monocytogenes* invades a host cell, an actin filament is nucleated, and this comet-like actin tail serves to propel the bacterium. Similar comet tails can be observed to form behind endocytic vesicles, particularly when cells are induced to express high levels of phosphatidylinositol kinases. The two groups show that comet tails contain dynamin, concentrated proximal to the bacterium or vesicle, and that the dynamin is important for the formation of the tails themselves and may modulate the speed of comet movement. — SMH



A dynamin (green) and actin (red) comet.

Proc. Natl. Acad. Sci. U.S.A. **99**, 161; 167 (2002).

MICROBIOLOGY

Subverting Surveillance

Chlamydia trachomatis and *C. pneumoniae* are intracellular bacteria that are responsible for several serious diseases. As well as blinding eye infections, the former causes chronic sexually transmitted infections that can result in infertility, and the latter causes often asymptomatic and undetected respiratory infections associated with the development of atherosclerosis. Fan *et al.* show that these bacteria secrete into the host cell factors that induce degradation of a host transcription factor known as RFX5. This component is required for a key stage in the processing of foreign material by host cells, because it promotes the expression of major histocompatibility complex antigen (MHC). If MHC cannot be expressed on the host cell surface in combination with peptide fragments from the pathogen, then the pathogen will remain

CONTINUED ON PAGE 589

SOURCE: (TOP) HAROLD E. BURKHART, PH. D./VIRGINIA TECH DEPARTMENT OF FORESTRY; (INSET) PHOTODISC; (BOTTOM) LEE AND DE CAMILLI, *PROC. NATL. ACAD. SCI. U.S.A.* **99**, 161 (2002)

undetected by host's immune surveillance machinery. However, it is not yet known how the chlamydial factors themselves evade immune surveillance. — CA

Infect. Immun. **70**, 345 (2002).

GEOPHYSICS

Making a Connection

Earth is protected from the solar wind, a stream of highly energetic ions and electrons, by its magnetic field. Some particles do, however, penetrate this shield during magnetic storms, causing disruption to satellites, communications, and power supplies, as well as generating striking auroral displays at high latitudes. These penetrations are believed to occur by means of a process called "magnetic reconnection," in which the geomagnetic field and the interplanetary magnetic field short-circuit, providing easy access to the magnetosphere along the open field lines. Many aspects of this process remain unclear, and advances are hampered by the fact that the reconnection process is difficult to observe.

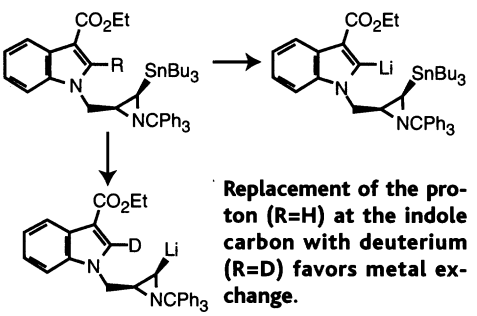
Collisions between particles cannot be the main driving force for reconnection, because the solar wind and the magnetosphere are two very sparse plasmas. Anomalous resistivity—the scattering of particles through interaction with wave fields—has been implicated, but analytical resistivity estimates were too low to account for observations. Watt *et al.* have simulated wave-particle interactions caused by ion-acoustic instabilities. They conclude that the previous analytical estimates may have been too low by three orders of magnitude, because quasi-linear effects were assumed to be weak. Other instabilities that cause anomalous resistivity may have been similarly underestimated. The authors caution that their one-dimensional simulations cannot capture all of the processes that occur in the real three-dimensional system. Nevertheless, the results suggest that magnetic reconnection may be easier to achieve than previously thought, bringing theory more in line with observation. — JU

Geophys. Res. Lett., 10.1029/2001GL013451.

CHEMISTRY

Small, Yet Effective

Organic syntheses often require an intricate and ingenious choreography of reactions—to add needed fragments, to subtract excess pieces, and to protect and deprotect otherwise vulnerable parts of the molecule.



Replacement of the proton (R=H) at the indole carbon with deuterium (R=D) favors metal exchange.

In this last category, blocking groups usually exert their effects directly through masking; for instance, in the use of *t*-butyloxycarbonyl to cover up the NH_2-terminal amino functionality during peptide synthesis. Vedejs and Little describe how a small blocking group, deuterium, helps to direct an anionic cyclization toward the desired product. The critical difference appears to be a large kinetic isotope effect; indole C-H lithiation is favored over tin-lithium exchange by about 10 to 1, but tin-lithium exchange is favored by about 4 to 1 over indole C-D lithiation. — GJC

J. Am. Chem. Soc., 10.1021/ja0120835.

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

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Protein Translation and LTP

Synaptic plasticity that underlies learning and memory processes, such as long-term potentiation (LTP), requires the synthesis and localization of proteins to facilitate changes in synaptic strength. Tang *et al.* report that a translational signaling pathway involving the rapamycin-sensitive kinase known as mammalian target of rapamycin (mTOR) and its downstream effectors, eukaryotic initiation factor-4E–binding protein and eukaryotic initiation factor-4E, are present in the cell body and dendrites of rat hippocampal neurons. These proteins were particularly enriched in postsynaptic sites. When hippocampal slices were treated with rapamycin, the magnitude of late-phase LTP decreased, and rapamycin also inhibited the stimulatory effect of brain-derived neurotrophic growth factor on LTP. How synaptic activity activates the mTOR signaling pathway during LTP will be of interest. — LDC

Proc. Natl. Acad. Sci. U.S.A. **99**, 467 (2002).

CREDITS: VEDEJS AND LITTLE, *J. AM. CHEM. SOC.*, 10.1021/JA0120835