EDITORS' CHOICE

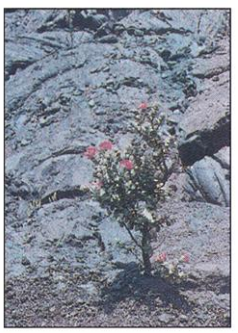
edited by Gilbert Chin

EVOLUTION

Pacific Windfalls

The phylogenetics, systematics, and geography of organisms have been linked inextricably since Darwin's day. However, seemingly straightforward questions—such as that of the relationship between the center of origin and the center of diversity of a given taxon—have been notoriously vexing, especially with plants. The application of molecular techniques, though not always a panacea, is exemplified by a new study of the Pacific wind-dispersed tree genus *Metrosideros*.

Wright *et al.* trace the phylogenetic affinities of the 25 to 30 species of *Metrosideros* using ribosomal DNA sequencing and map the phylogeny onto the current geographical distribution of these species across the central and southwestern Pacific. They find that New Zealand is the most likely candidate for the source of the current Pacific *Metrosideros* flora, even though neighboring New Caledonia has more species. They construct a chronology for the dispersal events that spread *Metrosideros* across the Pacific; while it appears that these trees were present in the western Pacific for much of the Miocene epoch, it is likely that the genus reached the Hawaiian islands only during the much more recent Ice Ages.



***Metrosideros* reach Hawaii.**

As might be expected, wind-dispersed plants form an important part of the flora of oceanic islands. With the ability to withstand the subzero temperatures of the upper atmosphere, it is feasible for seeds to be transported thousands of kilometers. Wright *et al.* suggest that the surprising recency of the *Metrosideros* colonization of the Hawaii islands is the result of a Pleistocene shift to strong westerly wind patterns at the height of the glaciations. *Metrosideros*, which is capable of colonizing fresh lava fields, is now one of the dominant tree taxa in the Hawaiian islands. The extension of such studies to other taxa promises to reveal much about the historical and geographical intricacies of biodiversity, its global patterns and local idiosyncrasies. — AMS

Proc. Natl. Acad. Sci. U.S.A., in press.

GEOLOGY

All about the Roof of the World

The Himalaya is a classic system for investigating many of Earth's physical processes. These mountains represent the best example of ongoing continent-continent collision and display Earth's highest topography. They are responsible for extremes in Earth's climate, including the Asian monsoon, and their dynamics likely influenced past and present climate patterns, ecosystems, and evolution; weathering of the Himalaya has altered world ocean chemistry. Current knowledge of many of these issues is based on the complicated tectonic evolution of the range, which began forming with the collision of India and Asia more than 50 million years ago.

Everest and Lhotse at sunset.

PHOTO CREDITS: DAVID S. HOROWITZ, ANDREW M. SUGDEN

Hodges provides an overview of the geology and geodynamics of the Himalaya and Tibet. These include the amount of shortening across the region as it relates to subduction, the mechanisms producing and maintaining the high topography, and the origin of the thermal structure recorded in the rocks along the main front of the Himalaya. He argues that the Himalaya, including Tibet, have been in a steady state since the Miocene (and perhaps longer), in which subduction and collision have been balanced by uplift and erosion, and he poses the question of whether extrusion of the Tibet plateau is also occurring to the south, as well as the north and west. — BH

Geol. Soc. Am. Bull. **112**, 324 (2000).

NEUROSCIENCE

Fin-de-siècle Paris

Absinthe conjures up images of Montmartre and Nouvelle-Athènes, Degas and Toulouse-Lautrec. Taken as a green liqueur with water, it was capable of inducing convulsions and hallucinations, and eventually was banned in much of Europe. Höld *et al.* now demonstrate that the neurotoxic component of absinthe, α-thujone, inhibits the type A receptor for γ-aminobutyric acid (GABA), which would have the effect of blocking transmission at inhibitory synapses. Why might this matter nowadays? Because of the growth of herbal medicines, and because the Internet has facilitated international supply of hitherto hard-to-obtain substances, as editorialized by Strang *et al.* — GJC

Proc. Natl. Acad. Sci. U.S.A., in press; *Brit. Med. J.* **319**, 1590 (1999).

GENETICS

Give and Take

Genetic determinism notwithstanding, the human genome is hardly a stable place. It is peppered with up to 100,000 copies of long interspersed elements (LINEs), endogenous mobile elements that can excise themselves from the genome and insert into new positions, thus generating much of the insertional mutagenesis in the human genome. According to Esnault *et al.*, LINEs also are responsible for another phenomenon that remodels the genome—the generation of so-called pseudogenes, which are DNA copies of existing transcribed genes sans introns and promotor, and which may serve as raw material for evolution. Transfection of cells with LINE expression vectors and reporter genes yields retroposition (reverse transcription and integration) of the reporter gene into the genome. The implication of LINE elements in the generation of pseudogenes in mammalian cells is satisfyingly consistent with the absence of LINEs or pseudogenes in the yeast genome. — KK

Nature Genet. **24**, 363 (2000).

MATERIALS SCIENCE

Losing Layers in Perovskites

The perovskite family of metal oxides includes several technologically interesting materials, such as high-temperature superconductors (HTSCs), colossal magnetoresistance (CMR) materials, and ferroelectrics. Because

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these compounds usually are synthesized through high-temperature reactions, targeting a particular composition and structure is hard. Schaak and Mallouk incorporated a reducible metal cation (Eu^{3+}) into the "A" site of a layered perovskite (the A sites lie in between the octahedra formed by other metal cations, which occupy the B sites). After ion exchange, reduction with hydrogen yielded three-dimensional perovskites through loss of oxygen, which forced additional bridging of the BO_6 octahedra. Although this method was demonstrated for an easily reduced A site cation, it should be possible to reduce B site cations, such as the Mn^{4+} ions in CMR materials and Cu^{3+} in HTSCs. — PDS

J. Am. Chem. Soc. **122**, 2798 (2000).

ASTRONOMY

Spiral Fueling of a Black Hole

Seyfert galaxies are large spiral galaxies with a bright nucleus. The nucleus is thought to hide an active black hole, on the basis of the observed strong infrared, x-ray, and gamma ray emissions. Understanding how a black hole is fed—that is, how the black hole accumulates enough gas and dust from its surrounding galaxy to fuel its energetic engine—remains an astrophysical puzzle.

Martini and Pogge obtained near-infrared images with the NICMOS camera on Hubble Space Telescope (HST) of 24 Type 2 Seyfert galaxies (Type 2s contain a galactic bulge of molecular gas near the nucleus of the galaxy), and they combined these images with archived optical images taken with WFPC2 on HST to get to the center of the feeding frenzy. Most of the Seyfert galaxies have a centrally located series of dust lanes creating a nuclear spiral that seems to be connected to the center but is clearly detached from the major spiral arms of each galaxy. Estimates of the amount of dust in the nuclear spirals suggest a minimum of a million solar masses of material, more than enough to support the activity of a black hole. Furthermore, the spirals are multi-arm pinwheels, which indicates that they did not form due to gravitational instabilities in self-gravitating disks; instead these nuclear spirals may have formed by the propagation of shock waves, which would reduce the angular momentum of the gas in the accretion disk. — LR

A Seyfert galaxy.

PHOTO CREDIT: AURA/STSCI/HUBBLE HERITAGE PROJECT/NASA

Astron. J. **118**, 2646 (1999).

CELL BIOLOGY

Maintaining Cellular Integrity

Filamentous fungi contain an unusual organelle, the Woronin body, whose structure and biogenesis have been unclear. Fungal hyphae grow as a syncytium in which cells are joined by septal pores, allowing for free passage of cytoplasm and organelles. If hyphal integrity is breached, the hexagonal Woronin body appears to detach from the interior surface of the cell wall and to occlude the now-exposed septal pore in preparation for subsequent sealing of the cell membrane.

Jedd and Chua isolated the Woronin body from *Neurospora crassa* and characterized a component protein called Hex1. This protein is present throughout the Woronin body, and when Hex1 was expressed in yeast, structures reminiscent of Woronin bodies were observed. Mutant *Neurospora* lacking Hex1 bled cytosol from cut hyphae, indicating the importance of this protein for assembly of a nanopatch. — SMH

Nature Cell Biol. **2**, 226 (2000).

CHEMISTRY

The Versatility of Selenium

Natural products provide an excellent starting point for the development of libraries of related molecules, which can be screened for biological activity, but the creation of combinatorial libraries can pose synthetic challenges. Chemical libraries usually are made by solid-phase synthesis, which requires a well-behaved linker between the molecular skeleton and the solid support, a tether that will survive subsequent reactions but can be cleaved readily upon completion.

In a pair of papers, Nicolaou *et al.* document the use of selenium-based chemistry for constructing libraries. Vancomycin, currently the antibiotic of last resort in the treatment of multidrug-resistant infections, can be coupled to a linker (that is versatile enough to link to carboxylic acids, alcohols, and amines) that allows for modifications to its critical oligosaccharide unit. Everninomicin, a promising new weapon against drug-resistant bacteria, contains 2-deoxy glycosides and orthoesters; selenium resins can be used for general stereoselective syntheses of these moieties and of the related allyl orthoesters, furnishing the building blocks for tinkering with this natural product. — JU

Angew. Chem. Int. Ed. **39**, 1084 (2000); *Angew. Chem. Int. Ed.* **39**, 1089 (2000).