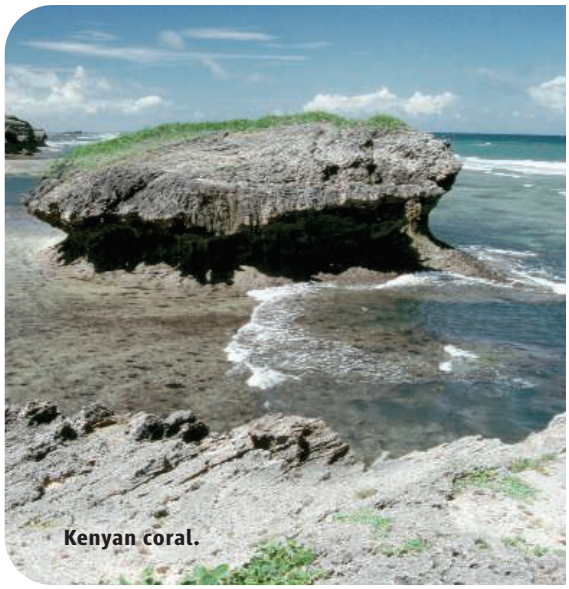


Kenyan coral.

GEOLOGY

Washing Soils Away

Soil erosion and land degradation are serious threats to developing countries. Not only do they diminish food security and threaten terrestrial ecosystems, but they also cause substantial damage to near-shore marine environments. As the causes and extent of soil erosion are explored with an aim toward combating the problem, historical records are needed to place modern rates in perspective. Fleitmann *et al.* document how erosion has affected East Africa, a region particularly vulnerable to the loss of fertile soil, by analyzing a 300-year-long record of Ba/Ca ratios in corals found off the coast of Kenya. These ratios serve as a good proxy for soil erosion because most of the Ba flux to the seawater stems from river discharge at the location where the samples were acquired. Shortly after the year 1900, Ba/Ca ratios began to increase steadily beyond their comparatively low values in the preceding 200 years; the initial increase could be due to British settlement of the fertile highlands of Kenya around that time. If effective soil conservation policies are not instituted, the situation will probably worsen in the future because of the country's growing population, leading to more intensive land use, as well as the increased rains expected with global warming. — HJS

Geophys. Res. Lett. **34**, L04401 (2007).

ENVIRONMENTAL MICROBIOLOGY

Colorful Coexistence

The diversity of plankton in lakes is surprisingly high, and even an apparently uniform-looking body of lake water can offer many ecological niches, depending on the scale of the ebb and flow of water masses, nutrients, temperature gradients, and so on. Huisman *et al*. have now shown that changing degrees of light penetration also provide niches. In a study ranging from the open ocean to landlocked ponds, the authors found that red picoplankton (absorbing green light) dominate in clear blue waters and green types (absorbing red light) dominate in peaty brown turbid lakes. A model for competition between red- and green-light–absorbing picocyanobacteria in different light fields correctly mirrored nature: Along a gradient of increasing turbidity, red picoplankton are replaced by green, and where turbidity is intermediate, both types of picoplankton can coexist. Moreover, changes in the population density of the plankton itself will affect light absorbance and result in competitive exclusion of the reds by the greens. — CA

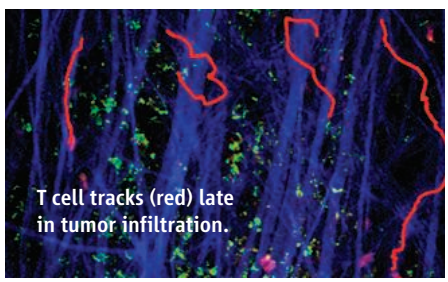
Ecol. Lett., in press.

IMMUNOLOGY

Tumor-Tunneling T Cells

T cell responses begin inside the lymph nodes and spleen, and considerable headway has been made in monitoring how these immune cells behave at these sites through live intravital imaging techniques. A natural extension of this is to visualize how activated T cells conduct themselves once they've migrated to inflamed tissues, or tumors.

Boissonnas *et al*. have combined immunofluorescence with intravital microscopy to follow cytotoxic T lymphocytes (CTLs) as they destroy tumors in vivo. Tumor cells were inoculated into mice at two separate sites, but with those at only one site engineered to express antigen to which T cells could respond. Although the solid tumors that formed at both sites became infiltrated with T cells, this pre-



T cell tracks (red) late in tumor infiltration.

dominated in the antigen-expressing tumors. The behavior of the infiltrating T cells was also measurably different, with those in the antigen-bearing tumor displaying strong signs of activation and distinct migration patterns. In particular, the tumor-reactive CTLs initially displayed diminished motility, which they regained as tumor cells were killed off. These CTLs also burrowed more vigorously into the tumors that expressed antigen. It will now be interesting to determine if similar behavior occurs in other tumor settings (for example, where less potent antigens are expressed) or in nonmalignant tissues where CTLs also mediate cellular destruction (for example, in autoimmune diseases). — SJS

J. Exp. Med. **204**, 345 (2007).

ASTROCHEMISTRY

The Sun Reflected in Osbornite

Knowing the chemical composition of the solar nebula is critical for understanding how the Sun and planets condensed from a cloud of gas, and for making benchmark comparisons as solar system materials are reprocessed in the solar wind and planetary atmospheres. However, although the Sun contains 99.8% of the mass in the solar system, its composition remains unclear.

Meibom *et al.* argue that analysis of a rare mineral in a meteorite has allowed accurate inference of solar nebula nitrogen and carbon isotope ratios. A speck of osbornite (TiN bearing some trapped TiC) was spotted in a calcium-aluminum–rich inclusion within the carbonaceous chondrite meteorite Isheyevo, which has been little altered since its formation. The osbornite is produced at very high temperatures (~2000 K), so must have formed by gas-to-solid condensation in the solar nebula without changes in the

Continued on page 1341

CREDITS (TOP TO BOTTOM): CHINCH GRYNIEWICZ/ECOSCENE/CORBIS; BOISSONNAS *ET AL., J. EXP. MED.* **204**, 345 (2007)

Continued from page 1339

isotopic composition. As supporting evidence, the measured $^{13}C/^{12}C$ ratio of 0.01125 ± 0.00008 (1σ) is consistent with the isotope ratio of carbon in the solar photosphere, and the $^{15}N/^{14}N$ ratio of (2.356 ± 0.018) x 10^{-3} matches the nitrogen composition in Jupiter's atmosphere and in the interstellar medium. — JB

Astrophys. J. **656**, L33 (2007).

ECOLOGY/EVOLUTION

Sowing Seed Far and Near

Although a great deal is known about the qualitative aspects of seed dispersal by animals (for example, which species feed on particular plants and disperse their seeds), the quantitative study of seed dispersal is still in its infancy. For example, the relative roles of different animal species in dispersing seeds over different distances are unclear. Genotyping techniques, coupled with detailed field observations, are beginning to yield results. Jordano *et al*. assessed the relative contributions of large birds, small birds, and fruit-eating mammals to the dispersal of seeds of *Prunus mahaleb*, a common fleshy-fruited tree in southern Spain, by genotyping seeds in fecal pellets and matching them to genotypes of parent trees. Although dispersal distance correlated fairly well with increasing size of animal, only a small subset of larger species made significant contributions to longer-distance dispersal over several hundred meters. Loss of these critical species or fragmentation of habitat could thus have disproportionate effects on plant dispersal and gene flow. — AMS

***Prunus mahaleb* in fruit.**

CREDIT: DR P. JORDANO/CSIC.

Proc. Natl. Acad. Sci. U.S.A. **104**, 3278 (2007).

CHEMISTRY

A Universal Suitcase

In biochemical environments, amphiphilic molecules form bilayer vesicles that can stabilize polar molecules in their interiors while encapsulating nonpolar guests inside the hydrophobic walls. Radowski *et al.* sought to mimic this universal carrier ability in a synthetic molecular assembly by fabricating a spherical multishelled structure from three inexpensive commercially available building blocks. For the core, they used hyperbranched poly(ethylene imine) (PEI), which was appended to alkyl diacid segments that in turn were capped by monomethyl poly(ethylene glycol). The chain lengths of all three components were varied to optimize transport properties for guests of widely ranging polarity in water, ethanol, chloroform, and toluene. Uptake of the guest molecules (which included an array of drugs, vitamins, and dyes) was substantially enhanced by using a large PEI core and long (C_{18}) alkyl diacid. Dynamic light-scattering measurements revealed that the macromolecules form aggregates that enhance their transport capabilities. The aggregates, which expanded with linear guests but contracted with globular ones, were highly robust, proving stable to filtration and chromatography and persisting in solution for more than a year. — MSL

Angew. Chem. Int. Ed. **46**, 1265 (2007).

MOLECULAR BIOLOGY

Dicing Triplets

Dicer, the endoribonuclease enzyme at the heart of RNA interference (RNAi), cleaves double-stranded RNA (dsRNA) and RNA hairpins to form small interfering RNAs (siRNAs) and microRNAs (miRNAs). The imperfect base-pairing of miRNA precursors requires that Dicer be fairly tolerant of mismatches in its substrates, and this in turn means that any RNA sequence that forms a passably presentable double helix can become a Dicer substrate.

Genes of the class of triplet-repeat expansion diseases, including Huntington's disease, contain stretches of CNG trinucleotide repeats that are dramatically expanded in afflicted individuals. Both the normal and expanded repeats are able to form hairpins in the messenger RNA (mRNA) in vitro. Are these repeats also substrates for Dicer? Krol *et al.* show that in vitro, Dicer can specifically cleave longer CNG hairpins both in isolation and in the local sequence context of mutant mRNAs. Furthermore, comparing mRNAs with normal and expanded repeats in cells from patients, Dicer selectively reduces the levels of mutant transcripts bearing the expanded numbers of repeats, generating siRNAs ("siCNGs") that can trigger further rounds of cleavage. The same effect can be achieved by the introduction of exogenous siCNGs, suggesting possible therapeutic interventions based on RNAi-driven selective knockdown of the mutant mRNAs. — GR

Mol. Cell **25**, 575 (2007).