Malaysian forest.

ECOLOGY/EVOLUTION

Tropical Forest Slows Down

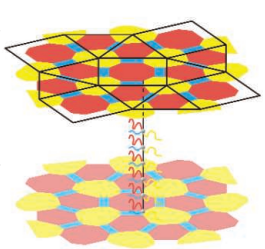
Tropical forests play a major part in the global carbon cycle. An understanding of the responses of tropical forests to climate change is an essential element in predicting the trajectory of global environmental change in the coming decades. Some studies have found increasing growth rates of trees, consistent with model predictions of CO_2 fertilization. However, others have suggested that growth rates might decrease, consistent with models of the effects of increasing temperature on tree respiration. Feeley *et al.* analyzed two detailed long-term data sets from forest plots in Panama and Malaysia, to reveal growth rates of individual species and whole communities over the past 25 years. In both places, growth rates decreased in the majority of species, and this pattern was also reflected at the community level. These decreases correlated with increasing temperature over the same period, suggesting the potential for positive feedbacks between decreasing tree growth and increasing atmospheric CO_2 concentration. — AMS

Ecol. Lett. **10**, 461 (2007).

MATERIALS SCIENCE

Aperiodic Polymer Tiles

Quasicrystals have sufficient long-range order to produce a diffraction pattern, but do not show the three-dimensional translational periodicity found in normal crystals. They have been observed in metallic and small molecular systems, often through small compositional changes in the materials, although in many cases the quasicrystals are of poor quality and stability. Hayashida *et al.* show this sort of patterning over a much larger length scale in three-arm block copolymers made of polyisoprene (I), polystyrene (S), and poly(2-vinylpyridine) (P) mixed with a polystyrene homopolymer. Previously this system has been shown to form the (3.3.4.3.4) Archimedean tiling structure, with every vertex surrounded by a pattern of triangle (3) and square (4) cells. Upon changing the I:S:P ratio, the ratio of triangles to squares shifted from the Archimedian value of 2 to 2.305, and a dodecagonal quasicrystal pattern emerged. The tiling, however, was not perfect: Transition regions led to sections showing sixfold symmetry and a triangle-to-square ratio of 8:3. When the composition of the blend was changed further, the overall quasiperiodicity of the triangles and squares was lost. Thus, it may be possible to tune the tiling patterns through small changes in the polymer composition. — MSL



Polymer phase separation leading to quasicrystalline arrangement.

Phys. Rev. Lett. **98**, 195502 (2007).

APPLIED PHYSICS

Patterned Graphene Transport

Graphene has received much recent attention, both experimental and theoretical, because of its mechanical stability and promising electronic properties. These single sheets of graphite, or unzipped carbon nanotubes, are expected to display many interesting transport properties that are dependent on geometry and crystallographic orientation, in much the same way in which the electronic properties of carbon nanotubes are dependent on their chirality, or how they are rolled up. Working with single sheets of graphene extracted from bulk graphite and patterned into strips of various widths (ranging from 10 to 100 nm) and a selection of crystallographic orientations, Han *et al.* have probed the ensuing transport properties. They found that the energy band gap widens with decreasing width, as expected from theory, but that there is no systematic variation with orientation. The results suggest a route to engineer the band gap of graphene nanostructures with potential applications for devices. — ISO

Phys. Rev. Lett. **98**, 206805 (2007).

GENETICS

A Powerhouse Conversion

Animal cells contain not only their nuclear genome, which is inherited equally from both parents, but they also, within their mitochondria, carry a further, much smaller genome, which is generally maternally inherited. Mitochondrial DNA is thought not to undergo recombination and to represent a relatively stable record of the evolutionary history of a species. By examining duplicated genes within the mitochondria of killifish, Tatarenkov and Avise found evidence of gene conversion within the mitochondria, suggesting that recombination does occur. Sequences from both copies of the control regions of the mitochondrial DNA identified 28 examples where both copies contained the same nucleotide substitution, resulting in an overestimate of genetic distance between individuals on the basis of paralogs, which arise from gene duplications, in comparison to that estimated from orthologs, which represent genes sharing the same evolutionary history. Thus, recombination and gene conversion are ongoing in the mitochondria of killifish and, by extension, probably in other animals as well. — LMZ

Killifish.

Proc. R. Soc. London Ser. B 10.1098/rspb.2007.0169 (2007).

Continued on page 1257

Continued from page 1255

GEOLOGY

Death Valley in Slow Motion

The San Andreas Fault is thought to mark the right-lateral slip between the North American and Pacific plates, but a large amount of the slip (~20 to 25%) occurs on a set of faults farther inland, extending from Death Valley in eastern California up through western Nevada. These faults have produced some of the largest earthquakes within North America, comparable in size to temblors on the San Andreas itself, and this slip is responsible for the great depth of Death Valley. Today, the fault network near Death Valley is moving at about 12 mm/year, but whether this represents the long-term rate has been hard to determine. Frankel *et al.* measured cosmogenically produced radionuclides in boulders to date offsets in an alluvial fan in Death Valley. The long-term rate for the fault system for the past 70,000 years is indeed close to the current rate, whereas farther south, where several recent earthquakes have occurred, the current strain rate seems to be exceeding the long-term average. — BH

J. Geophys. Res. 10.1029/2006JB004350 (2007).

PSYCHOLOGY

You Did It, It Did It

One of the many kinds of psychological processing we perform effortlessly is the recognition of actions as being motivated by animate versus inanimate agents. Two groups of brain areas have been proposed to subserve this function: the mirror neuron system and the social network. Mirror neurons become active both when a person performs an action and when a person observes that action being performed by another. Neurons within the social network become active in social contexts, such as during the assessment of emotion in others, or while imagining another's state of mind. Wheatley *et al.* examined the differential activation of these networks under conditions in which the central figure and its movements remained constant, but the backgrounds were changed to bias the interpretations of the scene as representing animate or inanimate agency. The mirror neuron system does indeed engage in the neural processing of motion, during both observation and imagination of the figure. On the other hand, the brain areas within the social network are specifically more active when people perceive the motion as biological or animate. — GJC

Psychol. Sci. **18**, 469 (2007).

CHEMISTRY

How H-Bonding Helps

Although hydrogen bonding has long been known to be prevalent in enzymatic substrate-binding motifs, its use in nonmetallic small-molecule catalysis has been adopted comparatively recently. Jensen and Sigman have quantified the impact of catalyst acidity on the rate and enantioselectivity of the hetero–Diels Alder reaction in one such system. The catalyst is a chiral oxazoline derivative that binds aldehydes through the N-H group of a pendant amide; the authors systematically varied the acidity of this group by adding differing numbers of Cl or F atoms to the amide α-carbon. They observed linear free energy relationships correlating both rate and enantioselectivity with increased acidity, which they tentatively attribute to a tighter transition state — JSY

Angew. Chem. Int. Ed. **46**, 10.1002/anie.200700298 (2007).

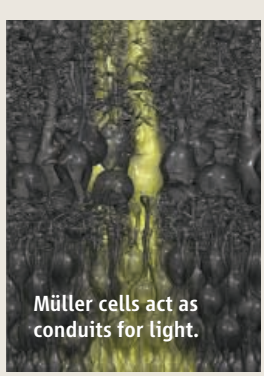
Science stke AAAS

www.stke.org

<< Living Optical Fibers

In the eye, specialized glial cells, the Müller cells, support the function and survival of neurons in the retina. Franze *et al*. now show that these cells also help to pass light to the retina. Light transmission and reflection microscopy of the inner retina (without the photoreceptor cells) revealed that light was transmitted to discrete points. A *z*-axis reconstruction showed the presence of "tubes" that corresponded to the Müller cells, which transmitted light effectively with minimal light scattering. Furthermore, dissociated Müller cells exhibited higher refractive index than did retinal neurons, consistent with their role in minimizing light loss through the length of the cell. Optical engineers use waveguide characteristic frequency (the *V* parameter) as a measure of the light guidance through a propagating material. Calculations of the *V* parameter for Müller cells confirmed that these cells could function as waveguides for visible light. Indeed, Müller cells efficiently transmitted light when placed in a modified dual-beam laser trap. — NRG

Proc. Natl. Acad. Sci. U.S.A. **104**, 8287 (2007).



Müller cells act as conduits for light.

CREDIT: DR. ANDREAS REICHENBACH, LEIPZIG UNIVERSITY

You Did It, It Did It

Gilbert Chin

Science **316** (5829), 1257.
DOI: 10.1126/science.316.5829.1257b