Biological chemistry

Ringing the changes with vancomycin

Angew. Chem. Int. Edn **43,** 6709–6713 (2004)

Vancomycin is a front-line antibiotic, but the only large-scale source is a natural product made by bacteria. Vancomycin analogues cannot be chemically synthesized in large quantities, but such an ability could be of great advantage in engineering new variants to combat the growing threat of drug-resistant bacteria. It might be possible to alter the substrate specificity of key proteins involved in vancomycin biosynthesis, and produce analogues that attack drug-resistant bacterial strains.

But this is no simple task: vancomycin biosynthesis involves many enzymatic steps, including three ring-forming reactions whose mechanism and substrate specificity are poorly understood. Katja Zerbe *et al.* have now performed one of these reactions *in vitro*, using an enzyme called OxyB to form the first ring in a simplified analogue of vancomycin. The authors mimicked the natural system by anchoring the molecule to one of the bacterial 'peptide-carrier domains' involved in the biosynthesis. It could be that the enzymes responsible for forming the other two rings also work like this, so it will be well worthwhile examining their substrate specificity to see if that can be tweaked. **Joshua Finkelstein**

General relativity

Galileo goes atomic

Phys. Rev. Lett. **93,** 240404 (2004)

Einstein reformulated Galileo's famous 'leaning tower' experiment as the weak equivalence principle, which proposes that the acceleration due to gravity is independent of a body's composition. Sebastian Fray *et al.* have tested this principle using atoms in place of Galileo's cannonballs.

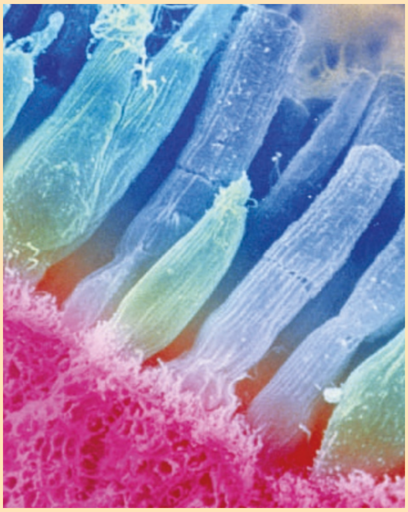
If weak equivalence holds, two isotopes of rubidium (^{85}Rb and ^{87}Rb) should experience the same acceleration in free fall. To make accurate measurements of the atomic motions, the researchers used atom interferometry, which exploits the quantum wave-like nature of atoms. Such an approach has been used previously to compare the free fall of atoms with that of macroscopic objects. But comparing two different isotopes with each other enabled Fray *et al.* to investigate the effect of different quantum states on an atom's free fall.

In particular, the differences in relative orientation of electron and nuclear spin put the theoretical possibility of a spin-dependence of the gravitational force to the test. However, the authors find that, both for mass and for spin-state differences, the weak equivalence principle seems to hold to an accuracy of about 1 part in 10^7. **Philip Ball**

Cell biology

Retinal waste disposal

J. Exp. Med. doi:10.1084/jem.20041447



OMIKRON/SPL

Rods and cones in the retina continuously slough off old fragments of their light-sensitive outer segments, following a 24-hour rhythm: rods (blue in picture) shed their aged tips every morning, whereas cones (blue-green) do so at night. These photoreceptor fragments are eaten up, or phagocytosed, by cells in the adjacent retinal pigment epithelium layer.

Emeline F. Nandrot *et al.* have found that disrupting this timed cycle of shedding and garbage disposal makes mice blind. They examined animals that had been genetically engineered to lack the integrin $\alpha_v\beta_5$ protein, which is used by pigment epithelial cells to take up the shed particles. In these mutant mice, the basal level of phagocytosis of photoreceptor fragments remained similar, but the epithelial cells lacked the early morning burst of activity that matches the rods' shedding. The mice slowly accumulated excess material and, after eight to ten months, went blind.

The authors suggest that the integrin triggers signals in the epithelial cells that both control the rhythm of phagocytosis and ensure the timely and efficient digestion of consumed material. The animals' deterioration mirrors that seen in human retinal ageing and macular degeneration, and could serve as a model for these conditions. **Helen Pearson**

Conservation

Shaky forest lifeline

Conserv. Biol. **18,** 1607–1616 (2004)

One hope for conservationists despairing at the current rate of extinctions has been that some forest species might be able to survive in the 'secondary' habitats that spring up in the aftermath of deforestation. But an analysis of Brazil's Atlantic forest ecosystems shows that, for birds at least, this lifeline does not seem to exist.

Destruction of primary forest is just as likely to result in the extinction of birds that have alternative habitats as of those that only use intact forest, report Grant M. Harris and Stuart L. Pimm. They measured original range size, current range size and abundance for 176 bird species, and estimated their extinction threat. The authors were looking for potential 'survivors' — species that, because they can make do in other habitats, would not die out if they lost their primary home. They found none.

Harris and Pimm suspect that the species spotted in secondary habitats are simply better at dispersing across the landscape, and that they presumably also make use of patches of unharmed primary forest. But the discovery that all bird species seem to be equally vulnerable to the complete removal of primary forest underlines the importance of conserving these habitats — today, only around 10% of Brazil's Atlantic forest is still standing. **Michael Hopkin**

Physics

Melting matters

J. Appl. Phys. **96,** 6127–6132 (2004)

The melting point of ice increases slightly when it is exposed to a strong magnetic field, Japanese scientists have found. This is surprising, given that water is diamagnetic and therefore has no intrinsic magnetic properties.

Hideaki Inaba and colleagues believe that the effect occurs because the applied magnetic field further stabilizes the network of hydrogen bonds that normally keeps the water molecules together. They showed that the change in melting point is proportional to the square of the magnetic field. For example, in a field of 6 tesla, the melting point of ice increased by 5.6 millikelvin.

Other researchers have noticed changes in the refractive index and the infrared spectrum of water under similar magnetic fields, again implicating hydrogen-bond stabilization. The hydrogen bond is mainly an electrostatic attraction between the slightly positively charged hydrogen atoms and slightly negatively charged oxygen atoms in a water molecule.

Inaba *et al.* suggest that the thermal motion of these charges in the magnetic field generates a force that damps down their movement, keeping the water molecules more tightly bound together. **Mark Peplow**