Cell biology

Tumour suppressors in the wrecking yard

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The proteasome is the wrecking yard of the cell, where proteins are broken down into smaller parts. Classically, potential protein victims are earmarked by becoming linked to chains of the small protein ubiquitin. But, very rarely, different systems can kick in.

Robert F. Kalejta and Thomas Shenk now show that tumour-suppressor proteins from the retinoblastoma (Rb) family, whose job is to put the brakes on cell division, are targeted for destruction by a protein called pp71. This is encoded by human cytomegalovirus, a member of the herpes family. The proteasome is still involved, as chemicals that inhibit its function prevent the Rb proteins from being broken down. Yet how pp71 directs its victims to the proteasome is not yet known.

The results prompt speculation that cytomegalovirus has found a neat way of manipulating its cellular hosts. As Rb proteins are degraded, cells could be pushed back into the cell-division cycle and begin to proliferate, allowing the virus to replicate and spread. **Helen R. Pilcher**

Ecology

Ecosystem engineering

Ecology **84,** 682–690 (2003)

Caterpillars make oak trees better environments for other insects. John T. Lill and Robert J. Marquis have found that, without one industrious species, the diversity of insect herbivores on trees falls.

***Pseudotelphusa* caterpillars build a tent by tying together a pair of adjacent leaves on white oaks (*Quercus alba*). They take refuge in this shelter, and slowly eat their home from within (see picture). Lill and Marquis removed caterpillars from 93 trees, and then made artificial shelters on 62 of them — to make sure that it was this that made the difference, and not some other aspect of caterpillar biology.**

ROBERT MARQUIS

A leaf tie and (inset) a *Pseudotelphusa* caterpillar. The paler patches in the main picture are where the leaf material has been consumed by the caterpillar within.

On trees without caterpillars or artificial shelters there was a steep reduction in the number of species of leaf-chewing insects, including other caterpillars, sawflies and beetles. It seems that the shelters protect other species from inclement weather and predators, and many of the squatters seek them out to lay their eggs on. White oak is a dominant tree in the forests of eastern North America. So by acting as ecosystem engineers, the common shelter-building caterpillars may be having a significant effect on the environment as a whole. **John Whitfield**

Nonlinear optics

Braking at room temperature

Phys. Rev. Lett. **90,** 113903 (2003)

Light slowed to a snail's pace might have uses in optical information technologies and quantum computing. But putting the brakes on the fastest thing in the Universe has previously been possible only at temperatures within a few degrees of absolute zero or within exotic environments. Matthew S. Bigelow and colleagues have now achieved it in a common solid-state material — ruby — at room temperature, bringing technological applications within sight.

'Slow light' was first reported in ultra-cold metal-atom vapours in which laser beams manipulate the refractive index of the medium. This reduces the propagation speed of a light pulse dramatically; in the extreme case the light can be stopped entirely, so that pulses can be 'stored'. A report last year of slow light in a solid metal oxide made the business look more practical — but this still required cooling to 5 K. Bigelow *et al.* use a different optical method — spectral hole burning — to control the refractive index of a ruby crystal, allowing them to slow light to about 57 m s^{-1} at room temperature. The technique is easy to implement and might find its way into optical information technology, for example to make compact, chip-scale optical delay lines. **Philip Ball**

Cancer

Building blood vessels

Cancer Cell **3,** 219–231 (2003)

In order to survive, grow and spread, tumours must establish their own blood supply. Robert A. Weinberg and colleagues have found that a key step in this process is the repression of a naturally occurring inhibitor of vessel formation, thrombospondin-1 (Tsp-1), by a cancer-causing form of the Ras protein.

The authors studied human epithelial and kidney cells expressing either high or low levels of this 'oncogenic' Ras. 'High-Ras' cells formed tumours when injected into immunodeficient mice, as did 'low-Ras' cells engineered to express low levels of Tsp-1. In contrast, when high-Ras cells were engineered to express high levels of Tsp-1, they formed smaller tumours, which struggled to establish their own blood supply.

Various other experiments led Weinberg and colleagues to conclude that vessel formation involves a complex cascade of signals, triggered by Ras, that ultimately activates a second oncogenic protein, Myc. This cascade, which is active in several human breast cancer cell lines, results in low levels of Tsp-1 and so leads to the formation of new blood vessels and tumour growth. The researchers hope that their findings will provide new targets for treatments aimed at inhibiting tumour growth. **Helen R. Pilcher**

Inorganic chemistry

Molecules lend a hand

Angew. Chem. Int. Edn **42,** 1293–1296 (2003)

Nature distinguishes left from right through its failure to preserve left–right symmetry in some interactions between subatomic particles. This so-called parity violation creates a difference in energy between the two enantiomers of chiral molecules, which has been implicated in the origin of biomolecular handedness. But the difference is so tiny — a factor of about 10^{-17} for L and D amino acids — that it typically lies orders of magnitude below the detection limits of current techniques. Undeterred, Peter Schwerdtfeger and colleagues have set out to design chiral molecules that might differ sufficiently in energy to make parity violation measurable.

Because the size of the effect scales approximately with the fifth power of the nuclear charge on an atom, the researchers figured that they must target enantiomers containing heavy-metal elements. But they also wanted to find compounds that are stable and whose synthesis seems feasible. Their targets included chiral organometallic complexes of bismuth, rhenium and iridium, for each of which the researchers used quantum-chemical methods to calculate the energy differences. All the molecules have analogues synthesized previously, and their parity violation should be strong enough to be just about detectable with spectroscopic techniques. **Philip Ball**