Optics

Laser light sees through clouds

Appl. Phys. Lett. **83,** 213–215 (2003)

Laser light can penetrate thick cloud, say François Courvoisier *et al*., improving the prospects of using laser beams for telecommunications and remote sensing in the atmosphere. The researchers show that very intense laser pulses are able to resist scattering by cloud droplets.

Above a certain power threshold, laser pulses form localized waves, called light filaments, that maintain their integrity as they travel through space (rather like the solitons first observed in tidal-bore-like water waves). Courvoisier and colleagues have studied the transmission of light filaments through water droplets that are tens of micrometres in diameter, mimicking cloud droplets. The filaments, typically about 150 μm across, are surrounded by a bath of unfocused photons that act as an energy reservoir, replenishing and 'rebuilding' a filament when it loses energy and intensity by scattering. This would enable light filaments to pass through virtually 'opaque' clouds; indeed, the filaments even survive a passage through large (around 0.1 mm) droplets of black ink. **Philip Ball**

Microbiology

Prion as passport

J. Exp. Med. **198,** 5–17 (2003)

The bacterium *Brucella abortus* poses quite a threat: it causes spontaneous abortion in livestock, and produces fever, arthritis and meningitis in humans. *B. abortus* infections are generally long-lasting, and it is thought that this is because, although the bacterium is engulfed by pathogen-hungry macrophage cells, it is not destroyed and instead lives there undetected.

Masahisa Watarai and colleagues now show that *B. abortus* gains safe entry into macrophages by hijacking the cellular prion protein (PrP^C). The process requires a secreted *B. abortus* protein called Hsp60, which recognizes PrP^C on the macrophage surface. The bacterium is then bundled into the cell, swaddled in a piece of macrophage membrane. Watarai *et al.* further show that mice lacking the gene for PrP^C are immune to *B. abortus* infection.

In an accompanying commentary, Adriano Aguzzi and Wolf-Dietrich Hardt suggest that the finding may point to a role for PrP^C. So far there is no confirmed function for this normal form of the prion protein, although the diseased form (PrP^{Sc}) causes brain-wasting diseases such as Creutzfeldt–Jakob disease in humans. Hsp60 is found in bacteria and all eukaryotic cells, and is known to induce inflammation and immune responses. Perhaps PrP^C is part of a generalized threat-detection mechanism that senses Hsp60 — a mechanism that is cunningly abused by *B. abortus*. **Tom Clarke**

Photonics

Drawing a line in silicon

Adv. Mater. **15,** 1167–1172 (2003)

Photonic crystals — materials that are impermeable to light of selected wavelengths — seem ideal for making light-based microchips, but only if they can be patterned with defects that form light-carrying channels. Nicolas Tétreault *et al.* have devised a way of writing lines of about a micrometre wide into thin films of silicon photonic crystals using a laser beam.

The photonic crystal is a silicon film perforated with a regular array of spherical voids, made by casting the silicon around a colloidal crystal of stacked silica microspheres and then etching the silica away. The porous silicon, which is amorphous (non-crystalline) and contains hydrogen, is compatible with standard silicon-chip electronic circuitry and excludes infrared radiation at the 1.5-μm wavelength used for optical telecommunications.

To open up channels, or waveguides, for shunting light around on a 'photonic chip', the researchers shine a pencil beam of green laser light onto the holey film. Local heating melts the amorphous silicon, which forms nanocrystals as it cools. This nanocrystalline silicon has a different refractive index from the amorphous form, and acts as a transparent waveguide within the photonic-crystal matrix. Light confined in this way can be guided around tight bends, without the losses that would occur in conventional miniaturized waveguides in which confinement relies simply on reflection at the walls. **Philip Ball**

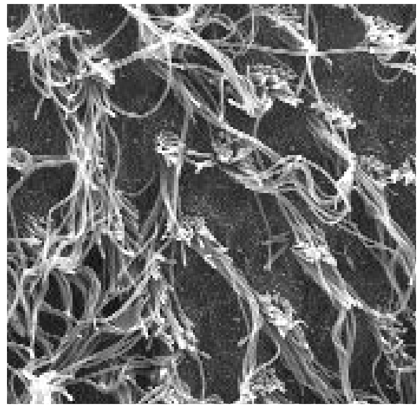
Hearing

Spin the chicken

J. Neurosci. **23,** 6111–6122 (2003)

People treated with large doses of certain antibiotics, such as streptomycin, can suffer permanent hearing and balance problems as a side effect. This is because caspase genes are activated in sensory hair cells (pictured) in the inner ear, causing the cells to die off. *In vitro* studies have found that simultaneous treatment with caspase inhibitors can reduce the damage.

Jonathan I. Matsui *et al.* now show that a similar strategy may work *in vivo*. The authors found that when chickens were treated with streptomycin, up to 60% of their hair cells died. But when the inner ear was infused with a broad-specificity caspase inhibitor, up to 95% of the hair cells survived.



Matsui *et al.* checked to see whether the cells were still active by rotating the chickens and watching their eyes. Functional hair cells detect head motion as well as sound, so that when the head moves, animals can stabilize their gaze by making compensatory eye movements. Chickens treated with caspase inhibitors showed improved eye responses, indicating that their hair cells were working. Whether or not the drug has a similar effect in humans, however, remains to be seen. **Helen R. Pilcher**

Plant physiology

Heavy metal and snails

New Phytol. **159,** 461–469 (2003)[1]
New Phytol. **159,** 453–459 (2003)[2]

Many plant species extract heavy metals, such as zinc, nickel or selenium, from soil and concentrate them in their leaves. Such hyperaccumulation may help plants to grow on contaminated soils, but could it also protect against invertebrate herbivores? The answer appears to be yes for caterpillars, but no for snails.

Brady Hanson and colleagues[1] gave Indian mustard (*Brassica juncea*) seedlings selenium-rich water, producing leaves containing around 0.1% selenium. Caterpillars of the cabbage white butterfly (*Pieris rapae*) avoided such leaves and died of selenium poisoning if they were their only food source. But land snails (*Mesodon ferrissi*) showed no ill effects, and even actively sought leaves with a high selenium content.

Simone B. Huitson and Mark R. Macnair[2] used a different approach: they crossed a species of cress that hyperaccumulates zinc (*Arabidopsis halleri*) with the related *A. petraea*, to produce plants containing a range of zinc concentrations when grown in the same zinc-rich soil. Garden snails (*Helix aspersa*) did not discriminate between plants with high or low zinc levels, although they did tend to avoid pure-bred *A. halleri*.

These studies do not settle the role of hyperaccumulation in plant defence, but they do confirm what all gardeners know: the voracity of snails is almost impossible to deflect. **Christopher Surridge**

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