Neurobiology

Nerves of rubber stretched out

J. Neurosci. **24,** 7978–7983 (2004)

The long projections of nerve cells, known as axons, must lengthen to keep pace with a growing animal — and in the spine of the blue whale this happens at a rate of up to 3 cm per day. But until now, researchers lacked much experimental evidence for how axons achieve such a feat.

Bryan J. Pfister *et al.* custom-built an axon-stretching device in which two populations of neurons were seeded on adjacent membranes. Connecting these neurons were axons, about 0.1 mm in length, that were gradually stretched by cranking the membranes apart with a computer-driven motor. Under the right conditions, the stretched axons could be grown at rates of up to 8 mm per day, and reach lengths of up to 10 cm without snapping or compromising the workings of their organelles. The image reproduced here shows two sets of neurons (top and bottom) connected by 5-cm-long bundles of stretch-grown axons.

The researchers have yet to work out how the cell transports and inserts building materials to achieve this feat of stretching. But they propose that the system they have devised might be used to grow long axonal tracts and bridge areas of damage for nerve repair. **Helen Pearson**

Chemical biology

A molecular stress gauge

Angew. Chem. Int. Edn **43,** 4750–4752 (2004)

Proteins that bind to DNA often bend the double helix. The energy needed for this mechanical distortion comes from the favourable binding interaction between protein and DNA. Wanqiu Shen *et al.* have constructed a DNA molecular device that measures how much excess binding energy a protein has available for distorting DNA.

The device contains a non-covalent tether that prevents bending; the authors vary the strength of the tether until the protein has enough excess binding energy to snap it. They use a protein from the bacterium *Escherichia coli* called IHF, which bends DNA when it sticks to a recognition sequence on the DNA molecule. In the measuring device this sequence is sandwiched between two rigid units labelled with fluorescent dyes. When IHF binds, bending causes the dyes to swivel apart, decreasing the resonant energy transfer between them — this is detected spectroscopically. The two end units are hooked together by complementary single-stranded DNA with a variable number of overlapping base pairs: the shorter the overlap, the weaker the tether.

The researchers find that bending always happens for a strand disruption energy of less than 3 kcal per molecule, and is always prevented when this energy exceeds 7–8 kcal per molecule. In between, there seems to be a mixture of disrupted and intact DNA devices: binding and bending by IHF is marginally possible. **Philip Ball**

Nuclear physics

Accelerated decay

Phys. Rev. Lett. **93,** 112501 (2004)

The radioactive decay of beryllium-7 (^{7}Be) speeds up when individual atoms are trapped inside the cage of a fullerene molecule (C_{60}), according to T. Ohtsuki and colleagues. An atom's environment is known to affect its half-life, but the influence of C_{60} on ^{7}Be seems to be the greatest ever recorded — the half-life of the decay changes by about 0.8%.

The ^{7}Be atom can decay by the capture of one of its own electrons by its nucleus, a process in which a proton is transformed into a neutron. But when the ^{7}Be atom is inside a C_{60} molecule, there is considerable overlap of the electron density of the atom and that of its carbon cage, which makes electron capture more likely.

The authors report that, whereas metallic ^{7}Be has a half-life of roughly 53 days 3 hours, the enclosed atoms have a half-life that is about 10.5 hours shorter. **Mark Peplow**

Cell biology

A protein digestif

Dev. Cell **7,** 359–371 (2004)

The pancreas is well known for its ability to regulate blood sugar levels, but the bulk of its mass functions to secrete enzymes into the gastrointestinal tract to help us digest our food. The factors governing this release are uncertain, but Cheng-Chun Wang *et al.* find that a protein called VAMP8 (or endobrevin) may be involved.

They discovered VAMP8 in the membrane of zymogen granules, tiny enzyme-filled sacs that are found in most pancreatic cells. They also found that pancreatic cells from mice lacking VAMP8 contain three times more zymogen granules than controls — yet the granules are unable to spill their contents. This suggests that VAMP8 helps to regulate enzyme release from these specialized pancreatic cells.

The authors think that the protein might also be involved in pancreatitis (inflammation of the pancreas), which occurs when digestive enzymes are activated in the pancreas and are secreted abnormally into the blood. Mice lacking VAMP8 are partially resistant to the condition and have lower blood levels of digestive enzymes than do controls with pancreatitis. **Helen Pilcher**

Physics

Water-wave regulation

Appl. Phys. Lett. **85,** 1645–1647 (2004)

Crystals that are composites of different materials can be engineered to block certain wavelengths of light: as light passes from one material to another, scattering of the waves effectively weeds out specific wavelengths. Likewise, theory predicts that an array of solid structures should have the same effect on water waves.

Taek Seong Jeong *et al.* have provided a practical demonstration of this phenomenon, in an experiment in which water waves passed through an array of submerged acrylic cylinders fixed to the bottom of a shallow water tank. The cylinders were laid out in different patterns — a hexagonal arrangement (which looks rather like the atomic structure of graphite) cut out water wavelengths from about 47 mm to 68 mm, while a triangular pattern damped down waves in the 23–38-mm range.

The authors point out that an offshore array of cylinders could diffuse waves that contribute to coastal erosion. They calculate that an arrangement of cylinders in a series of 10-metre-wide hexagons could effectively block coastal water waves that have a period of a few seconds. **Mark Peplow**