Microscopy

High-speed movies in miniature

Appl. Phys. Lett. **83,** 6–8 (2003)

Microscopic movies have been given a higher frame speed by Andrew D. L. Humphris and colleagues. This means that optical microscopy can be used to follow faster processes in, for example, living cells.

The scanning near-field optical microscope (SNOM) developed by Humphris *et al.* can image an area of 20 μm^2 in less than 10 ms, at a speed of more than 100 frames per second. This is more than a thousand times faster than commercial SNOMs, and ten times faster than any scanning probe microscope reported previously.

SNOMs, which can generate optical images with a resolution of less than a micrometre (that is, below the normal limit imposed by diffraction effects), are widely used for *in vivo* imaging in cell biology. The new improvement in speed hinges on two issues: greater imaging bandwidth, which increases the signal intensity and thus decreases the data acquisition time, and a new scanning mechanism that exploits a large-amplitude mechanical resonance of the instrument to move the probe tip (an optical fibre) back and forth. Normally, this kind of resonant oscillation is regarded as a nuisance that must be suppressed. **Philip Ball**

Cell biology

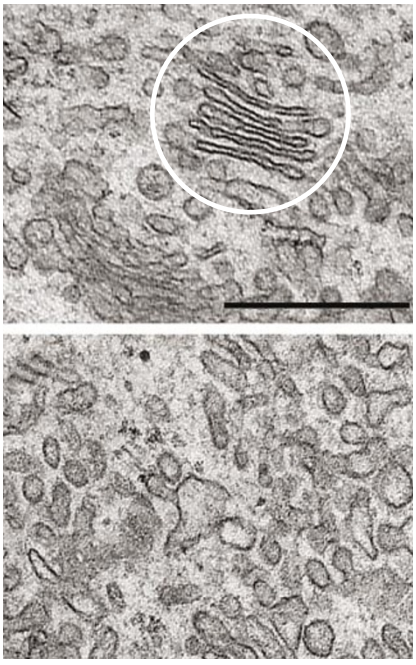
Golgi glue

EMBO J. **22,** 3279–3290 (2003)

A stack of flattened membranes — not unlike a pile of pitta bread — makes up the Golgi apparatus in a cell. Many newly made proteins travel through this system to their final cellular destinations. En route the proteins are modified by enzymes, which are arranged across the stacks in the order in which they function. So it's important that the Golgi remains well organized. Yanzhuang Wang *et al.* now find that the protein GRASP65 may be the glue that keeps the stacks together.

One school of thought holds that the Golgi apparatus breaks up during cell division to allow its membranes to be distributed to both daughter cells. Subsequently, each cell reassembles a new Golgi from the parts. In support of this, Wang *et al.* show, by recreating the phases of the cell cycle in a test tube, that GRASP65 is phosphorylated — and presumably out of action — during cell division, but is necessary for proper stacking of the Golgi afterwards (see picture).

The authors also find that GRASP65 can form dimers, and that beads coated with GRASP65 dimers aggregate. The beads separate after enzymes that phosphorylate GRASP65 during cell division are added, but reaggregate upon its dephosphorylation. With a stickiness that seems to alter with the cell cycle, it looks like GRASP65 has what it takes to be Golgi glue. **Marie-Thérèse Heemels**



Cellular pitta bread: top, normal Golgi (circled); bottom, what happens when GRASP65 is blocked in cell division. Scale bar, 0.5 μm.

Stem cells

Turning back the clock

Curr. Biol. **13,** 1206–1213 (2003)

Researchers have been trying for some time to decipher the molecules and mechanisms that can turn adult cells into youthful stem cells. Now John B. Gurdon and colleagues report that immature frog eggs can rejuvenate human and mouse nuclei alike.

The authors injected the oocytes of *Xenopus* frogs with nuclei taken from adult mouse or human white blood cells. Two days later, mouse or human *Oct-4* messenger RNA — the definitive stem-cell marker — had appeared. This indicates that the adult DNA had been reprogrammed in a species-specific way to become stem-cell-like. The effect was enhanced when the genetic material was injected directly into the oocyte nucleus, leading the team to speculate that a nuclear component may be responsible for the eggs' revitalizing abilities.

Gurdon and colleagues hope to analyse and isolate the molecules responsible so that, in future, adult cells taken from patients can be reprogrammed directly. This would allow the production of a limitless supply of donor-matched stem cells with which to repair and replace damaged and diseased tissue. **Helen R. Pilcher**

Acoustics

New bells ring sweeter

J. Acoust. Soc. Am. **114,** 505–511 (2003)

Bells are rarely used in Western music, at least outside of orchestral 'character roles', because they typically produce overtones that may sound dissonant when combined with other instruments. In particular, European bells tend to generate a strong minor-third tone, which could wreak havoc within a complex chord. Neil McLachlan *et al.* have used shape-modelling calculations to devise bells with overtones that are 'pure' harmonics, eliminating these problematic resonances.

Attempts to make harmonically tuned bells date back to the seventeenth century, but have had mixed success. The current researchers use finite-element modelling to deduce wall-thickness profiles of conical bells that produce up to six harmonics above the fundamental (or 'hum') tone. Their designs have been implemented by Australian Bell Ltd, which has made bronze bells cast and lathed to fit the calculated profiles. These harmonic bells have already been used in musical performances with the Melbourne Symphony Orchestra, and McLachlan and colleagues anticipate that their designs will "expand the musical applications of bells". **Philip Ball**

Diabetes

Molecular suspect fingered

Dev. Cell **5,** 73–83 (2003)

Type 2 diabetes mellitus will become one of the world's largest public-health problems, but we know little about its underlying biochemistry. A new molecular culprit has now been implicated in the disease.

The symptoms of type 2 diabetes are caused by high levels of blood sugar, which arise because β-cells in the pancreas become dysfunctional and stop releasing insulin normally. But what are the molecular signals that cause β-cells to malfunction?

Bruce M. Spiegelman and colleagues provide a clue. They have found that increased levels of a single protein — PGC-1α — are sufficient to induce diabetes-like effects in pancreatic cells. Moreover, levels of this protein are higher than normal in various animal models of the disease. PGC-1α appears to directly regulate the activity of several different metabolic genes, which in turn affect the ability of β-cells to respond to glucose and release insulin as necessary.

The same authors previously found that PGC-1α also activates genes involved in glucose production in the liver. So it seems that PGC-1α is a powerful regulator of both glucose production and insulin release. **Clare Thomas**