

## RESEARCH HIGHLIGHTS

## POPULATION GENETICS

## Celtic mutations

*Nature Genet.* doi:10.1038/ng1742 (2006)

Symptoms of the motor neuron disease amyotrophic lateral sclerosis (ALS) occur in mice whose gene for the neuroprotective protein VEGF is damaged. But mutations in this gene have never been found in human ALS patients.

A surprising link between ALS and VEGF, which also promotes the growth of new blood vessels during hypoxia, has now been made in a multi-population study. It included more than 1,600 ALS patients, and was run by Dublin-based scientists Matthew Greenway and Orla Hardiman of the Royal College of Surgeons in Ireland and their colleagues.

In 15 individuals — nearly all of Irish or Scottish descent — the study identifies mutations in the gene for angiogenin, a protein that seems to be required for normal VEGF activity in blood vessels.

## CONSERVATION

## Mix it up

*Proc. R. Soc. Lond. B* doi:10.1098/rspb.2006.3477 (2006)

Isolated small populations are prone to reduced fitness because they are forced to inbreed — a phenomenon that threatens to become more widespread as natural habitats are destroyed. Conservationists, however, have avoided strategies that link adjacent isolated populations because of the risk of spreading disease.

Researchers led by John Hogg of the Montana Conservation Science Institute in Missoula now provide some evidence to inform the debate. Their data, spanning 25 years, document fitness improvements in a flock of bighorn sheep (*Ovis canadensis*;

## Under pressure

*Geophys. Res. Lett.* **33**, L03312 (2006)

When a lava dome collapsed at Soufrière Hills Volcano in 2003 — the biggest such collapse on record — it triggered a sudden and dramatic increase in pressure in the underlying magma chamber.

During the event, researchers led by Barry Voight of Pennsylvania State University in University Park measured strain around the volcano (pictured), which has been erupting on the Caribbean island of Montserrat since 1995. The magma chamber pressurized within ten minutes of the lava dome's collapse, much faster than would be expected for the normal rate of magma flow.

The scientists suggest that bubbles within the magma may have expanded suddenly, causing the pressure rise.



S. O'MEARA &amp; D. O'MEARA/BSFL

pictured below) consisting of a few dozen animals, and isolated since 1922. Since the introduction of outsiders in 1985, fitness measures such as birth weight and male and female reproductive success have improved — gains that, the authors argue, offset the risks.

## CHEMISTRY

## Metal tools

*J. Am. Chem. Soc.* **128**, 2540–2541 (2006)

Organometallic chemists can often 'tweak' the reactivity of a transition-metal catalyst by adding ligands that bind to the metal — an approach that researchers have now used to expand the synthetic chemist's tool box.

Barry Trost and his co-workers at Stanford University, California, report that a palladium catalyst with a phosphorus-containing ligand can catalyse the oxidation, by a nitronate, of an ester group adjacent to a carbon-carbon double bond. If the ligand was a single enantiomer — a molecule that is not superimposable on its mirror-image — the product of the reaction was also a single enantiomer. This was true even when the starting material was a mixture of enantiomers. The products of this reaction could be used to synthesize various natural products, such as prostaglandins.

## ANATOMY

## Unexpected organ

*Science* doi:10.1126/science.1123497 (2006)

After years of study, the laboratory mouse can still surprise.

Hans-Reimer Rodewald at the University of Ulm, Germany, and his colleagues say they have discovered a new organ — a thymus the size of a pin-head — in the necks of mice. Previously, the mouse was thought to have just one thymus, situated near the heart.

The thymus helps to supply the immune system with T cells, and this unexpected finding raises questions about studies that have used mice with the main thymus removed to investigate, for example, T-cell production in other organs, such as the gut and skin.

## MATERIALS SCIENCE

## Pretty cool

*Science* **311**, 1270–1271 (2006)

A material that can be cooled by applying an electric field might help to prevent microchips from overheating, say Alex Mischenko of Cambridge University, UK, and his colleagues.

The researchers find that applying 25 volts



J. HOGG

across a thin film of lead zirconate-titanate can cause its temperature to drop by up to 12 °C at around 220 °C. This effect could be exploited to create an electrically driven heat pump. Lead zirconate-titanate is a well known piezoelectric material, meaning that an applied voltage creates a mechanical stress. But precisely why this can also lead to cooling is unclear. Previous observations of the 'electrocaloric effect' have been more than 100 times weaker — too small to be of much practical use.

## OPTICS

### Loopy fibres

*J. Phys. B* 39, 1011-1016 (2006)

Physicists in France have shown that the optical Sagnac effect, which is used in rocket navigation systems, also exists at the quantum level.

The effect is revealed when a laser beam is split and passed in opposite directions around a loop of rotating optical fibre. The interference pattern that is formed when the beams recombine depends on the fibre's angular velocity, so the system can be used as a rotation detector. Guillaume Bertocchi and his colleagues at the University of Nice Sophia-Antipolis detected a similar link between angular velocity and the interference pattern that built up as they sent single photons round the loop. The effect, however, may be too small to be of practical use.

## CANCER

### Unleashing the guardian

*Nature Chem. Biol.* doi:10.1038/nchembio774 (2006)

A drug that boosts the activity of our cells' anti-cancer guardian, the p53 protein, has an extra trigger that helps it

to target only tumour cells.

p53 usually forces cells to commit suicide if they start to become cancerous. But in half of all tumours, the protein is ineffectual. Nutlin-3, a small molecule, is one of a class of anti-cancer drugs that kills such tumour cells by activating p53.

Nutlin-3 works by preventing p53 from being gagged by another protein, known as MDM2. But, René Bernards and Roderick Beijersbergen at the Netherlands Cancer Institute in Amsterdam and their colleagues have found that the effectiveness of nutlin-3 also depends on the activity of the gene *53BP1*. This gene forms part of a DNA-damage signalling system, which is often turned on in cancerous cells.

## ACOUSTICS

### To be is to didgeridoo

*J. Acoust. Soc. Am.* 119, 1194-1204; 1205-1213 (2006)

Researchers in Australia have delved into the country's native heritage to reveal the physics of the didgeridoo, or *yidaki*. A team led by Joe Wolfe of the University of New South Wales in Sydney has used a range of methods to study the techniques used to play the instrument. The work builds on a study published in *Nature* last year (A. Tarnopolsky *et al.* 436, 39; 2005).

The didgeridoo, although it is a simple resonating tube, can produce a remarkable array of different sound effects, chiefly through the player opening and closing their glottis, or voicebox. Wolfe and his team also measured the acoustic effects of moving the lips and of using circular breathing. They publish an accompanying theoretical analysis.

Sound files are available at [www.phys.unsw.edu.au/~jw/didgeridu.html](http://www.phys.unsw.edu.au/~jw/didgeridu.html).

## RNA INTERFERENCE

### Brain protectors

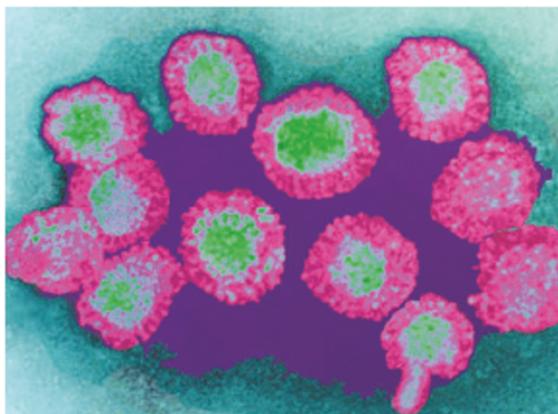
*PLoS Med.* 3, e96 (2006)

A scrap of RNA may halt the brain inflammation caused by the Japanese encephalitis virus and the related West Nile virus (pictured below), for which there are no effective treatments.

Researchers led by Premalata Shankar and Manjunath Swamy, both of Harvard Medical School in Boston, Massachusetts, tried combating the viruses by the technique of RNA interference.

They injected tiny fragments of RNA directly into the brains of mice. The RNA, delivered into cells by a lentivirus or lipid, blocked the activity of a key protein present in the coat of both viruses so that the viruses could not replicate.

The technique might work in humans if scientists can figure out a less invasive way of getting the RNA into the brain.



## JOURNAL CLUB

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**A bio-oceanographer learns a lesson from elephants.**

I once watched a lone bull elephant pushing over young trees planted in an extensive stretch of grassland bordering the Himalayas. The gunshot-like cracks of snapping trunks accompanied his stately passage through the plantation.

Many years later, I learned that the wanton destruction was actually adaptive behaviour. This demolishing of trees maintains grassland — their preferred food.

But trees can outgrow the rate of destruction when rainfall is above 650 mm per year, as shown by a recent assessment of savanna and closed-canopy forest habitats in Africa (M. Sankaran *et al. Nature* 438, 846-849, 2005).

I am struck by the parallels with marine plankton, my field of study. Diatom blooms are the equivalent of closed-canopy forests in the

sea: they overgrow their zooplankton grazers when the supply of iron is adequate. Blooms, fed by iron leaching from the continents, are prominent along ocean margins, but drop off beyond the shelf break. Adding iron to these deeper, nutrient-rich (but iron-poor) ocean waters is like watering the savanna: diatom blooms take over.

Diatom chains subsequently sink out in flakes, like falling leaves, into the depths of the ocean. This creates a carbon deficit in the surface waters, which is

compensated by draw-down of carbon dioxide from the atmosphere. So fertilizing the ocean with iron could sequester some anthropogenic carbon dioxide, an idea being tested in experiments.

But on land the opposite seems to hold. Some suggest that when trees take over grasslands, the amount of carbon sequestered will go down. So, perhaps letting elephants restore their former habitats would contribute more to carbon dioxide sequestration than would planting forests.