RESEARCH HIGHLIGHTS

Baby blues

Proc. R. Soc. Lond. B doi:10.1098/rspb.2005.3057 (2005); *Biol. Lett.* doi:10.1098/rsbl.2004.0274 (2005)
Prime examples of a biological trade-off have been discovered in two species of bird: caring for too many offspring in one year limits reproductive success the next.

On Norway's frozen north coast, a team led by Sveinn Hanssen of the University of Tromsø added eggs to the clutches of female common eiders (*Somateria mollissima*). The birds lost so much weight while sitting on the clutches, which were at the extreme of the usual sizes, that their fecundity dropped the following year.

Meanwhile, researchers from Auburn University in Alabama gave male eastern bluebirds (*Sialia sialis*, pictured) large broods of young to look after and found that they struggled to produce their trademark plumage the following season. Birds with a lighter parental load sported much brighter finery and enjoyed better mating success.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

DAYBREAK IMAGERY/OSF

QUANTUM PHYSICS

Dancing vortices

Phys. Rev. Lett. **94**, 190401 (2005)
Pushing around vortices in a sea of ultracold atoms could shed light on how phase transitions work in superconductors, suggest theorists led by Nick Bigelow of the University of Rochester in New York.

Cooling and confining a cloud of gas atoms can force them to form a type of matter known as a Bose–Einstein condensate. Start this substance swirling and the vortices that form tend to settle into a regular static pattern. But Bigelow predicts the vortices can be pushed through a series of different arrangements by a grid of laser beams. The pattern changes as the beams brighten. The sudden rearrangements would be similar to structural phase transitions in other systems — including those that can cause power loss in superconducting wires.

NEUROSCIENCE

Patch work

Nature Neurosci. doi:10.1038/nn1474
The difficulties dyslexic people have in reading may stem from a poor ability to detect visual signals through background noise, suggest Ann Sperling, now at Georgetown University in Washington DC, and her colleagues.

They showed 28 dyslexic and 27 non-dyslexic children two patches of visual noise similar to television static; in one patch, the noise was superimposed on a particular pattern. The dyslexic children needed greater contrast to spot which patch hid the pattern.

The group's findings contradict the popular hypothesis that defects in the neurons of the magnocellular pathway — a connection between the retina and the brain — are responsible for deficits in visual processing in dyslexia. The magnocellular pathway is in the clear because the dyslexic children demonstrated the same need for greater contrast when shown patterns designed to stimulate a different visual pathway.

MALARIA

Caught in the act

PLoS Biol. **3**, 192 (2005)
The liver-infecting action of the malaria parasite has been caught on camera for the first time.

Ute Frevert from the New York University School of Medicine and her colleagues modified the parasite *Plasmodium berghei* so that it fluoresced. They then used a digital microscope to watch it invade the livers of live mice. Their recordings show the parasites moving into the livers' Kupffer cells, confirming suspicions that these phagocytic cells are their entry point. Kupffer cells normally digest and demolish anything foreign. Frevert's images prove that the malaria parasite must disable this response, allowing it to spread to other liver cells and multiply.

BSIP, CHASSENET/SPL

CELL BIOLOGY

The matrix: unloaded

J. Cell Biol. **169**, 1–11 (2005)
A family of enzymes once thought to encourage tumour development could also inhibit it. A team at the University of California, Los Angeles, has found that MMPs, or matrix metalloproteinases, restrict the growth of new blood vessels in a tumour.

Cancerous tumours grow their own blood supply by making a protein called VEGF, which encourages blood vessels to form. The VEGF sticks to the matrix surrounding cells, and the MMPs work by cutting it free. Surprisingly, the free VEGF does not promote the formation of blood vessels, but instead triggers the enlargement of existing vessels that do not support tumour growth.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

MERCURY

Shell shock

Earth Planet. Sci. Lett. 234, 27–38 (2005)

The Mariner 10 probe's encounters with Mercury in 1974 and 1975 showed that the planet has a magnetic field — a surprising find for scientists who expected the small planet's iron core to have completely solidified. Although studies have since shown that a thin liquid shell of iron may persist around the core, it was not clear whether such a shell could sustain the kind of circulation needed to generate a magnetic field.

Now researchers led by Sabine Stanley at Harvard University use computer models to show that convection in a shell can indeed produce magnetic fields similar to those observed at Mercury (pictured right). The work cannot rule out magnetic rocks in the planet's crust as the source of the field, but NASA's MESSENGER mission should be able to test the theory when it arrives at Mercury in 2008.

MEDICINE

Breathe easy

Science doi:10.1126/science.1108228 (2005)

Experiments in mice have revealed that nitric oxide metabolites play a role in preventing asthma, a condition suffered by more than 100 million people around the world.

A team headed by Jonathan Stamler of Duke University in Durham, North Carolina, engineered mice to lack the enzyme S-nitrosoglutathione reductase, leading to elevated levels of metabolites known as S-nitrosothiols. Even when exposed to allergens known to induce asthmatic symptoms in mice, the engineered animals were able to breathe easily, suggesting the metabolites help to keep their airways open. Medicines that inhibit the reductase enzyme might, therefore, be able to prevent asthma attacks in humans.

GENETICS

The bald truth

Am. J. Hum. Genet. (in the press)

Male-pattern baldness is a misfortune that men inherit mainly from their mothers. A systematic survey of the genomes of brothers from 95 families reveals that variability in the androgen receptor gene on the X chromosome is the single most important cause. The research, led by Markus Nöthen of the University of Bonn, Germany, adds to evidence from an earlier investigation of male-pattern baldness that implicated the same gene. As yet, the mechanism remains unclear.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

ARTIST'S IMPRESSION/A. GRAGER/A/SPL

RNA INTERFERENCE

Silent assassin

Nature Biotechnol. doi:10.1038/nbt1101 (2005)

Hopes are high for using RNA interference — a recently discovered gene-silencing tool — to treat disease. The challenge has been to get the RNA molecules into the right cells, and it seems that antibodies might work as delivery vehicles.

Judy Lieberman's group at Harvard Medical School fused an antibody that targets HIV-infected cells with protamine, a compound that binds nucleic acids. The researchers demonstrated that small interfering RNAs bound to this fusion protein are carried across infected cells' membranes, and retain their activity.

Lieberman's small interfering RNAs were designed to suppress a gene that HIV needs in order to replicate, and they even managed to inhibit the virus in cells known as T lymphocytes. Transferring foreign genetic material into these cells has been particularly difficult. In mice, the antibody complex selectively sought out cells expressing HIV proteins after it was simply injected into the bloodstream.

RADIOACTIVITY

Zinc's double decay

Preprint nucl-ex/0505016 at http://arxiv.org (2005)

The existence of radioactive isotopes that can decay through the simultaneous emission of two protons was predicted more than 40 years ago. But it was not until 2002 that the first such isotope, iron-45, was synthesized.

Now Bertram Blank and his colleagues at the French heavy-ion accelerator GANIL have produced a second unstable proton-rich element. They smashed a beam of nickel-58 into a nickel target and isolated eight nuclei of the isotope zinc-54 the resulting fragments. Seven of these nuclei decayed by means of the two-proton mechanism, with an estimated half-life of around 3 milliseconds, supporting the predictions of theoretical models.

JOURNAL CLUB

Philippe Janvier
National Museum of Natural History, Paris

A specialist in early vertebrates retraces the discovery of an ancient fossil fish — his first impressions, later worries, and the relief prompted by a recent paper.

In 1999, my colleague Zhu Min showed me the first photographs of what he thought were two 535-million-year-old fish, found in Chengjiang, China. If they were actually fish, these fossils would be the earliest evidence of vertebrates — by about 50 million years.

My first reaction was that these small, leaf-shaped creatures did indeed resemble vertebrates. I wrote a News and Views article for *Nature* (402, 21–22; 1999) that explained how the fossils matched our conception of an ideal vertebrate ancestor. The fish seemed to combine aspects of the small, headless lancelet and the eel-like lamprey, which is one of the most primitive fish alive today. Could it be too good to be true?

Many similar specimens turned up soon after, providing information about the head and backbone of this early group, now known as Myllokunmingia. However, I became obsessively worried that all the recorded specimens lacked a tail tip. What if the tail looked like that of some of the strange, soft-shelled arthropods that also come from the Cambrian period? I began to fear that myllokunmingiids might not be fish — that we had been led astray by some extraordinary case of convergence.

So I was relieved when I read the first description of a complete myllokunmingiid tail in the *Journal of Evolutionary Biology* (X.-G. Zhang and X.-G. Hou 17, 1162–1166; 2004). It is a good fish tail, pointed to the rear and bearing a vertical web that joins the tail to the dorsal fin.

Certain enigmatic features of myllokunmingiids remain, but I am happy that the question of their tail is settled.