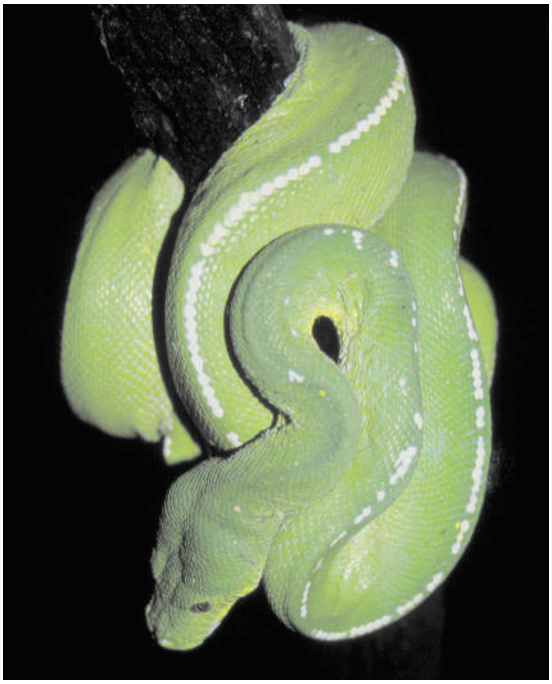
# RESEARCH HIGHLIGHTS

D. WILSON



## Hunting attire

*Biol. Lett.* doi:10.1098/rsbl.2006.0574 (2006)

A study of the tropical python (*Morelia viridis*, pictured) explains why these snakes are born yellow or brick-red in colour, then become green as they grow up.

Researchers led by Robert Heinsohn of the Australian National University in Canberra analysed how the different hues appear to the visual systems of the snakes' main predators, birds. They found that yellow and red are the least conspicuous colours on the ground at the forest's edge, where juvenile snakes hunt. But once the snakes are big enough to prey on rodents and small birds, they head into the forest canopy in search of a meal. The snake's colour switch is linked to this shift in foraging ground: in the canopy, green is better camouflage.

MICROBIOLOGY

## A break from the norm

*Nature Immunol.* doi:10.1038/ni1423 (2006)

When the bacterium *Shigella flexneri* invades the colon and triggers dysentery, it is thought to modify the normal inflammatory response of cells lining the intestine. Laurence Arbibe at the Pasteur Institute in Paris, France, and her colleagues show that it does this by altering part of the cells' epigenetic information — that found outside the genetic code.

The histone H3 protein (which helps package up DNA) partly controls the ability of the protein NF-κB to access and switch on a set of inflammatory genes that fend off pathogens. A *Shigella* protein called OspF interferes with this process. It prevents the normal addition of a phosphate group to histone H3, and by doing so blocks activation of these genes by NF-κB and represses inflammation.

CLIMATE SCIENCE

## Under a cloud

*Proc. Natl Acad. Sci. USA* **103,** 19668–19672 (2006)

Cutting back on fossil fuel and biomass burning could boost India's crops, says the team behind an agro-economic model of the country's rice yields.

Fuel and biomass burning in India produces brown clouds that reflect the Sun's rays and partially shield the country from the effects of global warming. This has led to suggestions that reducing the burning might cause an acceleration in current temperature increases that would damage rice yields.

But a computer simulation by Veerabhadran Ramanathan of the University of California, San Diego, and his colleagues shows that cutting back on fuel and biomass burning over the period of 1985–1998 would have led to a 10% increase in yields. The rise is due to the increase in rainfall predicted to occur when biomass pollution is reduced.

CANCER BIOLOGY

## Genetic liability

*PLoS Med.* **3,** e516 (2006)

A family that is prone to pancreatic cancer carries a mutation in a gene that may also play a role in non-inherited pancreatic tumours, report Teresa Brentnall of the University of Washington, Seattle, and her colleagues.

The researchers identified a gene, called *palladin*, that was mutated in 18 family members with pancreatic cancer or precancerous lesions, but not in family members free of the disease. They also showed that *palladin* is overexpressed in non-inherited pancreatic cancer and pre-cancer.

The *palladin* gene plays a role in building the cellular skeleton, and the team showed that cells with the mutated form of the gene in human cell culture were 50% more mobile than normal cells. This motility might aid the tumour's invasion of other tissues.

BIOCHEMISTRY

## Cycling backwards

*J. Am. Chem. Soc.* doi:10.1021/ja066103k (2006)

Minerals could have stood in for enzymes to produce complex organic compounds on the early Earth, say Xiang Zhang and Scot Martin of Harvard University in Cambridge, Massachusetts.

The researchers show that zinc sulphide — present naturally as the mineral sphalerite — can act as a photocatalyst for three of the five key reductive reactions in the reverse Krebs cycle. Run forwards, the Krebs cycle forms a crucial component of our own metabolism. Aerobic cells use enzymes to drive a set of reactions that break down carbohydrates into carbon dioxide and generate energy.

The reverse Krebs cycle uses an energy source to build up such molecules from carbon dioxide. If all the reverse cycle's steps can be catalysed by minerals, it could have produced carbohydrates before enzymes even evolved.

ASTRONOMY

## Catch a comet

*Science* **314,** 1711–1739 (2006)

Detailed analyses of the comet dust brought back by NASA's Stardust spacecraft in January were published in a series of seven papers in *Science* last week. They reveal the spacecraft's target, comet 81P/Wild 2, to contain a vast array of different particles — some from the heart of the Solar System, some from pre-solar times.

SCIENCE

Among the cometary grains that had embedded themselves in the spacecraft's aerogel collector (particle track pictured, left), the researchers discovered one particle enriched in the isotope oxygen-17. This suggests that it came from a dying star that existed long before our Solar System. They also found minerals containing lots of calcium and aluminium, which must have formed in the hottest part of the collapsing gas cloud that gave rise to the Solar System. How these grains made the long journey from the centre of the Solar System to its icy edge where the comet is thought to have formed is still under discussion.

NEUROBIOLOGY

## Brain, heal thyself

*Cell* **127,** 1253–1264 (2006)

Certain regions of the brain can use their own stem cells to heal local damage, suggests a study in mice.

Yuh-Nung Jan of the University of California, San Francisco, and his colleagues looked at an area of the brain known as the subventricular zone (SVZ). They showed that a gene called *Numb* regulates how stem cells from the SVZ become neurons, and instructs these cells to maintain the walls of the lateral ventricles, the brain's central cavities.

With *Numb* knocked out, mice developed large holes in these walls. But, rather than worsening over time, the holes were repaired within 6 weeks. The team suggests that stem cells that escaped the knockout were able to shore up the walls. Such capacity for do-it-yourself repair might be harnessed to treat brain damage.

CLIMATE CHANGE

## Predicting sea-level rise

*Science* doi:10.1126/science.1135456 (2006)

Future sea-level change is hard to predict, because the processes that drive it, such as glacial and icecap melting, are not easily modelled. Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research in Germany now provides a semi-empirical approach to the problem.

Using simple mathematical assumptions and 120 years of historical data, he finds a relationship between the amount that temperature increases above a set baseline and the rate at which sea level rises. Applying this technique to projected temperature increases suggests that sea levels in 2100 will be between 0.5 and 1.4 metres higher than they were in 1990. Although this uncertainty may be greater than expected, the result indicates that very small sea-level rises look implausible.

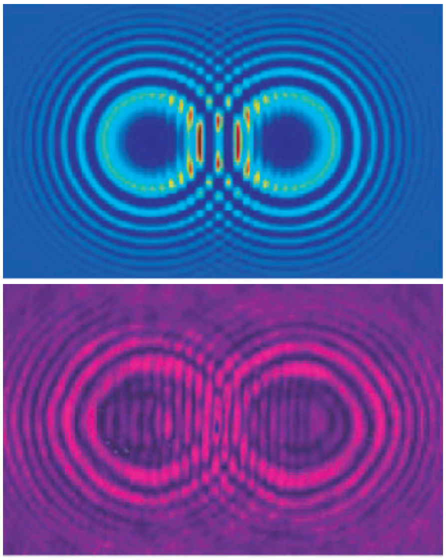
PHYSICS

## Ripple effect

*Nature Phys.* doi:10.1038/nphys486 (2006)

One route to good results is finding a convenient system to work with, as Jason Fleischer of Princeton University, New Jersey, and his colleagues demonstrate. They use an optical set-up to probe a kind of shock wave associated with superfluids.

The team created shock waves that mimic those in superfluids by shining laser beams into a nonlinear crystal. The light behaves like a density wave in a liquid. Unlike shock waves in classical fluids, which have a well-defined shock front, those in superfluids — where flow is unhindered by viscosity — disperse into a series of ripples. Fleischer's group used their simple set-up to study how these ripples interact when two shock waves collide (pictured below; blue from



simulations, pink from experiments).This extends previous observations of Bose–Einstein condensates, a type of superfluid.

CHEMICAL SYNTHESIS

## A big hand

*J. Am. Chem. Soc.* doi:10.1021/ja067840j (2006)

Making just one of two mirror-image (chiral) molecules is a great challenge for organic chemists at the best of times. Such molecules contain at least one 'stereogenic centre', typically a carbon atom around which four different substituents can be arranged in left- or right-handed orientations.

Scott Miller of Yale University in New Haven, Connecticut, and his colleagues tackle a harder problem still — finding a catalyst that can create a chiral molecule by transforming a part of the target molecule that sits half a nanometre from the stereogenic centre, while leaving an equivalent group untouched. An enzyme might be big enough to 'feel' the stereogenic centre from the remote reaction site, but Miller's group searched peptide libraries for smaller molecules that can do so too. Their best catalyst was a peptide containing just four amino acids. It's not clear how it works, but it gave a 95% excess of the desired chiral product.

# JOURNAL CLUB

**David R. Liu**
**Harvard University, Cambridge, Massachusetts, USA**

**Thanks to the discovery of a new catalytic RNA, a chemical biologist can satisfy his student's curiosity.**

An first-year undergraduate recently asked me a remarkable question: are all natural ribozymes, RNA molecules with catalytic activity, simply leftovers from the 'RNA world'? The RNA-world hypothesis supposes that RNA molecules were precursors to the first primitive forms of life, before the evolution of DNA and proteins.

Unanswered, my student's question preoccupied me until I encountered a recent paper by Jack Szostak of Massachusetts General Hospital, Boston, and his co-workers (K. Salehi-Ashtiani *et al. Science* **313,** 1788–1792; 2006).

Prior to this work, only two of the known natural ribozymes were associated with mammals. The rarity of catalytic RNAs in more recently evolved, higher-order cells could reflect their attrition on the evolutionary battlefield during the rise of more highly functional protein enzymes.

This paper, however, supports a different conclusion. Szostak's group designed an ingenious system to isolate self-cleaving RNA molecules from RNA encoded in the human genome. Using this system, they discovered several new ribozymes.

One of these ribozymes, associated with a gene known as *CPEB3*, is highly conserved among placental mammals and marsupials, but is absent from non-mammalian vertebrates. This observation suggests that it arose relatively recently, around 200 million years ago.

We can therefore infer that some ribozymes have evolved in modern organisms, long after the era of the RNA world. The work elegantly demonstrates a new approach to the study of ancient molecules — and also reminds me that our youngest students can ask some of the best questions.