

## RESEARCH HIGHLIGHTS

## Disruptive influence

*Nature Neurosci.* doi:10.1038/nn1801 (2006)

Cannabis may work its disruptive effects on memory by interfering with the synchronous firing of brain cells, researchers have found.

György Buzsáki of Rutgers, The State University of New Jersey in Newark, and his colleagues examined the timing and frequency of neuronal signals in animals injected with the active component of marijuana. They focused on the hippocampus, a brain area involved in the formation of memories.

Firing rates of hippocampal neurons were marginally affected by the cannabinoids, but the timing of the signals, which normally show a degree of synchrony, was disrupted. The extent of this disruption correlated with the animals' memory impairment.



T. MARECHAL/ALAMY

## NANOTECHNOLOGY

## What a contrast

*Nature Mater.* doi:10.1038/nmat1775 (2006)

Nanoparticles of iron-cobalt alloy are tiny magnets that could enhance the contrast of magnetic-resonance imaging (MRI) — used for medical scans — when injected into the body. But they 'rust' easily and are toxic, so have been of little use for such applications.

Now Hongjie Dai and his colleagues at Stanford University, California, have figured out how to wrap these particles in a thin, protective shell of carbon. They make the coats by exposing the alloy to carbon vapour, then attach phospholipids to make the particles water-soluble. These nanoparticles gave greater MRI contrast enhancement than commercial alternatives *in vivo*, without any apparent toxicity at the doses required.

## BEHAVIOURAL GENETICS

## Girls shove, boys box

*Nature Neurosci.* doi:10.1038/nn1809 (2006)

Differences between the fighting styles of female and male fruitflies are determined by a gene known as *fruitless*, researchers have found. The results imply that aggressive behaviours are hardwired into the nervous system of *Drosophila* flies.

Males with a female variant of *fruitless* fought female-style — with head-butts and shoving — whereas females with a male variant fought male-style, lunging and boxing. Modified

males also failed to establish dominance.

The *fruitless* gene, which also dictates male courtship behaviour, is transcribed differently in male and female flies. Barry Dickson of the Research Institute of Molecular Pathology in Vienna, Austria, and his colleagues made their observations by engineering flies to produce transcripts typical of flies of the opposite sex.

## CLIMATE SCIENCE

## How low did it go?

*Earth Planet. Sci. Lett.* doi:10.1016/j.epsl.2006.09.033 (2006)

A uniquely well-preserved record of past sea levels in the Gulf of Lions in the Mediterranean has been used to constrain the sea's lowest points over the past 434,000 years.

Marina Rabineau of the National Centre of Scientific Research in Plouzané, France, and her colleagues used high-resolution seismic profiles and shallow drilling cores to determine the position of palaeoshorelines at the peaks of the last five glacial periods (in

graphic below, red dots indicate new data, grey areas the range of past estimates).

After correcting for the effects of tectonic movement and sediment build-up, they conclude that sea levels were around 100 metres lower than today during the three most recent glacial periods, and around 150 metres lower during the earlier two. The difference points to more extreme glaciations in earlier cycles, which may be associated with the 400,000-year cycle in the eccentricity of Earth's orbit.

## CANCER BIOLOGY

## Addicted to genes

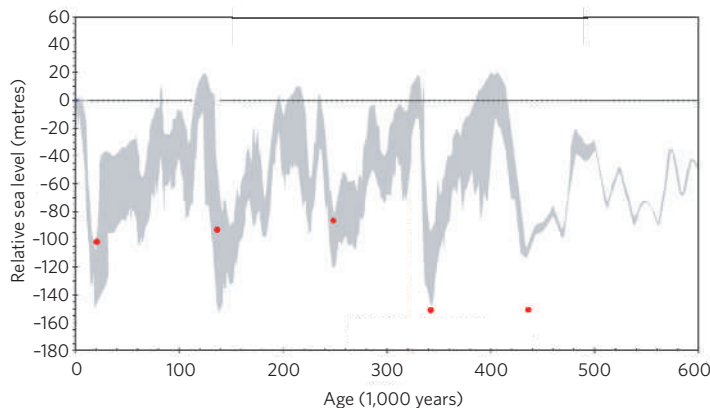
*Cancer Cell* 10, 425–435 (2006)

Tumour cells' apparent 'addiction' to the mutated genes that first turned them cancerous is examined in a new study from Jeffrey Settleman of Harvard Medical School in Charlestown, Massachusetts, and his team.

Certain types of cancerous cell die when their oncogenes are knocked out — a phenomenon that has been dubbed 'oncogene

addiction'. The researchers propose that this happens not because the cells are dependent on the gene, but because switching off the gene sets up an imbalance between signals that promote cell survival and those that promote cell death, or apoptosis.

They tested the idea in a number of cell lines, finding that following oncogene inactivation, certain proapoptotic signals do persist for longer than prosurvival signals.



ELSEVIER

## PHYSICS

**All together now***Phys. Rev. Lett.* **97**, 187402 (2006)

Physicists have gathered the most direct evidence yet that particles known as excitons can form a 'condensate'.

Excitons form when a negatively charged electron pairs with a positively charged 'hole' in a semiconductor. Theorists have predicted that a group of excitons can occupy a single quantum state and behave like one giant particle. The state is predicted to resemble one previously seen for ultracold atoms, known as a Bose–Einstein condensate.

Leonid Butov of the University of California, San Diego, and his team used a laser to create a ring of excitons in a semiconductor wafer. They saw that, when the excitons were cooled below a few Kelvin, their properties synchronized over micrometre scales. This spontaneous coherence indicates that a condensate has formed, but it is not yet clear whether the excitons' behaviour will match that of atoms in a conventional Bose–Einstein condensate.

## MOSQUITO-BORNE DISEASES

**Senior citizens***Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.0604875103 (2006)

A new technique to estimate a mosquito's age should aid efforts to understand the spread of diseases such as malaria and dengue.

Mosquitoes can only transmit such diseases once they are old enough to have incubated infective parasites — typically after 12 days of adult life. Existing methods to estimate a mosquito's age involve sampling chemicals from the surface of the insect's legs, but this only allows estimation of ages up to 15 days and they can live for longer than this.

Scott O'Neill of the University of Queensland in Brisbane, Australia, and his



colleagues identified a suite of genes in the mosquito *Aedes aegypti* that alter the genes' expression patterns over time. Estimating insect ages by profiling these genes works for more senior insects and is more accurate than previous techniques.

## EVOLUTION

**Which came first?***Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.0608762103 (2006)

The genetic code predates the enzymes that act as its stewards, argue researchers at Yale University in New Haven, Connecticut.

Dieter Söll and his colleagues studied enzymes known as aminoacyl-tRNA synthetases. These help to translate the genetic code into protein sequences by attaching amino acids to transfer RNAs (tRNAs).

They found that enzymes from two other microbes could interact with a tRNA isolated from the archaeal microorganism *Methanocaldococcus jannaschii*, charging it up with different amino acids.

This suggests that the enzymes evolved in the different organisms to accommodate a tRNA whose role in translation was already fixed. The tRNA may have emerged in the 'RNA world' that some people think predated the modern world of DNA and proteins.

## GENETIC ENGINEERING

**Pig lets vector stay***Proc. Natl Acad. Sci. USA* **103**, 17672–17677 (2006)

A novel vector for delivering foreign DNA into mammalian cells has been tested in pigs.

Most approaches to gene therapy or genetic engineering use custom-built DNA vectors based on viral genomes, which insert themselves into the host cells' DNA. But if the DNA inserts in the wrong place, it may not function properly and can cause mutations.

Marialuisa Lavitrano of the University of Milano-Bicocca, Italy, and her colleagues have developed a vector that can stay in cells without integrating into the host's genome, and which replicates independently. They added this 'nonviral episomal vector' to pig sperm, which they then used to fertilize eggs. Of the 18 resulting fetuses, 12 carried the vector in all tissues tested.

## MOLECULAR BIOLOGY

**Over the fold***Cell* **127**, 803–815 (2006)

The lung disease cystic fibrosis occurs when mutations prevent a membrane channel protein from folding up correctly. Tweaking a component of the folding machinery can help, show John Yates and William Balch of the Scripps Research Institute in La Jolla, California, and their colleagues.

The team pinpointed the stage at which folding goes awry by comparing the protein interactions of the mutant transmembrane regulator CFTR with those of its normal counterpart.

They found that partially blocking a helper protein, known as a co-chaperone, that is involved in stalling folding helped the mutant protein to form properly. Exactly how it does so is not yet clear, but the approach might also work for other diseases that involve protein misfolding, such as Alzheimer's.

**JOURNAL CLUB**

**Ralph Lewin**  
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**A marine biologist sees the potential of cyanobacteria, and the benefits of their renaming.**

Let's start with a false syllogism: bacteria are prokaryotes, blue-green algae are prokaryotes, and therefore blue-green algae are bacteria. All other algae are

eukaryotes and so, the argument went, we should reclassify the Cyanophyta as cyanobacteria.

I was never in favour of this renaming, but it may have been good for funding. I've heard that grant applications for research on bacteria have better chances of success than those for research on blue-green algae.

And these oft-neglected organisms have a lot to offer. A recent paper on *Lyngbya majuscula* from Bill Gerwick, now at the Scripps Institution

of Oceanography in La Jolla, California, and his colleagues (B. Han *et al. J. Nat. Prod.* **69**, 572–575; 2006), for example, reveals some interesting new compounds.

*L. majuscula* grows on warm seashores as tufts, which, when they come loose and float away, can stick to swimmers' skin and cause a rash — known as swimmers' itch or seaweed dermatitis.

Gerwick and his team extracted from dried *L. majuscula* two compounds that may explain its irritant effect. The compounds,

aurilide B and aurilide C, are hugely complicated ring-shaped molecules that resemble a toxin previously isolated from sea slugs.

In tissue culture assays, the compounds proved toxic to human and mouse cancer cells. Such natural products can act as starting points for pharmaceutical chemists.

Gerwick's paper refers to *L. majuscula* as a cyanobacterium in its title and as an alga elsewhere in its text, but what's important is the science, not the names.