

Down's syndrome, including behavioural changes and heart defects, reports the team led by Victor Tybulewicz of the National Institute for Medical Research, London, and Elizabeth Fisher of the Institute of Neurology, London.

PHYSICS

Feel the force

Nature Phys. doi:10.1038/nphys125 (2005)

A silicon chip that can juggle two blobs of ultracold gas provides a new tool for physicists exploring the quantum properties of Bose–Einstein condensates, and could form the basis of high-precision sensors.

The chip interferometer developed by Peter Krüger at the University of Heidelberg in Germany and his colleagues uses magnetic fields to split a condensate of rubidium atoms. The clouds of atoms are pulled up to 80 micrometres apart, such that there is interference between the quantum matter-waves of the two clouds.

Crucially, this separation does not affect the coherence of the condensates. This means that any changes in the way the two clouds interfere is a sensitive measure of external influences, such as a gravitational field, rather than an effect of the separation process.

MEDICINE

A good shot

J. Exp. Med. 202, 817–828 (2005)

A dose of the drug chloroquine, delivered in conjunction with a vaccine, enhances the response of the immune system's CD8⁺ T cells. The finding, reported by Vincenzo Barnaba of the University of Rome 'La Sapienza', and co-workers, may represent a strategy to improve the effectiveness of vaccination.

Chloroquine reduces the acidity of the environment into which soluble viral antigens, the key components of many vaccines, enter when they are engulfed by a cell. This may slow the degradation of the antigens so that more are presented to the patrolling cells of the immune system, including CD8⁺ T cells, which then mediate an appropriate response.

CELL BIOLOGY

Bound by a ring

Cell 122, 849–860 (2005)

Just before a cell divides, its chromosomes, which are organized as pairs of DNA molecules called chromatids, must be pulled apart so that each daughter cell can inherit one chromatid from each pair.

IMAGE
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REASONS

Until this point, a protein complex called cohesin clamps the chromatid pairs (pictured) firmly together. The cohesin complex has recently been shown to be a large ring structure. Dmitri Ivanov and Kim Nasmyth of the Research Institute of Molecular Pathology in Vienna now show that the cohesin complexes seem to keep chromatid pairs together not by binding them physically, but by trapping them topologically inside their rings.

BIOCHEMISTRY

Stable mate

Nature Chem. Biol. doi:10.1038/nchembio734 (2005)

Although the nitric oxide produced by mammalian tissues is known to regulate cell function, the nitrite produced when it is oxidized was long viewed as biologically inert. Now a study by Martin Feilisch of the Boston University School of Medicine, Massachusetts, and his colleagues shows that nitrite can act as a signalling molecule and a regulator of gene expression.

Rats injected with nitrite showed marked changes in the activity of important enzymes such as cytochrome P₄₅₀. Nitrite can also set off a molecular cascade inside cells that ultimately affects blood-vessel dilation.

The authors note the similar action of nitrite and nitric oxide, and suggest that the overlap may offer an evolutionary advantage. As the more stable molecule, nitrite may act as a longer-lasting version of nitric oxide.

Corrections

Our Research Highlight 'Diamond geezers' (*Nature* 437, 5; 2005) described a diamond material as "harder than the real thing". This is incorrect: the material is less compressible than diamond, as revealed through measurements of the bulk modulus. The reference for 'Keep your options open' (*Nature* 437, 298; 2005) should have been: *Cell* 122, 947–956 (2005). Apologies for the errors.

A. TSUMMER/SPL

JOURNAL CLUB

Patrick Newell
Applied Physics Laboratory
Johns Hopkins University
Baltimore, Maryland

A physicist is drawn to wave research in his study of the aurora.

Little delights me more than work that unexpectedly unifies subjects previously thought disparate, particularly when it involves my speciality — the aurora.

Bright aurora, which form rings around the northern and southern magnetic poles, result from the impact of electrons on the upper atmosphere, some 120 km above the Earth's surface. The electrons which originate in the Solar wind or from the ionized layer of the atmosphere — the ionosphere — have somehow been accelerated to high energies.

For years, we focused on quasi-steady electric fields at heights of 1,500 to 10,000 km above the Earth's surface as the cause of the acceleration. More recently, evidence from satellites has suggested that some auroral electrons are accelerated by an entirely separate phenomenon: electromagnetic waves called Alfvén waves, which propagate through ionized gas.

Work in the *Journal of Geophysical Research* (C. C. Chaston *et al.* 110, A02211; 2005) both solidifies this association and adds new wrinkles.

Chaston *et al.* show that regions where European Cluster satellites have measured a high flux of electromagnetic energy directed towards Earth — carried by an Alfvén wave — match up with areas where NASA's FAST satellite, in a lower orbit, has seen accelerated electrons. These electrons have just the type of energy spectra thought to correspond to wave-induced aurora.

Intriguingly, the paper also links the production of these Alfvén waves to surface waves on the magnetopause, which is the bubble that the Earth's magnetic field creates in the Solar wind. Although aurora remain my focus, I am now following wave research more closely.