

## RESEARCH HIGHLIGHTS

## Mapping the spread

*Emerg. Infect. Dis.* [online] [www.cdc.gov/ncidod/EID/vol12no02/05-0640.htm](http://www.cdc.gov/ncidod/EID/vol12no02/05-0640.htm) (2006)

As the H5N1 avian flu virus advances across Europe and Africa, a study of detailed outbreak data from Thailand shows how researchers can use geospatial analysis to understand what drives the disease's spread.

Marius Gilbert of the Université Libre de Bruxelles in Belgium and his colleagues looked at how the spatial distribution of H5N1 outbreaks in birds related to land use. They found surprisingly little association between disease distribution and the distribution of backyard chickens. Instead, free-ranging ducks feeding in paddy fields emerged as the greatest risk factor, suggesting that H5N1 control strategies in Thailand should focus on controlling the movement of ducks among rice paddies.

IMAGE  
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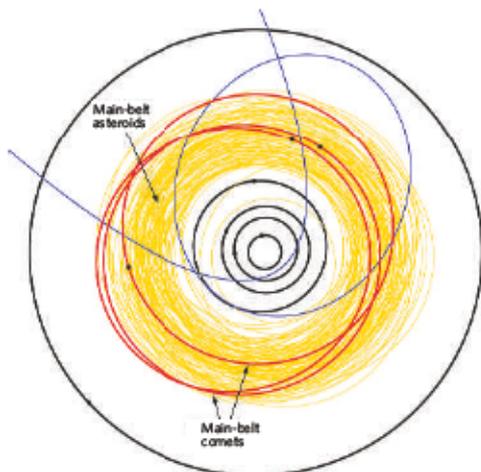
## ASTRONOMY

## Catch a comet by its tail

*Science* doi:10.1126/science.1125150 (2006)

Astronomers have new evidence for a third population of comets, closer to home than the two known reservoirs at the fringes of the Solar System.

Henry Hsieh and David Jewitt, both from the University of Hawaii in Honolulu, studied around 300 objects in the main asteroid belt. The diagram below shows the paths of some of the asteroids (yellow), which orbit between Mars and Jupiter (black). The researchers spotted three objects that are shedding dust, as do comets frazzled by the sun (red). They argue that the objects are comets that formed in the region and were later activated by collisions. The team estimates that there may



be up to 150 such active comets in the main asteroid belt. The blue lines show the paths of two conventional comets, Halley and Tempel 1, which originated in the more distant populations.

## GENETICS

## Fishing for key sequences

*Science* doi:10.1126/science.1124070 (2006)

Geneticists commonly track down important gene-control regions of DNA by searching for sequences that are similar in widely differing species. But this technique may overlook many key sequences, according to Shannon Fisher and Andrew McCallion at the Johns Hopkins School of Medicine in Baltimore, Maryland, and their colleagues.

The team shows that human DNA sequences thought to control a central developmental gene called *RET* also correctly direct the counterpart gene in the zebrafish (*Danio rerio*), even though the sequences from the two species bear no obvious similarities. The sequences may retain the ability to bind regulatory proteins despite their divergence, the researchers propose.

## ATOMIC PHYSICS

## Atoms fall into the trap

*Phys. Rev. Lett.* (in the press); preprint at <http://arxiv.org/abs/physics/0603157> (2006)

A promising route to a quantum computer involves storing quantum bits of information on atoms held in microfabricated traps. Trapping charged ions on chips using

electromagnetic fields is now a fine art. But neutral atoms are preferable, as they interact less with their environment — a process that can let quantum information leak away.

Hidetoshi Katori of the Japan Science and Technology Agency in Tokyo and his colleagues have now held nearly 100 neutral atoms of strontium in a microscopic electrical trap. Unlike previous neutral-atom traps, this one doesn't rely on magnetic interactions — the strontium atoms have no magnetic moment — and so is not susceptible to stray magnetic fields. The atoms stay put for up to 80 microseconds.

## BIOCHEMISTRY

## Four's a crowd

*Nature Methods* 3, 267-273 (2006)

A partnership based on one of the strongest non-covalent bonds in nature has been improved. Biochemists and nanotechnologists working with the protein streptavidin — which binds strongly to biotin — may no longer need to worry about their mixtures forming a sticky mess.

Streptavidin is used to track or anchor biotin-labelled molecules, but because it is a tetramer, it can bind four biotins at once. This leads to clumping. To counter the problem, Alice Ting of the Massachusetts Institute of Technology in Cambridge and her group created a streptavidin tetramer with only one biotin binding site. They used the manufactured tetramer to track biotinylated neuroligin-1, a neuronal adhesion protein that clumps when the normal tetramer is used.

## NEUROBIOLOGY

**Garlic sensation***Cell* 124, 1269–1282 (2006)

The pungent ingredients of mustard oil and garlic are known to activate the TRPA1 receptor, a member of the TRP family of ion channels that detect painful stimuli. David Julius at the University of California at San Francisco and his colleagues build on their earlier characterization of this receptor in isolated sensory neurons, with studies in mice.

The researchers report that mice lacking TRPA1 were completely insensitive to the pungent compounds in mustard oil and garlic, suggesting that TRPA1 is the compounds' sole target. The TRPA1-deficient mice were also less responsive to environmental irritants such as acrolein, an ingredient of tear gas and vehicle exhaust. However, the mice were normal in sensing extreme cold and loud sounds, contrary to suggestions that TRPA1 has a crucial role in these processes.

## MEDICINE

**Healthy diet, happy heart***N. Engl. J. Med.* 354, 1264–1272 (2006)

A lifetime of low cholesterol could slash the risk of heart disease, say Helen Hobbs of the University of Texas Southwestern Medical Center, Dallas, and her colleagues.

The team examined a group of people who carry rare versions of the PCSK9 gene that help to rid the body of low-density lipoprotein (LDL) cholesterol. The group was up to 88% less likely to develop coronary heart disease over the 15 years of the study than those carrying more common gene variants.

The results suggest that modest, lifetime reductions in LDL cholesterol — which may be achievable by exercise, diet or drugs — could reduce the rate of heart disease far more effectively than combating cholesterol at middle age.

## CELL BIOLOGY

**MicroRNAs under suspicion***Cell* 124, 1169–1181 (2006)

MicroRNAs — short RNAs that control gene function — were discovered 13 years ago, but there are still few clues to their precise roles.

Reuven Agami from The Netherlands Cancer Institute in Amsterdam and his colleagues have now completed a genetic screen of known human miRNAs. They looked for miRNAs that may induce cancer, identifying two that interfere with the tumour-suppressing p53 system.

The researchers then found that these two

## IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

miRNAs were expressed in all tested samples of testicular germ-cell tumours that had non-mutated p53 genes, confirming their clinical relevance.

## GEOLOGY

**Continents rock***Geology* 34, 245–248 (2006)

The young Earth had a more widespread continental crust than was once thought, a new study suggests.

Radiometric dating of a zircon crystal, found in the ancient metamorphic rocks of northwestern Canada, indicates that continental crust was present there 4.2 billion years ago — just a few hundred million years after the Earth had formed. It is the only indication outside Australia, where similarly ancient zircons have been found, that granite-rich continental crust existed so early in the planet's history.

Such crust may have covered a significant portion of the early Earth, say Tsuyoshi Iizuka of the Tokyo Institute of Technology, Japan, and his team.

## CHEMICAL BIOLOGY

**A taste for DNA***Angew. Chem. Int. Edn* 45, 2238–2242 (2006)

A single strand of DNA is all it takes, in principle, to activate the 'detection machine' devised by Itamar Willner and his colleagues at the Hebrew University of Jerusalem, Israel. Once triggered, the device chomps on strands of 'fuel' DNA, releasing fluorescent dye as it goes.

The machine is a DNA-cleaving enzyme; it is switched on when the target DNA strand pairs up with a complementary sequence looped around the enzyme's jaws. The enzyme then munches through the fuel DNA, releasing fluorescent marker as a waste product, and reconstructing itself before each fresh cycle of cleavage.

The researchers demonstrate their technique on a sequence associated with the Tay–Sachs genetic disorder, and say that it might provide an alternative to PCR-based sequence detection.

## JOURNAL CLUB

Gordon McFiggans  
University of Manchester, UK

**An atmospheric scientist  
ponders a cloudy problem.**

Reluctantly, I was forced to open an old can of worms when writing a review article on cloud formation.

The problem concerns how water droplets grow. Numerical models of cloud formation assume that any water-vapour molecules colliding with a liquid droplet will be accommodated on to the droplet's surface.

However, several groups have reported measurements that are inconsistent with this argument. These measurements suggest that something inhibits the uptake of water — possibly some component of the aerosol particle that originally 'seeded' the water droplet, which coats the growing droplet's surface.

The implications of this debate are more than academic. Predicting how clouds influence climate requires a good model of cloud brightness and persistence — properties that depend on droplet number and thus, ultimately, uptake probability.

My attention was drawn to work from the Queensland University of Technology in Brisbane, Australia, where researchers had used a home-built instrument to investigate aerosol particles. Their instrument sized the particles, then heated them to drive off volatile material before increasing the humidity. Finally, the instrument measured the size of the resulting water droplet (G. Johnson *et al.* *J. Geophys. Res.* 110, D20203; 2005).

A subset of the particles took up more water after heating, suggesting the lost volatile component had inhibited water uptake. This is the most direct evidence I have seen for a mechanism for suppressed water uptake in the real atmosphere.

In our review article, we dealt with the debate by laying out the arguments without drawing a clear conclusion. But experiments such as those done by Johnson *et al.* may yet provide a definitive answer.