RESEARCH HIGHLIGHTS

Big volcano, tiny troubles

Geology **37,** 435–438 (2009)
Potentially dangerous silica nanofibres have been identified in airbourne ash spewed across southern South America by a Chilean volcano. Martin Reich and his colleagues at the University of Chile in Santiago used high-resolution transmission electron microscopy to image the one-dimensional crystalline silica nanostructures, called cristobalites. They were formed during the eruption of Patagonia's Chaitén Volcano, which began on 2 May 2008 and is ongoing.

The researchers propose that amorphous silica was reduced by carbon monoxide and then oxidized to become breathable crystalline nanostructures. The formation of these structures was enhanced by micrometre- to nanometre-sized silica glass fragments in the volcanic column.

C. BROWN/EPA/CORBIS

NANOMEDICINE

Dude, where's my dot?

Nano Lett. doi:10.1021/nl900872r (2009)
Targeting diseases with nanotechnology-based therapies supposes precise knowledge of where nanodevices go when released in the human body. Yet current knowledge is anything but precise.

John Frangioni of Beth Israel Deaconess Medical Center in Boston, Massachusetts, Moungi Bawendi of the Massachusetts Institute of Technology in Cambridge and their colleagues went looking for answers in rats. They used near-infrared-emitting semiconductor nanoparticles coated with a polymer of varying lengths to determine how size and hydrophilicity affect where particles end up. Very small particles (around 5.5 nanometres wide) can be excreted by the kidneys, but even smaller ones get trapped in the liver; larger particles seem to target the pancreas, usually difficult to get to because it has few molecular targets. Meanwhile, the largest particles remain in the vasculature for long periods of time.

ANIMAL BEHAVIOUR

Simian support networks

Biol. Lett. doi:10.1098/rsbl.2009.0204 (2009)
Game theory can explain the evolution of cooperation in large, randomly structured groups through the balance between costs and benefits. However, groups of primates that exhibit cooperative behaviour are often neither large nor randomly structured.

Bernhard Voelkl and Claudia Kasper at the Strasbourg arm of the CNRS, France's basic-research agency, examined data on 70 primate groups ranging in size from 4 to 35 individuals, taking in a total of 30 species. They modelled the groups to see whether, over time, individuals would be better off cooperating or not.

They found that 61 of the groups were more likely to cooperate than they would have been in a less structured group of the same size, suggesting that the structure assists in the fixation of cooperative behaviour.

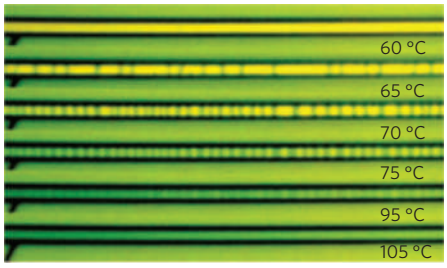
ATOM OPTICS

Seeing spots

Phys. Rev. A doi:10.1103/PhysRevA.79.053823 (2009)
The original 'Poisson spot' experiment had a crucial role in proving the wave nature of light: because of the way that waves diffract, light shining at a circular object casts a bright spot in the centre of the object's shadow.

Thomas Reisinger of the University of Bergen in Norway and his colleagues now demonstrate that a beam of deuterium molecules can also create a Poisson spot — replicating the classical experiment using neutral matter waves.

The authors suggest several potential applications, ranging from 'printing' larger molecules precisely on a surface to the study of quantum decoherence and other effects at the boundary of quantum and classical physics. Unlike other diffraction methods, Poisson's spot is wavelength independent.



MATERIALS SCIENCE

A material turnabout

Nature Nanotechnol. doi:10.1038/NNANO.2009.141 (2009)
Vanadium dioxide (VO_2) has long been a puzzle to condensed-matter physicists — above 68 °C it acts as a conductor, but below that temperature it is an insulator. Some say that collective motion of the electrons is mainly responsible for this transition, whereas others suggest that interactions between the electrons and the vibrations in the material's crystal lattice contribute to the odd behaviour.

David Cobden and his colleagues at the University of Washington in Seattle approached the mystery using nanobeams of VO_2, which are devoid of the defects and variations that obscure the results of experiments on larger samples. (Pictured below left, a 40-micrometre-long nanobeam imaged during warming shows dark metallic domains appearing and widening.) Their findings suggest that electron–electron interactions are behind the transition.

The same approach may prove useful in studying other materials. As for VO_2, it may find uses in electronics or mirrors that can be switched on and off at will.

GENETICS

A tippling gene

Cell doi:10.1016/j.cell.2009.03.020 (2009)
Mutating a gene in the fruitfly *Drosophila* increases the insect's resistance to the sedating effects of alcohol, report Ulrike Heberlein at the University of California, San