RESEARCH HIGHLIGHTS

Arctic travel

Science **316,** 1606–1609 (2007)

Plant species driven north by climate change shouldn't have too much trouble making the trip, according to a survey of plants growing on the rocky Arctic outpost of Svalbard, Norway. Seeds from all of the species studied travelled there from places as distant and diverse as Greenland, Scandinavia and Russia.

Researchers led by Inger Greve Alsos, now at the University Centre in Svalbard, compared genetic samples from nine Svalbard species with those from the same species gathered at sites across the Northern Hemisphere. They found that the island had been colonized by plants from each of the sample locations, presumably travelling by wind or on drifting ice or wood.

B. E. SANDBAKK

BIOTECHNOLOGY

RNA *en masse*

Nature Methods doi:10.1038/nmeth1058 (2007)

Scientists in France have developed the first efficient method to generate high-quality RNA samples for use as research tools.

Although the importance of diverse RNA molecules in most cellular processes is becoming ever clearer, the methods for producing pure RNAs have remained laborious and costly.

The simple and reliable technique thought up by Luc Ponchon and Frédéric Dardel from the University of Paris Descartes is analogous to the standard method for making genetically engineered proteins — both exploit the cellular machinery of the bacterium *Escherichia coli*.

In a twist to protect the RNAs from destruction by bacterial enzymes during synthesis, they use a bacterial molecule called tRNA as both a shield and a scaffold.

LOW-TEMPERATURE PHYSICS

Electron movies

Low Temp. Phys. doi:10.1007/s10909-007-9373-2 (2007)

Single electrons have been immortalized on the silver screen.

When a single electron finds itself in liquid helium it creates a bubble, thanks to the mutual repulsion between it and helium's two electrons. Wei Guo and Humphrey Maris from Brown University in Providence, Rhode Island, used sound waves to create pressure within such bubbles, pumping them up to the size of a small grain of dust. The low surface tension of superfluid helium allowed the electron-encapsulating bubbles to grow to this size before they popped.

The bursting bubbles were big enough to be caught on camera (pictured below), and sound pulses were used to track the motion of an electron after the rupture of its bubble. For each electron, bubbles grew and popped continuously as the sound wave pulsed. The resulting images show most released electrons travelling in a straight line. However, a few electrons shot through the liquid helium in a snake-like manner, possibly following a superfluid vortex.

NANOTECHNOLOGY

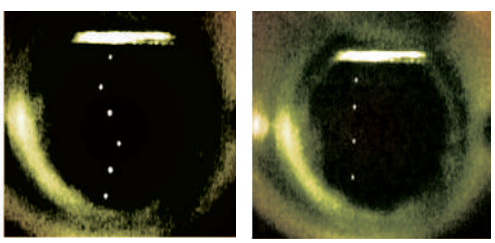
Tiniest magnets shape up

Adv. Mater. doi:10.1002/adma.200602374 (2007)

Researchers have engineered several different nanometre-scale crystalline structures from a single magnetic material. Each form, they say, may have a unique application.

Jiao-Ming Qiu and Jian-Ping Wang of the University of Minnesota in Minneapolis built their structures using tiny 'nanomagnets' made of iron and platinum (FePt). By 'sputtering' the FePt molecules onto a surface, they created simple, geometric shapes. At a low sputtering current, they found that FePt nucleated into an icosahedral (20-faced) structure, whereas at higher currents the particles created different types of octahedron.

The magnetic properties of the larger structures varied, and the authors say they could have a range of uses, from biodetectors to ultracompact hard drives.



W. GUO/BROWN UNIV.

NEUROSCIENCE

Touching empathy

Nature Neurosci. doi:10.1038/nn1926 (2007)

'Mirror touch' synaesthesia — in which people watching others being touched feel the same touch on their own skin — is a real condition, researchers have found. And, they say, such synaesthetes have more gut-level empathy with others.

Jamie Ward and Michael Banissy at University College London, UK, found that those with the condition make more errors than do control subjects in deciding where they themselves are being touched when they observe another person being touched at the same time.

They also found that mirror-touch synaesthetes show more emotional empathy, but not the type of empathy that requires reasoning. The researchers say the results support the concept that we empathize with others by automatically simulating their experiences.

MICROBIOLOGY

Stuck in the gut

Proc. Natl Acad. Sci. USA **104,** 10637–10642 (2007)

Scientists have identified a protein structure that helps the food-borne pathogen enterohaemorrhagic *Escherichia*

coli (0157:H7) stick to the host tissue it is invading.

These bacteria cause life-threatening bloody diarrhoea or kidney damage. But Jorge Girón from the University of Arizona in Tucson and his colleagues showed that the gene encoding this protein, known as *E. coli* common pilus (ECP), is present in almost all of the 169 strains of *E. coli* they studied, including non-pathogenic ones that live peacefully in the gut.

The authors suggest that pathogenic strains may exploit this protein to disguise their pathogenic nature from the host's immune system.

IMMUNOLOGY

Inflammation control

Science doi:10.1126/science.1145697 (2007)

New research has shown that retinoic acid, a metabolite of vitamin A, helps determine the course of T-cell specialization and could be important for regulating inflammation.

Hilde Cheroutre and her colleagues at the La Jolla Institute for Allergy and Immunology in California found that blocking retinoic acid perception in mouse T-cell cultures promoted synthesis of pro-inflammatory cells. Conversely, adding retinoic acid to cultures or live mice lowered the production of pro-inflammatory T-cells.

The researchers also found that inflammation could be suppressed in mice if the animals were given T cells pretreated with both retinoic acid and a protein involved in determining T-cell specialization. The team suggests that therapies targeting retinoic acid may be useful against certain inflammatory disorders.

CHEMISTRY

Gold leaf

Langmuir doi:10.1021/la063738o (2007)

Large, smooth films of gold would make the precise measurement of forces on the surfaces of materials easier. But making films big and smooth enough has been a challenge.

Now, Liraz Chai and Jacob Klein of the Weizmann Institute of Science in Rehovot, Israel, describe a method for creating gold

films that are smooth at the molecular level and as big as one square centimetre (pictured below) — several orders of magnitude larger than previous films of this type.

The key is to coat one side of thin, single-crystal mica sheets with evaporated gold, then strip away the mica to leave the film behind.

PLANETARY SCIENCE

Mystery of Mars's methane

Geophys. Rev. Lett. **34,** L11202 (2007)

The methane recently observed in the martian atmosphere could have been released from methane hydrates below the planet's surface, a new model suggests.

Methane hydrates are one possible source of the gas, but the temperature and pressure below the planet's frozen surface would theoretically stabilize any stores to a depth of 6 kilometres.

Megan Elwood Madden and her colleagues at Oak Ridge National Laboratory in Tennessee now suggest that increasing salt levels may destabilize the hydrates. Their calculations from some predicted sources of high salinity suggest that hydrates might only be stable down to 1.7 kilometres in high-salinity systems. They say the decrease in hydrate stability with increased salinity might allow methane to be released, and escape through fracture zones into the atmosphere.

CELL BIOLOGY

Stem-cell variation

Nature Biotechnol. doi:10.1038/nbt1318 (2007)

Stem cells around the world have a lot in common but are not exactly the same, reports an international consortium.

The International Stem Cell Initiative analysed 59 human embryonic stem-cell lines held in 17 laboratories worldwide to begin standardizing information about these notoriously finicky and mutable cells.

Participating labs considered characteristics such as surface proteins and the expression of certain genes. They found that the lines share most traits — for instance, all express a particular suite of cell-surface markers. However, they differ in others, such as the means by which one X chromosome is inactivated in female lines.

The results should give scientists more confidence in designing studies and comparing their results, the consortium says.

H. BARAK/WEIZMANN INSTIT./AM. CHEM. SOC.

JOURNAL CLUB

Nicolas Gruber
Swiss Federal Institute of Technology, Zürich, Switzerland

A climate scientist worries that attempts to curb atmospheric carbon dioxide levels are challenged on two fronts.

What is your carbon footprint? I must admit that, as someone who frequently travels across continents, mine is well above the Swiss average. Even worse, my footprint has grown over the past few years despite the fact that I am well aware of the consequences of my actions.

Now, imagine that everyone else on this planet has increased their carbon footprint as well. This is not hypothetical. A recent paper tells us that global carbon emissions have grown at the unexpectedly high rate of more than 3% per year since 2000 (M. Raupach *et al. Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.0700609104; 2007).

In particular, the rapidly increasing appetite for energy of the emerging markets in Asia has led to a dramatic increase in fossil-fuel burning. As a result, global CO_2 emissions now exceed the worst-case scenarios of just a few years ago. This is far from the direction that we ought to be taking to achieve a stabilization of greenhouse gases that "prevents dangerous interference with the climate system", as the Climate Convention in Rio set out to achieve in 1992.

Unfortunately, the situation may become even more difficult. Earth's biosphere has so far helped to mitigate the carbon problem by removing a substantial fraction of the emitted CO_2, but this 'sink' function may diminish.

There is some evidence that sinks are already weakening (C. Le Quéré *et al. Science* 10.1126/science.1136188; 2007), and coupled climate–carbon-cycle models tend to support the view that the trend will persist. If so, we are challenged at both ends — by unexpectedly rapidly increasing emissions and by diminishing sink strengths — making climate stabilization a truly grand challenge.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**