RESEARCH HIGHLIGHTS

Selections from the scientific literature

GEOSCIENCE

How plants check global warming

Plants' response to a twofold increase in atmospheric carbon dioxide could put a much stronger brake on global warming than expected.

Greater vegetation growth in hotter, wetter climates leads to more evaporation and transpiration from leaves, and therefore more heat loss from land. Other studies have noted this effect, but Lahouari Bounoua at the Goddard Space Flight Center in Greenbelt, Maryland, and his colleagues built into their modelling study additional feedback effects — such as alterations in plants' photosynthetic activity — that further boost vegetation growth.

They predict that the effects on plants of growing in 700 parts per million of carbon dioxide would reduce expected 30-year temperature rises by around 13% globally.

Geophys. Res. Lett. **doi:10.1029/2010GL045338 (2010)**

MICHAEL AW, WWW.MICHAELAW.COM

ZOOLOGY

Showcasing the sea's strange secrets

A bizarre worm with ten 'arms' has been discovered almost 3,000 metres below the ocean surface near Indonesia. *Teuthidodrilus samae* (**pictured**) is a newly identified genus and species of free-swimming annelid worm. Karen Osborn, currently at the University of California, Santa Cruz, and her colleagues report that it seems to be common deep in the Celebes Sea.

The 'squidworms' can reach 94 millimetres in length, and their appendages can be even longer. The worms have probably avoided detection for so long because of their ability to swim away from sampling gear and the difficulties of exploring the vast ocean depths. The strange creature shows how little we know about even common members of the sea's deep-water communities, say the authors.

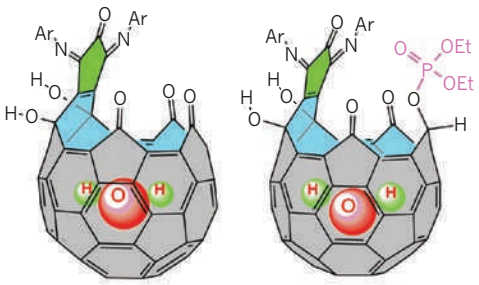
Biol. Lett. **doi:10.1098/rsbl.2010.0923 (2010)**

CHEMISTRY

Tiny molecular 'water bottle'

A 'buckyball' — a spherical molecule made up of 60 carbon atoms — has been turned into a vial just big enough to hold a single water molecule, complete with its own removable stopper.

Liangbing Gan of Peking University, Wim Klopper of the Karlsruhe Institute of Technology in Germany and their team created a 60-carbon fullerene sphere with an orifice big enough for water to pass through.



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They show that a phosphate group can be easily attached and removed from the edge of the orifice, where it acts as a plug for the fullerene vial. With this 'stopper' removed (**pictured** left), water is incorporated into the vial 230 times faster than with it attached (right).

The authors say that uses for the vial could include acting as a carrier for drugs in the body.

Angew. Chem. Int. Edn **doi:10.1002/anie.201004879 (2010)**

OPTICAL PHYSICS

A peek at a molecule's guts

Advanced microscopy techniques have provided researchers with an unprecedented glimpse into a molecule. Researchers used the electron beam of a scanning tunnelling microscope (STM) to excite different parts of the molecule, causing it to emit light.

Wilson Ho and his colleagues at the University of California, Irvine, used an STM and photon detector to image molecules of magnesium porphine. The images reveal a structure with twofold symmetry, which the authors say is due to an approximately planar molecule distorting into a saddle shape. This distortion warps molecular orbitals and so changes the spectra of the emitted photons, revealing the inner structure.

Previously, optical techniques have been able to detect individual molecules

but not to resolve details of their interiors.
Phys. Rev. Lett. 105, **217402 (2010)**

MEDICINE

Profiling for blood pressure

Whether the powerful high-blood pressure medicine rostafuroxin will be effective for a particular patient can be predicted from a set of gene variants.

Giuseppe Bianchi at the Prassis sigma-tau Research Institute in Milan, Italy, and his colleagues show how the drug works. It normalizes sodium transport in the kidneys that is disrupted by two specific mechanisms: a mutated version of a protein called adducin and a boost in levels of a hormone called ouabain. The researchers identify several gene variants heralding the faulty mechanisms and, in a second paper, show that patients with certain combinations of variants in five specific genes respond well to rostafuroxin, but not necessarily to two other blood-pressure medicines.

The key combination of variants is present in about 25% of patients.
Science Transl. Med. 2, **59ra86; 59ra87 (2010)**

STEM CELLS

Platelets get a boost

The reprogramming of adult cells to produce induced pluripotent stem (iPS) cells shows promise for tissue repair. c-MYC is one of the proteins used to reprogram cells, but at high levels it also hinders the transformation of iPS cells into platelets, a blood cell important in clotting and wound healing.

Some iPS cells do turn into platelets, however, and Koji Eto at the University of Tokyo, and his colleagues have now found out how. The team created numerous human iPS cell lines by delivering a cocktail of proteins, including c-MYC, to skin cells, and then differentiated these into platelets. The iPS cells that became platelets most efficiently were those that rapidly muffled the expression of c-MYC. In mice, these platelets homed in on damaged blood vessels just like natural platelets.
J. Exp. Med. **doi:10.1084/jem.20100844 (2010)**

MATERIALS

Controlling water on synthetic silk

Tiny water droplets have been made to move in a controlled direction along threads of synthetic spider webs.

Lei Jiang at the Chinese Academy of Sciences in Beijing, Yongmei Zheng of the Beijing University of Aeronautics and Astronautics and their colleagues constructed webs from different polymers and observed the spontaneous movement of micrometre-sized water droplets on their strands. On polymers with a rough surface, drops always migrate towards and coalesce at knots in the silk, regardless of its hydrophobicity. But if the surface is smoother they move away from the knots if the polymer is hydrophobic, and towards them if it is hydrophilic.

These results should allow the design of devices that can drive water droplets in a controllable manner.
Adv. Mater. **doi:10.1002/adma.201003169 (2010)**

DEVELOPMENTAL BIOLOGY

Placenta key to fetal growth rate

Gestation period varies widely in the mammalian world, with some species developing twice as fast as others in the womb. This is largely because of differences in the arrangement of fetal and maternal tissues in the placenta.

Isabella Capellini at Durham University, UK, and her team analysed data from previous studies on neonatal brain mass, body and litter size, and maternal placental morphology from 109 mammalian species. They discovered that animals with placentas where fetal and maternal tissues interlock the most — creating a greater surface area over which nutrients can flow — gestate in less than half the time taken by animals that have placentas with a minimal surface area for nutrient exchange.
Am. Nat. **doi:10.1086/657435 (2010)**

COMMUNITY CHOICE

The most viewed papers in science

CELL BIOLOGY

Genes that make cells move

HIGHLY READ on genesdev.cshlp.org the week beginning 15 November

The movement of cells in the body is important for normal development, but can also be deadly — in metastatic cancer. Researchers have teased out 31 genes whose products belong to various pathways that seem to regulate human cell migration. The pathways converge on a key signalling enzyme called RSK, suggesting that this could be a target for new cancer drugs.

Daniel Haber at the Massachusetts General Hospital in Boston and his co-workers screened roughly 11,000 genes in human cells using 55,000 small RNA molecules that silence specific genes. They used a chamber with a perforated membrane to identify which cells retained their roving abilities.

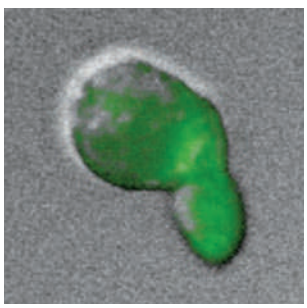
The authors found that many of the 31 genes they identified had not previously been linked to cell motility. Furthermore, when the researchers blocked RSK with a small-molecule inhibitor, single cells moved much more sluggishly.
Genes Dev. **doi:10.1101/gad.1989110 (2010)**

NEUROBIOLOGY

The source of sour taste

The five basic tastes are sensed on the tongue by different sets of cells, but the acidic taste of sour has long defied molecular analysis. Now researchers have genetically engineered mice in which they can fluorescently tag sour-taste cells (**pictured**), and have pinpointed the changes that acid triggers in the cells.

Isolating the cellular mechanisms associated with sour-taste recognition has been challenging because many ion channels in cell membranes respond to acid, whether or not they are involved in sour sensing. Emily Liman and her team at the University of Southern California in Los Angeles tagged not only the sour-taste cells but also those for bitter, sweet and umami, and compared the responses of these cells to acid. They found that the sour-taste cells fired alone when protons were transported across the membrane — but all cells reacted to sodium ions, which were previously thought to mediate sour sensing.
Proc. Natl Acad. Sci. USA **doi:10.1073/pnas.1013664107 (2010)**



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