RESEARCH HIGHLIGHTS

Selections from the scientific literature

PLANETARY SCIENCE

Close companion for Uranus

Planetary scientists have discovered the first object known to share its orbit with Uranus.

The body, measuring some 60 kilometres in width and dubbed 2011 QF_{99}, stays just ahead of Uranus as the two orbit the Sun. Computer simulations indicate that 2011 QF_{99} will remain near the planet for around 3 million years.

It is part of a group of outer Solar System bodies in unstable orbits — they become temporarily trapped by giant planets and later return to wandering the Solar System's fringes, report Mike Alexandersen of the University of British Columbia in Vancouver, Canada, and his colleagues.
Science 341, **994–997 (2013)**

BACTERIOLOGY

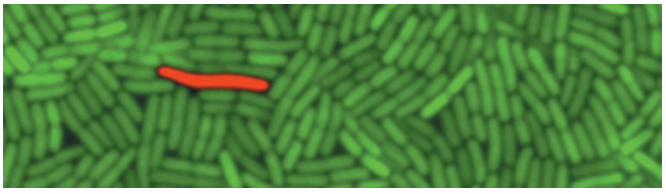
Random signal triggers tolerance

Researchers have determined that randomly produced amounts of a signalling molecule can prompt a multidrug-tolerant state found in one in every million bacterial cells.

Populations of many disease-causing bacteria contain 'persisters': slow-growing but genetically unchanged cells, which can resuscitate and multiply after antibiotic treatment. Such persisters (**pictured**; in red) are implicated in chronic and recurrent infections such as tuberculosis.

Kenn Gerdes at Newcastle University, UK, and his colleagues showed that the mechanism behind persistence in *Escherichia coli* can be traced to the signalling molecule (p)ppGpp, which is known to initiate a drug-tolerant stress response in bacteria.

Levels of this molecule vary between cells, and the rare cells that produce (p)ppGpp amounts above a certain threshold grow slowly and resist antibiotics. Why some cells produce more (p)ppGpp than others remains unclear, but the authors propose a "microstarvation" model in which the cells with the least nutrients go into persistence. The finding suggests an application for drugs that inhibit (p)ppGpp synthesis.
Cell 154, **1140–1150 (2013)**



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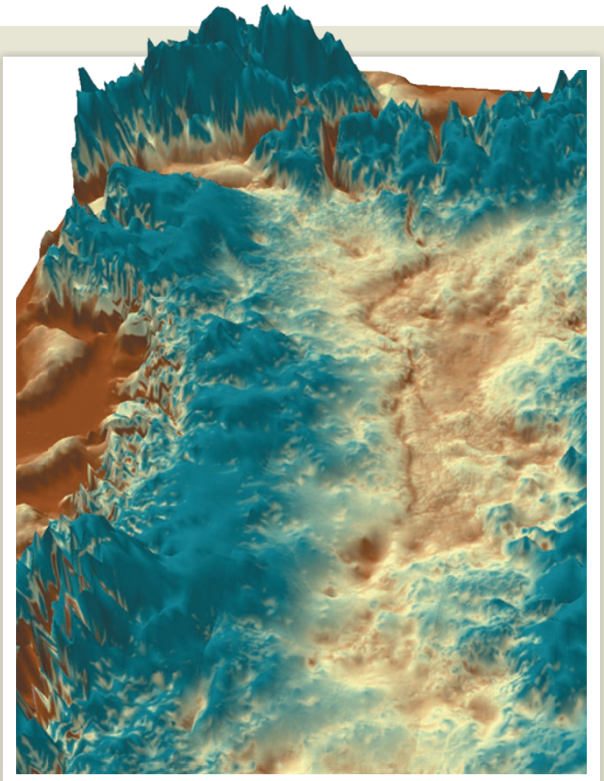

J. BAMBER/UNIV. BRISTOL

GEOLOGY

Greenland's Grand Canyon

Researchers have used radar to penetrate Greenland's ice sheet, revealing a monstrous canyon in the bedrock beneath.

The canyon (**pictured**, looking northwest from central Greenland) runs for at least 750 kilometres to the northern edge of the sheet and is up to 800 metres deep in parts, reports a team led by Jonathan Bamber of the University of Bristol, UK.

Water may have carved the massive canyon at some point before about 3.5 million years ago, when Greenland's ice sheet began growing. This feature could act as a drainage route and might explain why Greenland — unlike Antarctica — has few lakes beneath its ice.
Science 341, **997–999 (2013)**

NANOTECHNOLOGY

Super-bright nanocrystals

A dollop of infrared light can greatly improve nanocrystals that convert infrared photons to visible light.

Such crystals are made of sodium yttrium fluoride doped with ions of elements such as thulium, which emit radiation in the visible spectrum. If too much thulium is added to the mix, the luminosity drops.

But Jiangbo Zhao and Dayong Jin at Macquarie University in Sydney, Australia, and their colleagues have discovered that using high levels of infrared light to irradiate the crystals prevents this 'quenching' of the visible light emission and makes the crystals shine 1,000 times brighter.
Nature Nanotechnol. **http://dx.doi.org/10.1038/nnano.2013.171 (2013)**

MODEL ANIMALS

The social lives of lab mice

Mice raised in labs have more-complex social lives than previous models of group behaviour have suggested.

Alon Chen and Elad Schneidman at the