

## 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<sub>99</sub>, stays just ahead of Uranus as the two orbit the Sun. Computer simulations indicate that 2011 QF<sub>99</sub> will remain near the planet for around 3 million years.

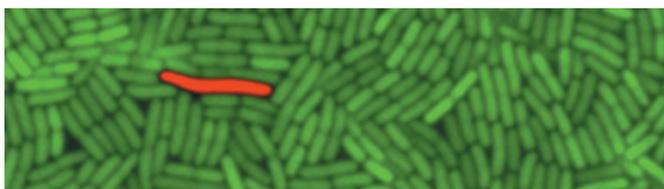
It is part of a group of outer Solar System bodies in unstable orbits — they become temporarily trapped by giant planets and later return to wandering the Solar System's fringes, report Mike Alexandersen of the University of British Columbia in Vancouver, Canada, and his colleagues. *Science* 341, 994–997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

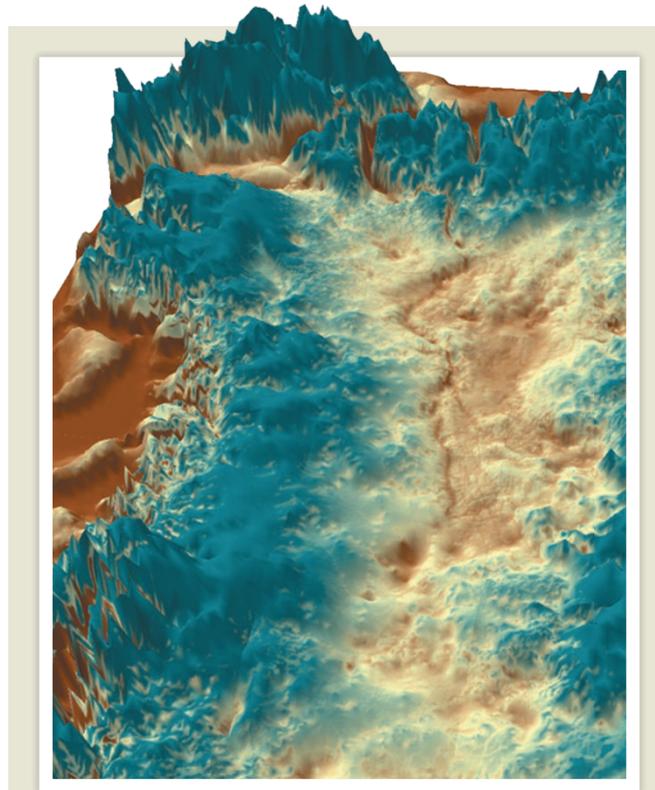


are implicated in chronic and recurrent infections such as tuberculosis.

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



## 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)

(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)

## 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

Weizmann Institute of Science in Rehovot, Israel, and their colleagues used cameras to track the locations of groups of four mice in an arena at night by painting their fur with fluorescent colours.

Models that assumed the mice act as individuals or interact in pairs (the typical model of mouse sociality) did poorly at describing the group's movement as a whole. Only models with interactions between three mice gave good approximations of the observed behaviour.

Using this model, the researchers found that mice raised in standard lab environments were less individualistic than those who had lived in larger groups and in more complex enclosures.

*eLife* 2, e00759 (2013)

## CLIMATOLOGY

## Geoengineering has its limits

Blocking solar radiation cannot restore a high-carbon world to its preindustrial climate.

Ben Kravitz of the Pacific Northwest National Laboratory in Richland, Washington, and his colleagues analysed results from 12 climate models simulating quadrupled atmospheric carbon dioxide levels, and a matching reduction in solar radiation.

Blocking the sunlight kept average global temperatures in check while preventing 97% of Arctic sea-ice loss, but the effects on temperature and precipitation varied by region, with the Arctic experiencing more warming and the tropics more cooling, as well as less rainfall in places.

The authors suggest that solar geoengineering cannot simultaneously correct for global and regional impacts from rising greenhouse-gas levels.

*J. Geophys. Res.* <http://doi.org/nmz> (2013)

## NEUROBIOLOGY

## Protecting neurons from Parkinson's

An enzyme that adds a phosphate group to a protein called  $\alpha$ -synuclein — the phosphorylated form of which tangles up inside neurons in Parkinson's disease — also targets the protein for destruction.

Hilal Lashuel and his colleagues from the Swiss Federal Institute of Technology in Lausanne injected rat brains with the genes for both  $\alpha$ -synuclein and the enzyme PLK2.

When they increased amounts of  $\alpha$ -synuclein, the rats lost specific neurons and developed Parkinson-like symptoms. But both effects were avoided, and levels of neuronal  $\alpha$ -synuclein fell, when they overexpressed the gene for PLK2 at the same time.

They showed that the PLK2 enzyme protects neurons from  $\alpha$ -synuclein toxicity by shepherding the protein into autophagy, a cellular process for clearing debris.

*Proc. Natl Acad. Sci. USA* <http://doi.org/nmx> (2013)

## ANIMAL BEHAVIOUR

## Puppeteer squid haunts the deep

The deep-sea squid *Grimalditeuthis bonplandi* (pictured) uses its tentacles to mimic smaller sea creatures, attracting prey.

The animal's tentacle stalks are fragile in comparison to those of most squid, and its tentacle tips lack the suckers or hooks that are usually used to catch and manipulate prey.

Henk-Jan Hoving, then at the Monterey Bay Aquarium Research Institute in Moss Landing, California, and his colleagues analysed videos of seven *G. bonplandi* recorded by remotely operated submarines, the first observations ever made

## COMMUNITY CHOICE

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## MARINE MICROBIOLOGY

## Marine plastic fantastic for microbes

**HIGHLY READ**  
on [pubs.acs.org/journal/esthag](http://pubs.acs.org/journal/esthag)  
in August

A new ecosystem is emerging on plastic marine debris in the world's oceans: the 'plastisphere'.

Tracy Mincer at the Woods Hole Oceanographic Institution and Linda Amaral-Zettler of the Marine Biological Laboratory in Woods Hole, both in Massachusetts, and their colleague sequenced the microbial communities on plastic litter floating in the sea. They revealed a complex food web living in biofilms on two types of plastic, made up of microbes that were genetically distinct from those in the surrounding seawater. Unlike those in seawater samples, the communities on plastic had an even spread of diversity and were not dominated by just one or two types.

*Environ. Sci. Technol.* <http://doi.org/m4q> (2013)

of the squid in its natural habitat. The creatures moved their tentacles in a manner that resembled the movements of smaller animals such as fish or other cephalopods. The researchers suggest that the motions cause vibrations, water movements or bioluminescence in nearby microorganisms. The squid then consume curious creatures that come to investigate.

*Proc. R. Soc. B* 280, 20131463 (2013)

For a longer story on this research, see [go.nature.com/byyusm](http://go.nature.com/byyusm)

## GENETICS

## A library of human knockouts

The functions of all 20,000 human protein-coding genes are still not known, partly because large gene-knockout libraries are not available for human cells.

One strategy for making such a library is to use a retroviral gene trap that disrupts gene expression when inserted into different genes.

But this does not work for human cells, which have two copies of most genes. Now a team led by four researchers — Tilmann Bürckstümmer of biotech firm Haplogen in Vienna, Austria, and Thijn Brummelkamp, Giulio Superti-Furga and Sebastian Nijman of the Research Center for Molecular Medicine of the Austrian Academy of Sciences in Vienna — has overcome this problem.

The team used a cancer-cell line that has only one copy of most genes (near-haploid) to assemble a knockout library of 3,396 human genes. The collection should enable screens of a range of phenotypes, the team reports. *Nature Meth.* <http://doi.org/nmw> (2013)

## CORRECTION

The Research Highlight 'Soil life predicts nutrient flow' (*Nature* 500, 380; 2013) stated an incorrect affiliation. Franciska de Vries is now at the University of Manchester, UK.

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