# RESEARCH HIGHLIGHTS

*Selections from the scientific literature*

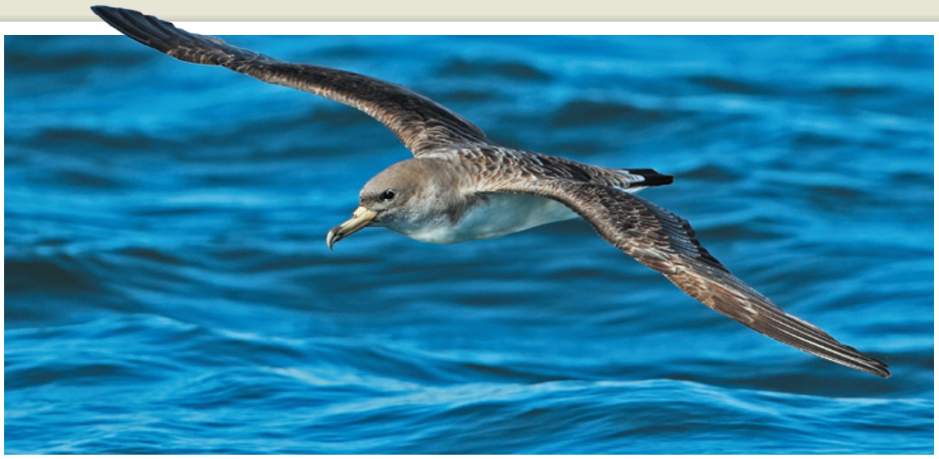
ELECTRONICS

## Skin that glows on touch

A flexible electronic skin, or e-skin, lights up instantly in response to touch.

A team led by Ali Javey at the University of California, Berkeley, manufactured the e-skin by layering carbon nanotube transistors, light-emitting diodes (LEDs) and pressure sensors. The authors made a 3.5- by 3-centimetre patch of e-skin that lights up where pressure is applied — the higher the local pressure, the brighter the LEDs. The researchers suggest that the technology could be modified to respond to sensations other than pressure and may have applications in interactive displays, robotics and health monitoring.

***Nature Mater.*** **http://dx.doi.org/10.1038/nmat3711 (2013)**



ROBIN CHITTENDEN/FLPA

ANIMAL BEHAVIOUR

## Sea birds scent home

Scent helps Cory's shearwaters to navigate long distances over featureless oceans.

Anna Gagliardo at the University of Pisa in Italy and her team deprived eight shearwaters (*Calonectris borealis*; pictured) of their sense of smell by washing their nasal cavities with a zinc sulphate solution. The authors attached magnets to the heads of eight more birds to disrupt any natural magnetic sense, and used another eight not subject to sensory manipulation as controls.

All animals were tagged and released around 800 kilometres from their home colony. The control birds and seven of those carrying magnets returned to the colony within a few days. Just two of the smell-deprived birds made it home within the breeding period, and only after following long, tortuous paths. The researchers suggest that shearwaters navigate by an odour-based map, and not by geomagnetic fields.

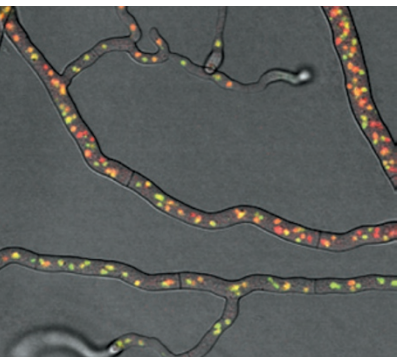
***J. Exp. Biol.*** 216, **2798–2805 (2013)**

FUNGAL BIOLOGY

## Mould optimized for gene mixing

Some moulds boost their genetic diversity by pumping DNA through sprawling networks of fungal fibres.

Unlike plants and animals, certain fungi form colonies of interconnected cells with mobile, genetically distinct nuclei in a common cytoplasm. Marcus Roper at the University of California, Los Angeles, and his colleagues tagged nuclei of the red bread mould *Neurospora crassa* with either green or red fluorescent proteins (**pictured**) and then monitored how the nuclei moved through fungal filaments, which branch and fuse into a hyphal network. The team found that fluids push nuclei through the tiny tubes at a rate of 3 millimetres per hour, supplying the tips of the network with a diverse mix of DNA. The network's structure enhances hydraulic flow, boosts nuclear mixing and could help fungi to recombine genes to create more robust mould, the authors say.



PATRICK HICKEY/UCLA

***Proc. Natl Acad. Sci. USA*** **http://dx.doi.org/10.1073/pnas.1220842110 (2013)**

CANCER RESEARCH

## Tumour lines are not all equal

The cell lines that researchers routinely turn to when studying ovarian cancer are not the best genetic match available.

Nikolaus Schultz and his team at the Memorial Sloan-Kettering Cancer Center in New York screened 47 cell lines used to model ovarian cancer. The researchers compared the models with samples of human ovarian cancer in terms of gene expression, genetic duplications and mutations. Many frequently used lines were quite different from the most common and lethal cancer types. For example, two cell lines most often used as tumour models did not contain mutations in a gene that is typically altered in ovarian cancers. Less-used lines were deemed better matches. The analysis will help researchers to choose the most-relevant lines for testing potential cancer drugs, the authors say, and the approach could be used for other tumour types.

***Nature Commun.*** 4, **2126 (2013)**

ASTRONOMY

## Stellar ice hints at planet birth

A 'snow line' in the gas-rich disk around a young star shows how far from the star carbon monoxide freezes, and so where planets are likely to form. Carbon monoxide ice

indicates that temperatures are cold enough for the chemical components of planets to form. It also increases the density of dust grains and helps them to clump together. A team led by Chunhua Qi of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and Karin Öberg of the University of Virginia in Charlottesville studied the gas disk surrounding TW Hydrae, a star 54 parsecs from Earth. This revealed signals of diazenylium, an ion that exists mainly in areas where carbon monoxide is frozen. The team found this snow line about 30 Earth–Sun distances from the star. Knowing the location could help astronomers to shape models of planet formation in the Solar System and beyond, the authors say.
***Science*** **http://dx.doi.org/10.1126/science.1239560 (2013)**

CELL BIOLOGY

## Twists in a protein factory

A protein-synthesis organelle called the endoplasmic reticulum is shaped like a spiralling car park — and can add new levels as needed.

A team led by Mark Terasaki at the University of Connecticut Health Center in Farmington and Tom Rapoport at Harvard Medical School in Boston, Massachusetts, produced extremely detailed electron microscopy images of the organelle by staining very thin sections using a technique that accentuates the membrane sheets from which it is built. This method revealed sheets that form a twisting, continuous membrane with layers connected by helical ramps. The team described this geometry precisely using mathematical modelling and showed that the structure allows for dense, adjustable packing of material in the cell, boosting the surface available for protein production within a small volume.
***Cell*** 154, **285–296 (2013)**

CLINICAL GENOMICS

## TB resistance revealed

DNA sequencing can reveal antibiotic resistance in tuberculosis (TB) infections faster than standard tests.

The causative agent of TB, *Mycobacterium tuberculosis*, grows so slowly in culture that assessing its susceptibility to antibiotics can take one to two months, with each drug requiring its own test. A team led by Sharon Peacock at the University of Cambridge, UK, used whole-genome sequencing to investigate a case of tuberculosis that had shown resistance to many antibiotics. Within days of sampling and culturing the patient's mucus, sequencing revealed co-infection with two strains of tuberculosis, a condition that had not been detected with standard tests. The team examined genes known to influence the effectiveness of 39 antibiotics. The results indicated that the strains were resistant to nine drugs that had already been identified by a reference laboratory, as well as to five others not yet assessed.
***N. Engl. J. Med.*** 369, **290–292 (2013)**

CLIMATE MODELLING

## Ice-free Arctic predicted

High levels of greenhouse-gas emissions could drive the annual sea-ice minimum in the Arctic, which occurs in September, to a level defined as ice-free by around mid-century.

A team led by Jiping Liu of the State University of New York in Albany assessed recent projections from 30 climate models on the basis of how well they represent current sea-ice levels. The researchers also looked at the projections of those models that best represented the evolution of sea ice from 1979–2011. Both analyses suggest that, compared with 2012 levels, sea ice could decline by some 50% to around 1.7 million square kilometres by the 2060s if emissions are moderate. A high-emissions scenario could push the annual minimum to less than 1 million square kilometres — the ice-free level — in the 2050s.
***Proc. Natl Acad. Sci. USA*** **http://dx.doi.org/10.1073/pnas.1219716110 (2013)**

## COMMUNITY CHOICE

*The most viewed papers in science*

MENTAL HEALTH

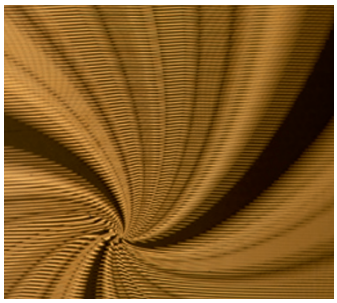
## Psychotherapy helps depression

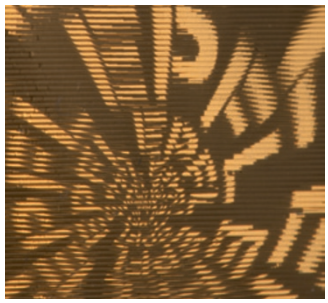
HIGHLY READ on plosmedicine.org in July

Extracting robust evidence for the value of psychotherapy from clinical trials has been challenging, but comprehensive analysis of trials has found that various types of psychotherapy provide similar benefits for depression.

Jürgen Barth from the University of Bern, Switzerland, and his colleagues analysed 198 randomized, controlled clinical studies, covering seven psychotherapeutic techniques and involving 15,118 people with depression. The researchers used a technique called network meta-analysis, which allowed them to extract comparative information from individual studies.

Their analysis showed that each of the psychotherapies helped patients to a similar degree — but the effect was less marked in larger and blinded trials than in smaller and non-blinded ones. The clearest benefits were seen in the large and more rigorous studies assessing cognitive behavioural, interpersonal and problem-solving therapies.
***PLoS Med.*** 10, **e1001454 (2013)**





JÜRGEN BRUGGER/VICTOR CADARSO/ROGER HERSCH/EPFL

MATERIALS SCIENCE

## Illusions to foil counterfeiters

Microscopic markings that are too small to be reproduced by standard printers can give rise to optical illusions, and could be used to mark authentic banknotes or luxury-brand goods.

Jürgen Brugger, Victor Cadarso and their group at the Swiss Federal Institute of Technology in Lausanne fabricated microscopic lines in rows or spirals (**pictured**, left) by patterning pixels in gold using ultraviolet light. When an array of tiny cylindrical lenses is laid over the lines, interference patterns produce images (**pictured**, right) of letters and other symbols. Copying these patterns, or moirés, would be difficult, the researchers say, because even micrometre-sized blemishes visibly distort the illusion.
***Light Sci. Appl.*** 2, **e86 (2013)**

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