

## NEUROSCIENCE

### In vivo cell switch for brain repair

By reprogramming one type of brain cell into another *in vivo*, researchers have opened the door to new ways of repairing damaged brains.

Gong Chen and his colleagues at Pennsylvania State University in University Park converted reactive glial cells — the cells that flood sites of brain injury — into neurons in the brains of mice. They injected a retrovirus carrying the gene encoding a protein called NeuroD1 into the cortex of normal mice and those engineered to model Alzheimer's disease. The virus delivered the gene to two types of glial cell, resulting in the reprogramming of these cells into functional excitatory or inhibitory neurons.

NeuroD1 also turned human astrocytes, a type of glial cell, into functional neurons *in vitro*. The authors suggest that the approach could be used to replace neurons lost to injury or disease in humans.

*Cell Stem Cell* <http://doi.org/qq7> (2013)

## MATERIALS

### Extra-stretchy graphene gloves

Graphene-based sensors that measure strain, or deformation, can be stretched



to twice their normal length. These could be useful for the development of wearable interactive electronics.

Previous such devices struggled to stretch by even 30%, making them too stiff to detect the full range of motion of human joints, for instance. Pooi See Lee and her colleagues at Nanyang Technological University in Singapore made their sensors out of nanopaper: crumpled graphene (atom-thick sheets of carbon) and tiny cellulose fibrils embedded in a stretchy material.

A glove developed by the

researchers has strain sensors on each finger (**pictured**) for measuring the bending and stretching of separate digits. It could one day be used to perform surgery remotely and in other applications.

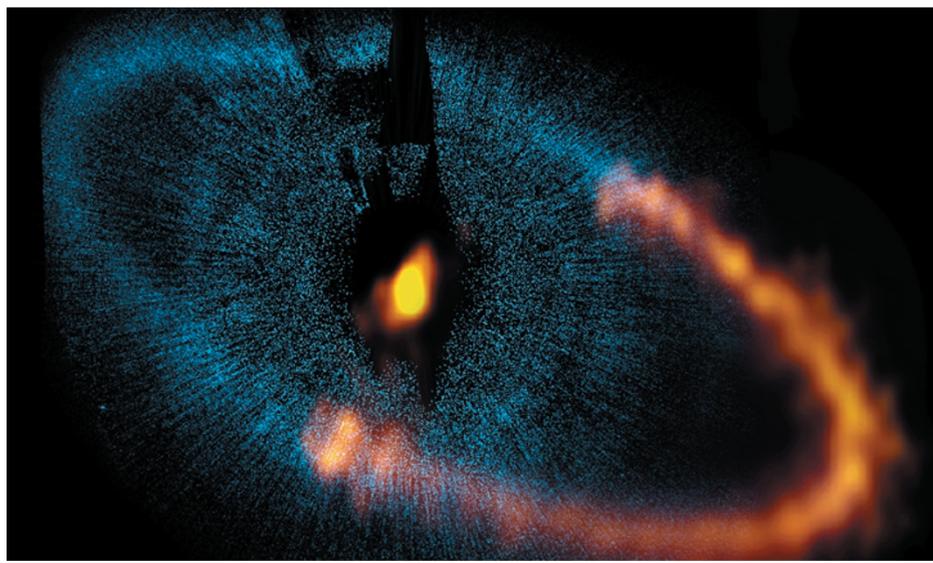
*Adv. Mater.* <http://doi.org/qrh> (2013)

## IMMUNOLOGY

### Dietary fibre dampens asthma

A high-fibre diet curbs allergic inflammation in mouse lungs by shifting the composition of microbes in the gut.

Benjamin Marsland at the University of Lausanne in Switzerland and his colleagues raised mice on diets containing different levels of fibre and exposed the animals to extracts of house-dust mite, a cause of asthma. The resulting lung inflammation was less in mice consuming high levels of fermentable fibre than in those on a low-fibre diet, and the animals also harboured a community of intestinal microbes that generated higher levels of short-chain fatty acids when metabolizing fibre. These fatty-acid molecules boosted



## ASTROPHYSICS

### Comets hint at cosmic encounter

Researchers have discovered a second comet belt in Fomalhaut, a bright, triple-star system that is already known to host an exoplanet and a bright comet belt around its primary star, Fomalhaut A (**pictured**).

Grant Kennedy at the University of Cambridge, UK, and his colleagues used data from the Herschel Space Observatory to find the second belt, which surrounds the system's least-massive star, Fomalhaut C. The discovery

of two such bright comet belts around stars in the same system is rare, and suggests that the two stars had a close encounter that increased collision rates within each debris disk: colliding comets generate large amounts of dust and ice that would make the comet belts look brighter. Such a stellar interaction could also explain the elliptical orbits of Fomalhaut A's exoplanet and comet ring.

*Mon. Not. R. Astron. Soc.* 437, 2686–2701 (2014)

the generation of immune cells called dendritic cells that were less able to trigger allergic inflammation in the lungs.

The results provide a possible link between the rising incidence of asthma in developed countries and decreasing dietary-fibre intake. *Nature Med.* <http://dx.doi.org/10.1038/nm.3444> (2014)

## ZOOLOGY

## Tobacco breath aids defence

The tobacco hornworm, which feeds on tobacco plants, exhales some of the ingested nicotine to repel predators.

Ian Baldwin and his colleagues at the Max Planck Institute for Chemical Ecology in Jena, Germany, glued tiny sensors to the mouths of tobacco hornworm larvae (*Manduca sexta*; pictured) to measure the levels of nicotine in their breath. They found that larvae that fed on engineered, nicotine-free tobacco plants (*Nicotiana attenuata*) exhaled less nicotine than larvae fed on normal plants, as did larvae in which an enzyme that transfers nicotine from the gut into the circulation was silenced. Wolf spiders (*Camptocosa parallela*) preferred to prey on larvae with less nicotine on their breath.

The study shows how ingested toxic chemicals can be used for predator defence.

*Proc. Natl Acad. Sci. USA* <http://doi.org/qq3> (2013)

## GENOMICS

## CRISPR screen identifies genes

Two teams show how a genome-editing system can be used to screen human cells for genes of interest.

The CRISPR system allows biologists to edit specific genes using 'guide' RNA molecules that target them. Feng Zhang at the Broad Institute in Cambridge, Massachusetts, and his colleagues created a library of 64,751 guide RNA sequences that target 18,080 genes in human cells. Using this library, the researchers pinpointed genes that are required by cancer and stem cells to survive. They also teased out genes that, when lost, allow cancer cells to fend off the melanoma drug vemurafenib.

A separate team led by Eric Lander at the Broad Institute and David Sabatini at the Whitehead Institute for Biomedical Research in Cambridge, Massachusetts, used a library of 73,000 guide RNAs to screen for several genes, including those involved in resistance to the chemotherapy drug etoposide. *Science* 343, 80–84; 84–87 (2014)

## STRUCTURAL BIOLOGY

## Better pictures of protein structures

A modified method for determining the three-dimensional structure of large proteins seems to show them in a more natural pose than conventional techniques do.

Proteins called G protein-coupled receptors (GPCRs) are important drug targets, but researchers struggle to figure out their structures. Vadim Cherezov of the Scripps Research Institute in La Jolla, California, and his colleagues modified the standard X-ray crystallography technique by using an X-ray free-electron laser to capture serial images

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## CANCER

## How drugs boost resistance

**HIGHLY READ**  
on [jem.rupress.org](http://jem.rupress.org)  
in December.

Chemotherapy kills cancer cells, but in colorectal cancer it can also stimulate their growth by activating cells called fibroblasts in the connective tissue.

Matthew Kalady and Jeremy Rich at the Cleveland Clinic in Ohio and their colleagues analysed tumours from patients with colorectal cancer before and after chemotherapy. The researchers found that the abundance of cancer-associated fibroblasts increased after treatment, and that these cells enhanced the ability of a subset of cancer cells to initiate tumour growth. The fibroblasts seem to do this by secreting signalling proteins, including one called IL-17A.

The findings suggest that chemotherapy can trigger drug resistance by changing the tumour's microenvironment. Disrupting this mechanism could be a way of improving cancer therapies, the authors say.

*J. Exp. Med.* 210, 2851–2872 (2013)

of the structure of a GPCR for the neurotransmitter serotonin.

The team used the technique on tiny serotonin-receptor crystals kept at room temperature, and obtained structures that differed from those determined using conventional approaches with larger crystals kept at cool temperatures. The results suggest that the room-temperature free-electron-laser approach may better capture the protein's conformation in its native environment.

*Science* 342, 1521–1524 (2013)

## GEOLOGY

## Radar signals sinkhole to come

Radar measurements taken more than a month before a giant sinkhole (pictured) opened up in 2012 in Bayou Corne, Louisiana, reveal that nearby ground shifted horizontally towards the pit's location.

Cathleen Jones and Ronald Blom of NASA's Jet Propulsion Laboratory in Pasadena, California, looked



at radar data gathered by an unmanned aircraft as part of a Mississippi River delta study. By comparing data from flight passes in June 2011 and July 2012, the team saw that surface material had moved by as much as 26 centimetres towards where the 110-metre-wide sinkhole appeared in August 2012.

Radar remote sensing could be a way of predicting the formation of these potentially catastrophic sinkholes and their growth rate, the authors say.

*Geology* <http://doi.org/qnr> (2013)

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