

## NEUROSCIENCE

### A window into nerve repair

Some neurons regenerate better than others.

Researchers led by Vincenzo De Paola at Imperial College London severed nerve cells in mouse brains, using lasers to minimize scarring and inflammation. The authors set glass panes into the skulls of the animals and monitored regrowth in more than 100 neurons for up to a year. More than half of the cut neurons from the deepest layer of the brain's cortex regrew, but only about one-fifth of those in its other layers did. Neurons in the brains of juvenile mice were also more likely to regrow than those in adult brains.

Regrowth depends, at least in part, on the neurons themselves and not just external factors such as neural-support cells, the authors say. They suggest that long-term imaging could be used to test potential neuron-repair strategies in the brains of living animals.

*Nature Commun.* 4, 2038 (2013)

## MATERIALS SCIENCE

### Ratchet action misshapes pearls

Perfectly round pearls (pictured) owe their spherical shape to spiral



growth patterns of nacre, the iridescent material also known as mother of pearl. By contrast, non-spherical pearls such as drop pearls have longitudinal growth fronts positioned such that they work like teeth on a ratchet, spinning the gem as it grows in an oyster.

Julyan Cartwright of the University of Granada, Spain, and his team calculated the forces exerted by nacre particles sticking to and bouncing off the growth fronts of a developing pearl. The forces proved strong enough to rotate the pearl once every 20 days (the speed at which pearls have previously been found to

rotate) and to influence its ultimate shape.

Microscopic control over macroscopic motion could be a useful design principle for building tiny machines, the researchers suggest.

*Langmuir* <http://dx.doi.org/10.1021/la4014202> (2013)

## CANCER

### Drug outdoes standard therapy

A large clinical trial has confirmed the promise of a targeted drug therapy in advanced non-small-cell lung cancer.

The drug crizotinib, which targets an oncogenic protein

encoded by the mutated *ALK* gene, extended progression-free survival in patients with *ALK* mutations by 7.7 months, compared with 3 months for chemotherapy alone. The results from the trial, which included 347 patients, are reported by Alice Shaw at Massachusetts General Hospital in Boston and her colleagues, and come just six years after the discovery of *ALK* fusion mutations in cancer and two years after the drug was approved for non-small-cell lung carcinoma in the United States on the basis of smaller clinical trials.

A related paper from a team also led by Shaw



## ANIMAL BEHAVIOUR

### Familiar nest sites beat better lakes

When common loons (*Gavia immer*, pictured) settle down to breed, they pick sites similar to the ones they hatched in, even if better sites are available.

As part of a 20-year study, researchers led by Walter Piper at Chapman University in Orange, California, tagged and observed birds across glacial lakes in the north-central United States. Loons that were reared on small, acidic lakes tended to settle on similar sites, even though

large, less-acidic lakes can support more and healthier chicks. The researchers suggest that adult loons might survive best on lakes that offer the types of fish and other prey that the birds are most familiar with. A trade-off between reproductive success and survival rate could help to explain the apparently maladaptive habitat choices seen in loons and other species, the authors say.

*Proc. R. Soc. B* 280, 20130979 (2013)

reports a new mechanism of resistance to crizotinib in one patient, showing that the search for effective targeted treatments must continue.

*N. Engl. J. Med.* 368, 2385–2394; 368, 2395–2401 (2013)

## PALAEOLOGY

## Ancient 'starfish' had a helix

Five rays twisting down from the top of a fossil hint at how creatures such as starfish gained their unusual symmetry.

Starfish, sea urchins and all other known living echinoderms have a symmetry that allows them to be sliced into five identical parts, but some of their counterparts in the Cambrian period, which began about 540 million years ago, were asymmetric or had bilateral symmetry.

Andrew Smith at the Natural History Museum in London and Samuel Zamora at the Smithsonian Institution in Washington DC discovered Cambrian fossils in Morocco that show what stages intermediate to the body plan of living echinoderms might have looked like.

*Helicocystis moroccoensis* (pictured) is the oldest known echinoderm with five-part symmetry; it resembled an egg with its tapered end planted in the sea floor. Its mouth opened upward and its body spiralled down.

*Proc. R. Soc. B* 280, 20131197 (2013)



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## ZOOLOGY

## Hot sex for jawless fish

After dancing seductively for their potential mates, male sea lampreys (*Petromyzon marinus*) crank up the heat, literally, using a ridge of tissue on their backs.

Courtship behaviour of lampreys — eel-like, bloodsucking, jawless fishes — includes the male rubbing his ridge against the belly of an interested female. Researchers had assumed that this simply aroused females mechanically, but when Weiming Li and his colleagues at Michigan State University in East Lansing dissected the tissue, they found that ridges from mature males were full of cells packed with oil droplets and cells primed for energy production, a hallmark of heat-producing tissue. The ridge temperature in males jumped by up to 0.3°C in the presence of sexually mature females.

The authors say that the ridge is the first example of a heat-generating sexual trait. *J. Exp. Biol.* 216, 2702–2712 (2013)

## GEOSCIENCE

## Earthquakes sink volcanoes

Giant earthquakes in subduction zones do not just create tsunamis — they can also cause nearby volcanic regions to sink, possibly altering the risk of eruptions.

In subduction zones, one plate of Earth's crust plunges beneath another. Quakes cause the overriding plate to expand and subside. Volcanoes on these plates subside even further, according to satellite radar data from two regions.

Youichiro Takada and Yo Fukushima at Kyoto University, Japan, measured drops in volcanic regions of up to 15 centimetres near the fault that broke in the 2011 magnitude-9.0 Tohoku earthquake. Separately, Matt Pritchard at Cornell

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## CROP SCIENCES

## Super-broccoli secret solved

HIGHLY READ  
on wiley.com  
in May

A single gene is probably responsible for high levels of sulphur-containing compounds in new commercial varieties of broccoli.

Richard Mithen at the Institute of Food Research in Norwich, UK, and his group analysed hundreds of genetic markers in broccoli hybrids (pictured) bred to produce more glucoraphanin, a compound with reported health benefits. The team had previously created the three hybrid lines by crossing common broccoli (*Brassica oleracea*) and a wild Sicilian cousin (*Brassica villosa*) multiple times. The analysis showed that the hybrids had all inherited a version of a gene from *B. villosa*. The gene, called *Myb28*, also regulates glucoraphanin production in the model plant *Arabidopsis*. Field trials under diverse conditions showed that the hybrids consistently had higher levels of the compound. The plants both drew more sulphur-containing building blocks from the soil and shunted a greater portion of them towards glucoraphanin production. The work paves the way for blinded human studies that assess the health benefits of eating the glucoraphanin-rich broccoli, the authors say.

*New Phytol.* 198, 1085–1095 (2013)



University in Ithaca, New York, and his colleagues measured subsidence of up to 15 centimetres within weeks of the 2010 magnitude-8.8 Maule earthquake off the coast of Chile.

The authors of the Japanese study suggest that the subsidence occurred because reservoirs of magma below the volcanoes sank. By contrast, the authors of the Chilean study say that hydrothermal reservoirs may have drained, causing the ground above to collapse.

*Nature Geosci.* <http://dx.doi.org/10.1038/ngeo1857>; <http://dx.doi.org/10.1038/ngeo1855> (2013)

## AGEING

## Clock blocked by age

A protein linked to ageing and metabolic disease might control the brain's internal clock.

The protein SIRT1 regulates the expression of many genes and has been linked to daily biological cycles called circadian rhythms in tissues such as fat and the liver. Hung-Chun Chang and Leonard Guarente at the Massachusetts Institute of Technology in Cambridge found that in mouse brains, SIRT1 switches on two proteins that are known to regulate circadian rhythms.

Aged mice were slower than young mice to adjust to shifts in light–dark cycles, and expressed lower levels of SIRT1 in the brain region that sets circadian rhythms. Boosting SIRT1 levels shortened animals' adjustment time, whereas depleting SIRT1 lengthened it.

*Cell* 153, 1448–1460 (2013)

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