

RESEARCH HIGHLIGHTS

Selections from the scientific literature

COMPUTING

A faster brain-inspired computer

A computer that mimics the way the brain works, and contains both optical and electronic parts, can recognize simple speech three times faster than earlier devices that used only optical components.

Reservoir computers use neural networks made of interconnected units that relay signals in recurrent, closed loops, allowing them to store information from the past and 'learn' from it. These devices are usually light-based, but Laurent Larger and his colleagues at the University of Burgundy Franche-Comté in Besançon, France, designed a simpler architecture that incorporates off-the-shelf electronics and encodes information differently using the light signals, allowing for faster performance. In speech-recognition tests, the team's device processed 1 million words per second with error rates of less than 9%.

The device could be miniaturized and put on a chip, the authors say. *Phys. Rev. X* 7, 011015 (2017)

CANCER BIOLOGY

Rogue metabolite halts DNA repair

A range of cancers could have new treatment options thanks to the discovery that a metabolite made by many tumours increases their vulnerability to a class of drug.

Tumours resort to a number of metabolic tricks to support their continued growth and survival. One metabolite that has been linked to cancer is 2-hydroxyglutarate, which is made by mutated forms of either of two proteins: IDH1 or IDH2.



EVOLUTION

Origin of vertebrate gills

The ancestor of all living vertebrates may have had gills, a finding that adds to a long-standing debate about the evolutionary history of gills.

In jawless animals such as lampreys, gills form from the embryo's innermost layer of cells, or 'endoderm', whereas in jawed vertebrates, including many fish species, gills were thought to develop from the outermost layer, or 'ectoderm'. This led scientists to think that gills evolved separately in the two lineages.

Andrew Gillis and Olivia Tidswell at the University of Cambridge, UK, studied embryonic gill formation in the little skate (*Leucoraja erinacea*; pictured), a jawed vertebrate related to sharks and rays. They found that most of the gill tissue developed from the endoderm — as it does in jawless vertebrates.

The discovery that gills seem to grow from the same tissues in both jawless and jawed vertebrates suggests that gills may have evolved only once — in the vertebrates' common ancestor. *Curr. Biol.* <http://dx.doi.org/10.1016/j.cub.2017.01.022> (2017)

Peter Glazer and Ranjit Bindra at Yale University in New Haven, Connecticut, and their colleagues found that these mutations also cripple cells' ability to repair broken DNA. This makes tumour cells highly sensitive to a class of cancer drugs called PARP inhibitors, which are being used to treat cancers with similar DNA-repair defects. Inhibiting the mutated IDH1 enzyme reduced mutant cells' sensitivity to PARP inhibitors, whereas treatment with 2-hydroxyglutarate enhanced it in normal cells.

The results point to several types of cancer that could potentially be treated with these drugs.

Sci. Transl. Med. 9, eaal2463 (2017)

GLACIOLOGY

East Antarctica's Weddell woe

The immense East Antarctic ice sheet may be more vulnerable to rising temperatures in the Weddell Sea than previously thought.

Earlier studies have predicted that most of the ice lost from Antarctica as a result of global warming will be from the West Antarctic Ice Sheet. To study the much larger ice sheet in East Antarctica, Nick Golledge at Victoria University of Wellington and his team used a three-dimensional ice-sheet model to simulate the way ice flow across the continent responds to a changing climate in various warming scenarios. They predict that most of the melting to affect East Antarctica will originate in the Recovery basin, thanks to the warming Weddell Sea, which abuts this basin.

Climate models suggest that by the end of the century, the eastern Weddell Sea could

JONATHAN BIRD/GETTY

RALPH C. EAGLE JR/SPL

experience some of the highest increases in sea-surface temperature in Antarctica. *Geophys. Res. Lett.* <http://doi.org/bzsd> (2017)

PLANETARY SCIENCE

Ceres has complex chemistry

The dwarf planet Ceres hosts organic compounds that are possible ingredients for life.

NASA's Dawn spacecraft is orbiting Ceres (**pictured**), which is also the largest asteroid in the Solar System, and the craft has previously



NASA/JPL-CALTECH/UCLA/WFS/DLR/IDA

spotted signs of salts, ice and other basic chemicals on its surface. Using Dawn's mapping spectrometer, a team led by Maria Cristina De Sanctis at the National Institute of Astrophysics in Rome has discovered signatures of complex organic matter — in particular open chains of carbon atoms — on Ceres.

Organic compounds have been seen on comets and a few other asteroids. But Ceres has water and internal heat as well, meaning that it could have a rich, potentially life-sustaining environment.

Science 355, 719–722 (2017)

PALAEOLOGY

Ancient reptile bore live young

A 245-million-year-old fossil of a pregnant reptile offers the first evidence for live birth in the animal group that includes modern birds and crocodiles.

Live birth has evolved dozens of times in vertebrates,

but has never been seen in archosauromorphs, which emerged around 260 million years ago. This group comprises dinosaurs as well as extant birds and crocodiles.

A team led by Jun Liu at the Hefei University of Technology in China analysed the fossil — found in 2008 in southwestern China — and concluded that it was a long-necked marine reptile called *Dinocephalosaurus*. A relatively large creature found inside its rib cage was curled up and positioned in a way that is typical of vertebrate embryos.

The fossil suggests that no genetic or developmental barriers prevented live births in archosauromorphs, the authors say.

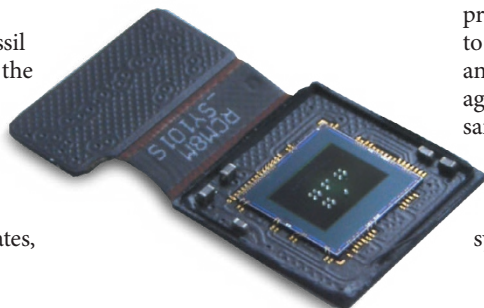
Nature Commun. 8, 14445 (2017)

IMAGING

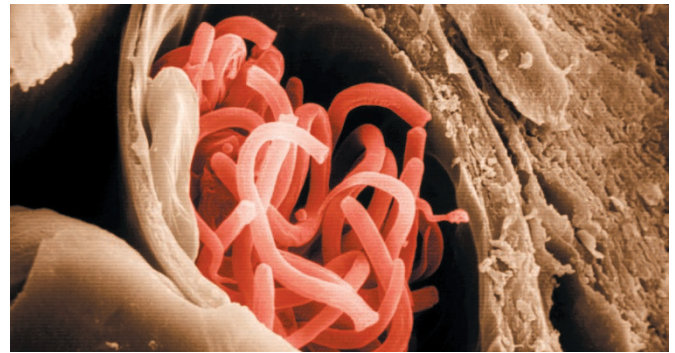
3D-printed camera sees like an eagle

A tiny camera made of four different lenses 3D-printed on a chip can generate images with high resolution in the centre — similarly to the way the eyes of eagles and humans work.

Simon Thiele and his colleagues at the University of Stuttgart, Germany, printed multiple groups of four objective lenses onto a semiconductor image-sensor chip just a few millimetres wide (**pictured**). Each lens has a different field of view, and so can focus at various distances. A computer combines data from the lenses to form an image that has increasing resolution towards the middle. This mimics the vision of predators, which is more sharply focused in the centre and allows them to quickly spot prey.



SIMON THIELE



With further improvements, the technology could be used in miniature drone cameras and for other applications, the authors say.

Sci. Adv. 3, e1602655 (2017)

INFECTIOUS DISEASE

Autoimmunity in nodding syndrome

A mysterious disorder that causes seizures in children in East Africa could be due to an autoimmune reaction.

In Tanzania, Uganda and South Sudan, nodding syndrome causes children's heads to drop and results in epileptic seizures, cognitive impairment and sometimes death. Although people with the syndrome are often infected with the parasitic worm *Onchocerca volvulus* (**pictured**), researchers have not found a causal link between the two.

Now, a team led by Avindra Nath at the National Institute of Neurological Disorders and Stroke in Bethesda, Maryland, has discovered that people with nodding syndrome have higher levels of antibodies against a protein called leiomodrin-1 than do healthy people from the same village. The researchers show that leiomodrin-1 is made by human neurons and by key parts of the mouse brain. This protein is structurally similar to those made by *O. volvulus*, and antibodies that react against *O. volvulus* do the same against leiomodrin-1,

suggesting an autoimmune response.

People with the syndrome currently receive

anti-epilepsy drugs, but the findings suggest that they might also benefit from therapies that modulate the immune system, the authors say.

Sci. Transl. Med. 9, eaaf6953 (2017)

METEOROLOGY

High winds add to extreme deluges

Narrow bands of water vapour that typically travel over the ocean and dump huge volumes of rain on land, often causing flooding and landslides, come with another hazard — extreme wind.

Duane Waliser of the Jet Propulsion Laboratory in Pasadena, California, and Bin Guan of the University of California, Los Angeles compared global data on these 'atmospheric rivers' with data on wind and precipitation extremes between 1997 and 2014. They found that across most mid-latitude regions, up to half of the most extreme wind and rain storms were associated with atmospheric rivers. The majority of damaging wind storms in Europe between 1997 and 2013 were also linked to these bands of vapour.

The typical wind speed associated with a land-falling atmospheric river was at least double the average for all storm types.

Nature Geosci. <http://dx.doi.org/10.1038/ngeo2894> (2017)

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