

NEUROSCIENCE

Light rewrites memories of place

Researchers have used light to disconnect the memory of an experience from that of the location where it occurred.

'Place' cells in the brain fire when the animal is in a particular location, helping it to remember that place. Stéphanie Trouche and David Dupret at the University of Oxford, UK, and their colleagues wired up the brains of mice to monitor these cells and switch them off using light. When the researchers switched off the place cells that were associated with one of two differently shaped enclosures, they found that a group of previously silent place cells fired instead to encode that location.

The team injected mice in one enclosure with cocaine, which made the animals prefer that location. When the initially active place cells were switched off, the mice no longer sought out the cocaine-linked enclosure — yet behaved as if it were still familiar.

Nature Neurosci. <http://doi.org/bcvs> (2016)

CHEMISTRY

Catalyst for clean drinking water

An efficient and affordable catalyst could improve access to clean drinking water in remote areas.

Hydrogen peroxide is commonly used to treat water and as a disinfectant, but it is synthesized in large-scale facilities at high concentrations that require dilution before use. Simon Freakley and Graham Hutchings at Cardiff University, UK, and their colleagues created a series of catalysts that can be used to make small batches of diluted hydrogen peroxide directly from hydrogen and oxygen.

An earlier version of their catalyst used gold and palladium supported on activated carbon. Their latest version replaces gold

with cheaper materials, including tin, zinc and nickel, but it maintains the same high reaction efficiency of more than 95%, and uses commercially available support materials such as titanium dioxide.

Science 351, 965–968 (2016)

CANCER

Immune changes drive metastasis

Quantifying the number of cancer-fighting immune cells that a tumour contains could offer a way to predict whether it will spread through the body.

Cancer is often deadly when it spreads, but anticipating primary-tumour spread (or metastasis) is difficult. Jérôme Galon at the French National Institute of Health and Medical Research in Paris and his team analysed tumours from more than 800 people with colorectal cancer, comparing people whose tumours had metastasized with those whose had not. The primary tumours from both groups had similar patterns of mutations in cancer genes, but tumours that had spread had fewer cell-killing T cells. The invasive edges of the metastasized tumours also had a lower density of lymphatic vessels, which transport immune cells.

The authors conclude that these changes contribute to metastasis, and that immunotherapies that boost T-cell responses could block the spread of cancer in people with early-stage disease. *Science Transl. Med.* 8, 327ra26 (2016)

COSMOLOGY

Missing matter may hide in voids

As much as 30% of the Universe's observable matter could be hiding in enormous cosmic voids, where it is too sparse for scientists to observe.

Matter in the nearby Universe is said to be missing because astronomers have failed to see as much material

SOCIAL SELECTION

Popular topics on social media

How many replications are enough?

When psychologist Courtenay Norbury came across a paper in *Research in Developmental Disabilities* this week that had similar conclusions to research she published 12 years ago, she turned to social media with a question. Norbury, who studies children with autism spectrum disorders at University College London, tweeted: "How many times does a research finding need to be replicated before the field says 'ok, how do we move this forward?'" Dorothy Bishop, a developmental neuropsychologist at the University of Oxford, UK, who helped to write a report on how to improve the reliability of biomedical research, tweeted in response

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that some fields can get stuck on the same research questions: "The opposite of the reproducibility crisis! Stasis. And yup it's a problem in some areas."

Res. Dev. Disabil. <http://doi.org/bctr> (2016)

as observations of the early Universe suggest there should be. To map how matter might be distributed, Markus Haider at the University of Innsbruck in Austria and his team used a simulation for how galaxies and intergalactic filaments evolved. This modelled the behaviour of both normal and dark matter — an invisible substance detected only by its gravitational pull — in a cube of space 350 million light years (about 107 million parsecs) across.

Analysis of the model, known as Illustris, suggests that the energy of radiating supermassive black holes has flung as much as 24% of normal matter out of galaxies and into voids, where an extra 6% that has yet to gather in filaments also lies. This could help to explain some of the missing matter, say the authors.

Mon. Not. R. Astron. Soc. 457, 3024–3035 (2016)

CLIMATE SCIENCE

Sample reveals Antarctic history

The Antarctic ice sheet retreated inland millions of years ago, when atmospheric carbon dioxide levels were not that much higher than they are now.

A team led by Richard Levy of GNS Science in Lower Hutt, New Zealand, analysed a drill core of sediment from McMurdo Sound, Antarctica, to reveal climate history between 21 million and 13 million years ago. The greatest ice-sheet shrinkage was seen when CO₂ levels were 500 parts per million or more: today's level is about 400 p.p.m., and rising. The researchers conclude that Antarctica (pictured) may respond more quickly to changing CO₂ levels than once thought.

A related study by some of the same authors modelled how the Antarctic ice sheet responded to shifts in climate and found similar changes.

Proc. Natl Acad. Sci. USA <http://doi.org/bcv4> (2016); <http://doi.org/bcv5> (2016)



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