

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## IMMUNOLOGY

### Infections 'scar' immune system

After the body has cleared a gut bacterial infection, some intestinal tissues have long-lasting weakened immunity — partly because of gut microbes.

Infection can lead to chronic inflammatory disorders. To find possible mechanisms, Yasmine Belkaid at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland, and her colleagues infected mice with a foodborne pathogen, *Yersinia pseudotuberculosis*, and then monitored them for up to six months. They found a variety of changes that weaken the immune system in gut tissues. For example, immune cells called dendritic cells were diverted into fat tissue away from lymph nodes, where they would normally activate the immune response. Signals from gut microbes also seemed to maintain inflammation.

The results show how frequent infections could lead to chronic disease later in life. *Cell* 163, 354–366 (2015)

## CHEMISTRY

### Cheap absorber for solar cells

An iron-based chemical can absorb and convert light into electrons with 92% efficiency — making it a promising material for solar cells.

Light-harvesting 'sensitizers' in solar cells are typically made of rare elements, which are expensive to scale up. To find a cheaper alternative, Kenneth Wärnmark at Lund University in Sweden and his colleagues engineered an iron-based sensitizer that captures photons and transfers their energy to electrons in a similar way to those based on rare elements.



## METEOROLOGY

### Winged weather watchers

Soaring birds equipped with sensors that track their location could be used to estimate weather variables such as wind speed.

Jelle Treep at the University of Amsterdam and his team analysed Global Positioning System (GPS) data from four griffon vultures (*Gyps fulvus*; pictured) as the birds flew across the Grand Causses region of southern France. By tracking the birds' in-flight location at three-second intervals and using knowledge of airborne bird movements, the team estimated wind speed and direction and vertical air movement. These GPS estimates agreed with ground data at three local weather stations and were consistent with meteorological theories.

As GPS equipment becomes smaller, lighter and able to collect higher-resolution data, bird-borne trackers could become an important tool for meteorological surveys in remote areas, the authors say.

*Bull. Am. Meteorol. Soc.* <http://doi.org/768> (2015)

The sensitizer converts photons with 92% efficiency: 12% better than the previous best sensitizer based on iron.

Some electrons quickly combined with positive charges, limiting the effective current generated. Still, the authors say that using abundant materials such as iron as a sensitizer for photovoltaics opens up possibilities for

low-cost solar energy.

*Nature Chem.* <http://dx.doi.org/10.1038/nchem.2365> (2015)

## PALAEOGENETICS

### First ancient African genome

A 4,500-year-old human skeleton from a cave in Ethiopia has produced Africa's

first ancient genome sequence.

Marcos Gallego Llorente at the University of Cambridge, UK, and his colleagues sequenced genomic DNA from one of the bones and compared it with sequences from modern Africans and Eurasians, as well as ancient Europeans. They conclude that the ancestors of modern Ethiopian highlanders were related to early farmers who moved into Europe from western Eurasia around 9,000 years ago. Descendants of these people later moved back to Africa around 3,000 years ago.

Most Africans today have 4–7% Eurasian ancestry because of this migration, suggesting that this event was larger and more significant than was thought.

*Science* <http://doi.org/78d> (2015)

## NEUROSCIENCE

### People identified from brain activity

A map of connections between brain regions that are active during mental activity can be used as a unique, reproducible 'fingerprint' to identify individuals.

Emily Finn of Yale University in New Haven, Connecticut, and her colleagues studied data from the Human Connectome Project, which is mapping all of the structural and functional connections in the brain. They looked at 126 people whose brains were scanned while they were resting or doing certain tasks. By analysing patterns of neural connectivity, the team identified subjects with a success rate of more than 90% when comparing rest scans, and with 54–87% success when comparing brain activity during tasks. The most useful networks for identifying people were those in certain regions of the cerebral cortex that control attention, memory and other

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cognitive functions.

The results provide a foundation for future work to link functional brain connections with individual behaviours, the authors say. *Nature Neurosci.* <http://dx.doi.org/10.1038/nn.4135> (2015)

## PALAEOANTHROPOLOGY

## Early human with a familiar handshake

A recently discovered early human species probably walked upright and wielded tools, but also took to the trees.

Last month, researchers reported the discovery of fossil bones from at least 15 individuals of a species they named *Homo naledi*. A team led by Tracy Kivell at the University of Kent in Canterbury, UK, has analysed nearly 150 hand bones from the find, including a complete right hand (pictured, left). The hands resemble those of *Homo sapiens*, Neanderthals and other regular tool-users, although the long, curved fingers suggest that *H. naledi* was comfortable in trees.

In a separate study, William Harcourt Smith at the City University of New York and Jeremy DeSilva at Dartmouth College in Hanover, New Hampshire, looked at 107 foot bones, including a nearly complete right foot (pictured, right), and concluded that *H. naledi* strode upright. However, the feet still had some primitive features: certain toe bones were more curved than are those of modern humans.

*Nature Commun.* 6, 8431; 6, 8432 (2015)

## CANCER

## How elephants dodge cancer

Elephants have extra copies of a gene that fights tumour cells, which could explain why they rarely develop cancer.

Joshua Schiffman at the University of Utah in Salt Lake City and his colleagues studied elephant white blood cells and found that they have 20 copies of a tumour-suppressor gene called *TP53* in their genome — humans and other mammals have only one. The cells also underwent TP53-mediated apoptosis — programmed cell death — more frequently than human cells do when exposed to DNA-damaging radiation. This suggests that elephant cells kill themselves to avoid the risk of uncontrolled growth.

In a separate study, Vincent Lynch at the University of Chicago in Illinois and his co-workers report similar results. They also discovered more than a dozen *TP53* copies in two extinct species of mammoth, but just one copy in manatees and in small furry mammals called hyraxes — both close living relatives of elephants. The extra copies may have evolved as the animals in the elephant lineage expanded in size, says the team.

*J. Am. Med. Assoc.* <http://doi.org/772> (2015); Preprint at [bioRxiv http://doi.org/773](http://doi.org/773) (2015)

## CLIMATE-CHANGE BIOLOGY

## Corals cope with pH-altered waters

Some corals seem to be resilient to ocean acidification.

As carbon dioxide emissions rise, ocean waters are absorbing more of the gas and becoming less alkaline, threatening the ability of corals and other marine organisms to make skeletons and shells. Lucy Georgiou at the University of Western Australia in Perth and her colleagues exposed colonies of *Porites cylindrica* coral on Australia's Great Barrier Reef to flumes of modified

## SOCIAL SELECTION

Popular topics on social media

## Nobel prizes prompt surprise online

This year's Nobel prizewinners seemed to surprise many researchers, judging by their reactions on social media. The chemistry prize recognized discoveries in DNA repair, yet was not awarded to the scientists who won the prestigious Lasker prize earlier this year for research in a similar area. Many speculated that the physics prize would go to a woman for the first time in more than 50 years, but it went to two men for their work on neutrinos instead. One of the scientists who shared the Nobel Prize in Physiology or Medicine, Chinese pharmacologist Youyou Tu, discovered a malaria medicine called artemisinin after studying traditional Chinese medicine texts. As chemist Ashutosh Jogalekar wrote on his blog ([go.nature.com/loead](http://go.nature.com/loead)):

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“The story of artemisinin clearly indicates that we need to pay much more attention to forgotten examples from traditional Asian medicine and subject them to scrutiny.”

sea water. This lowered the ambient pH around the animals so that it was similar to conditions that are predicted for oceans at the end of the century. After six months, the researchers found no difference in the growth rate of the corals' skeletons between controls and those living in lower pH conditions.

The corals naturally produce a fluid that bathes the growing parts of their skeletons, and the team found that the fluid had a higher pH than the reef waters for all the corals in the experiment. This suggests that some corals can regulate their internal pH to tolerate a certain level of ocean acidification, the authors say.

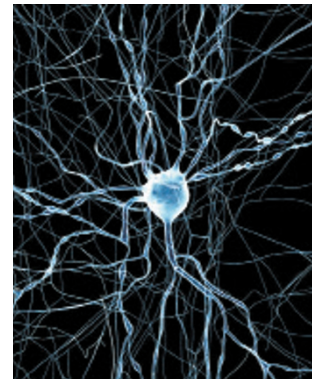
*Proc. Natl Acad. Sci. USA* <http://doi.org/77b> (2015)

## NEUROSCIENCE

## Computer model of rat-brain part

A supercomputer has simulated the activity of 31,000 virtual brain cells (pictured) in a section of rat brain the size of a grain of sand.

Henry Markram at the Swiss Federal Institute of Technology in Lausanne and his team built their model based on experimental measurements



of rat brain slices. The simulation represents roughly 37 million synapses, or neuronal connections, in the brain region that receives sensory information from the whiskers and other parts of the body. Using the model, the team simulated rat whisker movement and saw similar neuronal responses to those observed in rat experiments.

The model could be manipulated in ways that are difficult to do experimentally, providing insights into how individual cells contribute to the functions of neuronal networks, the authors say. *Cell* 163, 456–492 (2015)

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BLUE BRAIN PROJECT

PETER SCHMID/  
WILL HARCOURT-SMITH



**CORRECTION**

The print version of the Research Highlight 'Corals cope with acidified waters' (*Nature* **526**, 296–297; 2015) incorrectly stated that ocean water is being acidified when in fact it is becoming less alkaline; the online title was changed to reflect that. It also said coral-made fluid was less acidic than reef waters; in fact, the fluid had a higher pH. And it said that some corals can control the pH of surroundings, whereas they control their internal pH.