

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## NEUROSCIENCE

### What drives sugar addiction

Researchers have identified the brain circuits that compel mice to seek out sweet treats.

Kay Tye of the Massachusetts Institute of Technology in Cambridge and her colleagues genetically engineered mice so that the neurons in a brain circuit involved in reward processing would fire when exposed to light. When the researchers activated these neurons, the animals sought sugar more frequently through a port in their cage, even when they received a mild electric shock to their feet in the process. Switching the neurons off stopped the sugar-seeking behaviour, but did not prevent the mouse from eating its normal food.

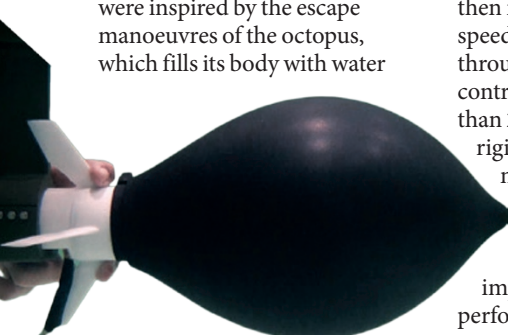
The researchers propose that targeting this pathway could be a possible therapy for compulsive overeating. *Cell* 160, 528–541 (2015)

## ROBOTICS

### Robot zips away like an octopus

A self-propelling, octopus-inspired rocket can zoom through water using energy more efficiently than fish that accelerate rapidly to escape.

Gabriel Weymouth of the University of Southampton, UK, and his colleagues were inspired by the escape manoeuvres of the octopus, which fills its body with water



KATHRYN LANGIN

## EVOLUTION

### Birds diversify at close quarters

A population of birds in California has evolved diverse bill sizes and shapes, even within a small geographic area.

Diversification within a species is thought to occur mainly when populations are separated by geographical barriers, such as mountains or bodies of water. To see if this happens in a single population, Kathryn Langin at Colorado State University in Fort Collins and her colleagues studied more than 500 island scrub-jays (*Aphelocoma insularis*; pictured),

which have small ranges and live only on the 250-square-kilometre Santa Cruz Island in California.

The team found that birds living in pine forests had longer, shallower bills — presumably for prying open pine cones — than jays in oak forests, even though the two habitats were next to each other. Adaptations at this microgeographic level could be more common than once thought, even for mobile animals, the authors suggest.

*Evolution* <http://doi.org/zt3> (2015)

and then quickly expels it to dart away. On the basis of this principle, the authors built their rocket using a flexible hull, which they inflated with water (pictured). They then measured the rocket's speed as it shot the fluid out through its base. As the rocket contracted, it achieved more than 2.6 times the thrust of a rigid rocket doing the same manoeuvre.

The researchers calculate that making the robot bigger would improve its accelerating performance, and suggest that

their technology could be used in underwater vehicles.

*Bioinspir. Biomim.* <http://dx.doi.org/10.1088/1748-3190/10/1/016016> (2015)

## METEOROLOGY

### Smoke makes tornadoes worse

Smoke in the air could increase the likelihood of tornadoes forming, as well as their intensity.

Pablo Saide of the University of Iowa in Iowa City and his colleagues

studied a major tornado outbreak that killed more than 300 people in April 2011 in the southeastern United States. It occurred when smoke particles from fires in Central America drifted across the region, which the team's calculations suggest led to atmospheric changes, such as thicker and lower clouds. These had several cascading effects, including stronger wind shear, that make tornadoes more likely to form and more severe in areas that are prone to such storms. Meteorologists may need to

GABRIEL WEYMOUTH AND VIGNESH SUBRAMANIAN

take smoke into account when forecasting severe weather, the authors say.

*Geophys. Res. Lett.* <http://doi.org/zqyq> (2015)

## MATERIALS

## Graphene sponge like rubbery cork

A spongy, light-as-air material made from crumpled sheets of carbon atoms combines the best properties of rubber and cork as it absorbs and releases liquid. It springs back into shape after being compressed and does not bulge out at the sides when squeezed.

Ray Baughman at the University of Texas at Dallas and Yongsheng Chen at Nankai University in Tianjin, China, and their colleagues assembled thin sheets of graphene oxide at high pressures in alcohol and water, and then freeze dried and heated them to make the aerogel material. They show that their sponge can mop up more than 1,000 times its own weight in engine oil, releasing the oil when squeezed. The material is also more compressible than ordinary rubber at temperatures from  $-196^{\circ}\text{C}$  to  $900^{\circ}\text{C}$ .

This combination of properties means that the aerogel could be used as an artificial muscle that contracts without getting fatter, the authors say.

*Nature Commun.* 6, 6141 (2015)

## CLIMATE CHANGE

## Hot and hotter in Europe

Air temperatures in Europe are more likely to break record highs than to fall below record lows for any given day, thanks to climate change.

Martin Beniston of the University of Geneva in Switzerland analysed daily temperatures over the past 60 or so years from 30 climate observation stations across Europe. He found that the ratio of days per year with record high temperatures to days with record lows increased from

about 1:1 in the 1950s to nearly 1.5:1 in 2013. The ratio has risen sharply since the turn of the millennium, despite the observed slowdown in the rate of warming over the past 15 years.

In an already warm climate, even a small shift in mean temperature leads to a marked rise in the number of extremely warm days, Beniston argues.

*Climatic Change* <http://doi.org/zqr> (2015)

## ANIMAL COGNITION

## Chicks like a small number on the left

In a study of how animals recognize numbers, chicks prefer a panel showing a small number of dots to be on their left-hand side and a larger number on their right. This suggests that the left-to-right representation of numbers in animals could be similar to that of humans.

Rosa Rugani at the University of Padua in Italy and her colleagues trained domestic chicks (*Gallus gallus*) to recognize a panel showing five dots. When smaller arrays of only two dots were placed on each side of the chicks, they chose the left array about 70% of the time and the right-hand one roughly 30% of the time. When presented with larger arrays of eight dots, the chicks preferred the one on the right. However, when trained to recognize 20 target dots, the birds went to the left when shown eight dots.

This left-to-right mapping of numbers may have evolved because of brain asymmetry in vertebrates, with numerical processing residing in the right hemisphere.

*Science* 347, 534–536 (2015)

## GLACIOLOGY

## Iceland rises out of the melting ice

Iceland is rising faster than previous estimates, probably because of its disappearing glaciers.

## SOCIAL SELECTION

Popular articles on social media

## A strategy on where to send papers

Deciding where to submit a scientific manuscript is a strategic decision for researchers who are balancing the desire for high impact with the need for quick publication. Two ecologists have tried to crack that conundrum by creating mathematical models that quantify the potential value of submitting to any of 61 ecology journals. In a study in *PLoS ONE*, they conclude that *Ecology Letters*, *Ecological Monographs* and *PLoS ONE* are good choices for researchers seeking a large number of citations but relatively fast review times. Researchers on social media appreciated the effort. “Super interesting,” tweeted Ross Mounce, an evolutionary biologist at the University of Bath, UK. But Marcel Holyoak, editor-in-chief of *Ecology Letters*, says that the analysis has limitations and is “most useful for a naive author without experience on which journals to target.”

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*PLoS ONE* 10, e0115451 (2015)

When the ice caps melted at the end of the last ice age, the ground lifted up as the overlying weight of ice decreased. However, it has been difficult to tease out this signal from the effects of modern climate change. A team led by Kathleen Compton of the University of Arizona in Tucson studied more than five years of data from more than 60 Global Positioning System stations across Iceland.

Parts of central Iceland have been rising by more than 30 millimetres per year and that rate has been increasing, probably due to faster ice melt since 1980.

*Geophys. Res. Lett.* <http://dx.doi.org/10.1002/2014GL062446> (2015)

## ANIMAL BEHAVIOUR

## Squid change colour on camera

Squid continuously adjust their colouration to signal fellow squid or for camouflage, according to a rare study conducted in the animal's natural environment.

Hannah Rosen of Stanford University, California, and her colleagues fitted three Humboldt squid



(*Dosidicus gigas*) in the Gulf of California with cameras (pictured) that recorded their underwater activity. The authors identified two distinct patterns of colour changing. Whole-body ‘flashing’ between white and red was seen in the presence of other squid. ‘Flickering’ involved wave-like patterns that seemed to mimic the reflections of sunlight in the water, and occurred whenever there was natural light and the animal was not flashing.

The team suggests the flashing behaviour is a form of intra-species signalling, while the flickering represents dynamic camouflage.

*J. Exp. Biol.* 218, 265–275 (2015)

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