

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## NANOMATERIALS

### Droplets surf graphene waves

Tiny particles of liquid move quickly across thin layers of carbon by 'surfing' waves that ripple through the sheets.

Angelos Michaelides at University College London and his colleagues used computer simulations to investigate how liquids move across graphene — a layer of carbon one atom thick. Graphene has wave-like ripples that transport nanometre-scale droplets of water and oil, and even ice particles. This happens because the particles are attracted to the high density of carbon atoms in the wave trough. These nanodroplets move much more quickly on flexible layers of material such as graphene than on rigid materials like metal.

If validated by experiments, this mechanism could be used to control the delivery of water-soluble drugs on surfaces coated with a layered material, the authors say.

*Nature Mater.* <http://dx.doi.org/10.1038/nmat4449> (2015)

## PROSTHETICS

### Bionic touch lights up neurons

A thin, flexible device can sense a wide range of pressures and produces signals that stimulate nerve cells in a dish.

Zhenan Bao of Stanford



University in California and her collaborators embedded carbon nanotubes in a rubbery polymer and attached that material to a flexible circuit (pictured) mounted on a robotic hand). The device mimicked the response of touch-sensitive nerve cells in the skin by emitting discrete electrical spikes of increasing frequency in response to applied pressure. The team converted the electronic signal into light that then stimulated genetically engineered,

light-sensitive mouse neurons *in vitro*.

Such artificial skin could one day restore sensation for people wearing prostheses, the authors say.

*Science* 350, 313–316 (2015)

## ECOLOGY

### Caffeine keeps bees coming back

Caffeine-infused nectar tricks honeybees into changing their foraging behaviour in ways

that may benefit the plant.

Many plants produce the bitter-tasting caffeine to deter herbivores, but also rely on bees to spread their pollen for reproduction. To look at caffeine's effect on pollinators, Margaret Couvillon and her colleagues at the University of Sussex near Brighton, UK, monitored honeybees feeding from a sugar solution. They then compared the bees' behaviour to those feeding on the same solution but with caffeine added at



NASA/JHUAPL/SWRI

## PLANETARY SCIENCE

### Pluto hosts wildly varying terrain

The first published findings from NASA's New Horizons mission to Pluto confirm that the dwarf planet has geological features that resemble those found on Mars and various moons in the Solar System.

NASA's spacecraft flew past Pluto in July, sending back reams of data that have been analysed by Alan Stern at the Southwest Research Institute in Boulder, Colorado, and his colleagues. Broad, bright plains on Pluto

known as Sputnik Planum seem to be covered by nitrogen glaciers; these quickly erase craters made by crashing asteroids. Nearby lies the dark Cthulhu region, which is covered in craters that are thought to be up to 4 billion years old.

Pluto also hosts unique features, such as 'snakeskin' terrain that may have been sharpened into ridges over time as material froze and then sublimated away.

*Science* 350, 292 (2015)

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a concentration found in nectar. The caffeine-fuelled bees revisited the feeders more frequently than did the control bees, and they at least tripled the number of waggle dances they performed to recruit bees from the hive.

Because caffeine disguises a reduced sugar concentration, the nectar the bees take back to the hive might be sub-standard. That could mean that the colony would produce less honey, the authors predict.

*Curr. Biol.* <http://dx.doi.org/10.1016/j.cub.2015.08.052> (2015)

## ANIMAL BEHAVIOUR

## Electric eels use shocks to sense

Electric eels send out strong zaps to track moving prey by their electrical conductivity, enabling the eels to strike with remarkable precision.

Electric eels (*Electrophorus electricus*; **pictured**) are known to use electricity to stun their prey, and have electrical sensors (pictured in pink). To see whether the high-voltage zaps have a sensory role, Kenneth Catania at Vanderbilt University in Nashville, Tennessee, presented the eels with a twitching fish in an insulated plastic bag and a conductive rod.

The eels reacted to the mechanical signals from the moving prey, producing a strong shock and striking in the direction of the fish. But they repositioned mid-strike, capturing and attempting to feed on the rod instead, even when it moved around quickly.

This sensory system is

similar to how some bats use echolocation, says Catania. *Nature Commun.* 6, 8661 (2015)

## AGROECOLOGY

## Wild flowers are a pesticide source

Commonly used insecticides have been found on wild flowers as well as on crops.

Neonicotinoid pesticides applied to the seeds of some crops end up in the nectar and pollen of adult plants, so the chemicals are a suspected cause of the global decline in bee populations. Because most crops flower only briefly, it was unclear how bees could be exposed to enough pesticide to feel toxic effects. Now Cristina Botías and her colleagues at the University of Sussex in Brighton, UK, show that these chemicals are present in the pollen of wild flowers growing near fields where neonicotinoids were used.

The team measured neonicotinoid levels in pollen sampled from fields of oilseed rape (*Brassica napus*), nearby wild flowers and local beehives, and estimated that 97% of these compounds that were brought back to beehives originate from wild flowers.

The wild flowers had higher levels of insecticide in their pollen than crop plants did, and they bloom for much longer.

*Environ. Sci. Technol.* <http://doi.org/8bk> (2015)

## MEDICAL TECHNOLOGY

## Cheap MRI uses small magnets

A technique for magnetic resonance imaging (MRI) could provide fast brain scans at a fraction of the cost of conventional machines.

Most MRI scanners require large magnets to generate a strong enough magnetic field to penetrate soft tissue. A team led by Matthew Rosen at Harvard Medical School in Boston, Massachusetts, has demonstrated a way to capture an image

## SOCIAL SELECTION

Popular topics on social media

## A call for preprints at meetings

In what has been called “gaygenegate” in some corners of the Internet, a conference presentation on 8 October about the genetics of homosexuality in men has come under intense scrutiny. The talk also prompted questions about whether scientists working on controversial topics should post

unreviewed preprints of their findings before presenting them at a meeting. Statistician Andrew Gelman of Columbia University in New York, who criticized the homosexuality study’s statistical analysis, wrote in a blog post that the lack of a peer-reviewed paper or preprint made it difficult for people to evaluate the work. Other researchers countered that conferences are meant to be forums for early, unpublished work.

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using magnetic fields that are 450 times weaker than those used by current machines, and at one-twentieth of the cost.

The team engineered a radio-frequency coil that could pick up the faint radio signals generated as a result of the weak magnet and used data-collection techniques that speed up image reconstructions.

Although the resulting images have a lower resolution than do those from large MRI scanners, they can still reveal major abnormalities such as signs of traumatic brain injury or stroke, Rosen says.

*Sci. Rep.* 5, 15177 (2015)

## EVOLUTION

## Village-dog DNA hints at origins

DNA from free-roaming ‘village dogs’ shows greater genetic diversity than that of pure-bred dogs, and could help to settle debates about where dogs were domesticated.

Humans domesticated dogs from wolves more than 15,000 years ago, but researchers disagree about whether that happened in Europe, East Asia, the Middle East or elsewhere. A team led by Adam Boyko at Cornell University in Ithaca, New York, analysed the genomes

of 549 free-breeding village dogs from around the world, as well as 4,676 pure-bred dogs belonging to 161 breeds. Genome-wide patterns of ancestry in the village dogs hint at a central Asian origin for domestic dogs, followed by population expansions in East Asia.

The researchers say, however, that more-extensive studies of DNA from diverse dogs are needed to pinpoint the origins of man’s best friend.

*Proc. Natl Acad. Sci. USA* <http://dx.doi.org/10.1073/pnas.1516215112> (2015)

## 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.

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