

RESEARCH HIGHLIGHTS

Selections from the scientific literature

NANOTECHNOLOGY

Microphone made from a molecule

A single molecule can act as a nanometre-sized microphone.

Michel Orrit and his colleagues at the University of Leiden in the Netherlands placed molecules of dibenzoterrylene within a crystal a few degrees above absolute zero and attached a tuning fork to the crystal. Hitting the fork caused vibrations that stretched and compressed the crystal, which in turn shifted the frequency at which the molecules emitted light. The light-frequency readout allowed the team to detect the vibrations from an individual molecule.

The nano-microphone could be used as an ultra-sensitive detector for very slight vibrations, such as from tiny oscillators that measure the properties of quantum systems, the authors say.

Phys. Rev. Lett. 113, 135505 (2014)

NEUROSCIENCE

Paralysed rats stimulated to walk

Paralysed rats can be made to walk using a device that electrically stimulates the spine and adjusts the pulses according to ongoing movement.

Grégoire Courtine and his



colleagues from the Swiss Federal Institute of Technology in Lausanne implanted electrodes into the spinal cords of rats below the site of the animals' paralyzing injury. The team developed algorithms that tuned the electrical signals in realtime, based on continuous feedback on the leg's position and movement. This allowed the rats to walk with a more natural gait, compared with systems currently in development that use fixed stimulation parameters. The animals walked at least 1,000 steps on a treadmill and could climb steps (pictured).

The authors plan to test their technique in patients with spinal-cord injury. *Sci. Transl. Med.* 6, 255ra133 (2014)

PALAEONTOLOGY

Amphibian regrew limbs long ago

The oldest evidence for limb regeneration has been found in fossils of a 300-million-year-old amphibian.

Salamanders can regrow entire lost limbs. Usually, the regrowths are indistinguishable from those that they replace, but in some cases they have distinctive abnormalities such as fused or missing digits. Nadia Fröbisch and her colleagues at the Natural History

Museum — Leibniz Institute for Evolution and Biodiversity Science in Berlin found similar abnormalities in fossils of *Micromelerpeton credneri* (pictured), a distant relative of modern amphibians.

This is the first fossil evidence for limb regeneration, and suggests that this ability originated in an ancient amphibian ancestor. *Proc. R. Soc. B* 281, 20141550 (2014)



CAROLA RADKE/MFN

CANCER

Vitamin D boosts cancer treatment

Vitamin D could make pancreatic cancer treatment more effective, by reprogramming cells that bolster tumour growth.

Pancreatic cancer is particularly deadly, partly because of cells called pancreatic stellate cells, which foster an environment that favours the growth of tumours and resists chemotherapy. Ronald Evans and Michael Downes of the Salk Institute in La Jolla, California, and their colleagues found that the vitamin D receptor is expressed in human pancreatic tumours. Activation of the receptor markedly altered

gene expression in pancreatic stellate cells, shifting them to a quiescent state in which they could not support tumours as well.

As a result, treating mice bearing pancreatic tumours with a vitamin D analogue and chemotherapy slowed tumour growth and increased survival compared with chemotherapy alone.

Cell 159, 80–93 (2014)

ECOLOGY

Dingo destruction okay for prey

Efforts to control Australia's dingo populations to protect livestock may not be having negative effects on other prey species.

Some studies have suggested

ALAIN HERZOG/EPFL

that controlling populations of top predators, such as the dingo (*Canis lupus dingo*), can indirectly cause declines in some prey species further down the food chain. Benjamin Allen at the University of Queensland in Gatton, Australia, and his colleagues laid poisoned bait for dingoes at several large study sites across the country. They found that prey populations in areas where dingoes were killed were similar to, or greater than, those in areas with no culling. Over the long-term, prey population sizes fluctuated independently of predator control levels.

This may be because the amount of dingo culling was not high enough to affect the animal's populations, the authors say, concluding that current dingo control practices probably do not need to be changed.

Front. Zool. 11, 56 (2014)

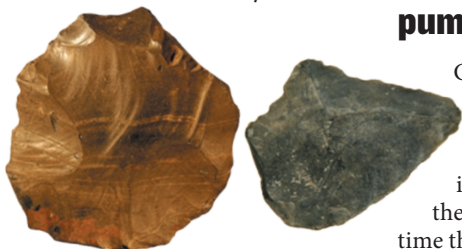
ARCHAEOLOGY

Stone tools not out of Africa

An advanced method of making stone tools did not spread out of Africa in a single wave as once thought, but evolved independently among different groups of early humans in Eurasia and Africa.

Stone-tool-making technology changed 400,000 to 200,000 years ago from a process whereby tools were made by chipping off and discarding flakes to shape a rock, to a more complex technique whereby the rock is first shaped (pictured left) in order to flake off pieces (pictured, right) for later use. Daniel Adler of the University of Connecticut in Storrs and his colleagues analysed artefacts, from a 325,000-year-old

DANIEL S. ADLER



archaeological site in Armenia, that were made by both methods and report that the objects were from the same archaeological layer.

The finding is the earliest evidence of the simultaneous use of the older 'bifacial' and the more complex 'Levallois' technologies outside of Africa, and suggests that the latter did not suddenly replace the former, the authors argue.

Science 345, 1609–1613 (2014)

PALAEOCLIMATE

Winds favoured Pacific exploration

Polynesians took advantage of an unusual shift in climate and tradewind direction about a 1,000 years ago to sail downwind towards New Zealand and other islands.

Ian Goodwin at Macquarie University in Sydney, Australia, and his colleagues reconstructed Pacific sea-level pressure and wind patterns during a period 700–1,200 years ago when certain Polynesian islands and New Zealand were colonized, and when the global climate shifted. They found that these climate changes resulted in altered wind patterns that allowed Polynesians to easily sail to the East Polynesian islands, New Zealand and Easter Island without having to travel against the wind.

The finding contradicts earlier assumptions that these voyagers needed to sail upwind to reach their destinations.

Proc. Natl Acad. Sci. USA
<http://dx.doi.org/10.1073/pnas.1408918111> (2014)

ASTROPHYSICS

Space ripples could pump up stars

Gravitational waves could energize and brighten stars — possibly providing indirect evidence for the weak ripples in space time that are thought to

SOCIAL SELECTION

Popular articles on social media

Ig Nobel prizes provide fun fodder

In honour of the winners of this year's Ig Nobel Prizes, researchers on social media buzzed about holy images on toast, medical uses for bacon, the slipperiness of banana skins and other offbeat works of science.

The awards, presented by the *Annals of Improbable Research*, recognize quirky research papers that might otherwise have slipped into obscurity. Not many people were talking about 'Frictional coefficient under banana skin', for example, until it took home the physics prize. Shortly afterwards, Michael Lerner, a physicist at Earlham College in Richmond, Indiana, tweeted that the paper "is clearly showing up on one of my exams". Neil Cronin, a human-locomotion researcher at the University of Jyväskylä in Finland, tweeted: "Finding funding for muscle research: difficult. Finding funding for banana skin friction study: easy apparently."

Tribol. Online 7, 147–151 (2012)



Based on data from altmetric.com. Altmetric is supported by Macmillan Science and Education, which owns Nature Publishing Group.

➔ **NATURE.COM**
For more on popular papers:
go.nature.com/kxf4e2

be emitted by high-energy events such as exploding stars.

Barry McKernan at the City University of New York and his colleagues calculated the effect that gravitational waves would have on a star if the waves have frequencies matching those of the star's natural vibrations. They found that the star absorbs those waves, and if close to a powerful source such as merging black holes, it could heat up and brighten.

The study suggests that gravitational waves, which are difficult to detect, could interact more strongly with matter than previously thought.

Mon. Not. R. Astron. Soc. 445, L74–L78 (2014)

PHYSIOLOGY

Ancient roots of daily rhythm

The hormone that regulates sleep and other circadian processes in vertebrates also controls night-time behaviour

in zooplankton, suggesting early evolutionary origins for the hormone.

Melatonin is produced by many organisms, but its function in invertebrates has not been clear. Maria Antonietta Tosches, Detlev Arendt and their colleagues at the European Molecular Biology Laboratory in Heidelberg, Germany, studied larvae of the marine worm *Platynereis dumerilii*, which move up and down in the water at certain times of the day. The authors found that the larvae make melatonin in the brain and that production ramps up at night. This boosted neuronal activity, which resulted in less swimming, allowing the larvae to drift downward.

Melatonin evolved in early animals to coordinate their behaviour with the time of day, the authors propose.

Cell 159, 46–57 (2014)

➔ **NATURE.COM**
For the latest research published by Nature visit:
www.nature.com/latestresearch