RESEARCH HIGHLIGHTS

Selections from the scientific literature

PHOTONICS

Light goes one way on a chip

A device that controls light so that it travels in just one direction could be used in high-speed computers that carry signals using light, rather than electric charges.

A team led by Lan Yang and Şahin Kaya Özdemir at Washington University in St. Louis created a diode using two doughnut-shaped rings on a silicon chip. While one ring absorbs an incoming light signal, the other amplifies it. When the rings are close together, light travels through the device both ways. When the rings are farther apart, the signal can be amplified in one direction but blocked in the other.

The device is smaller and uses less power than existing optical diodes.

Nature Phys. **http://doi.org/r8n (2014)**

CRAIG MCCLAIN

ECOLOGY

Fallen trees form a sea-floor feast

Dead trees at the bottom of the ocean host a diverse range of bacteria, fungi and molluscs (pictured; a cent is included for scale).

Craig McClain of the National Evolutionary Synthesis Center in Durham, North Carolina, and James Barry of the Monterey Bay Aquarium Research Institute in Moss Landing, California, left 18 *Acacia* hardwood logs at a depth of more than 3,000 metres in the northeast Pacific Ocean and retrieved them after five years.

The duo found thriving ecosystems that varied dramatically between logs, even though the wood was within an area 500 metres square: on average, the logs were only about 25% similar in terms of species composition. Key colonizers were wood-boring bivalves, which create holes for other organisms to shelter in and provide food in the form of wood chips and faeces.

Changing patterns of deforestation, river flow and hurricanes might affect the frequency and size of such 'wood falls', which could have a significant impact on deep-sea diversity, the authors say.

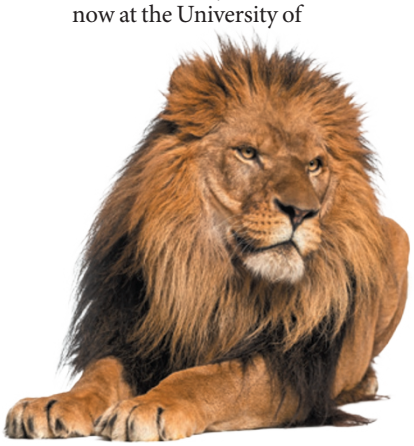
Biol. Lett. 10, **20140129 (2014)**

EVOLUTION

Ancient lion DNA yields family tree

Five genetically distinct lion populations roam in Africa and Asia — a finding that hints at greater diversity in these animals than previously thought.

A team led by Ross Barnett, now at the University of Copenhagen, analysed mitochondrial DNA (mtDNA) from the remains of 14 lions (*Panthera leo*) in museums, including extinct individuals from North Africa and Iran. Comparisons with mtDNA from other ancient and modern lions (**pictured**) suggested that the different populations are descended from an ancestral one living in southeastern Africa around 124,000 years ago. Habitat changes led to the expansion of the lions' range throughout Africa and, beginning around 21,000 years ago, into Asia and the Middle East.



Lion conservation and restoration efforts — which currently recognize only two populations in Africa and Asia — ought to account for this extra diversity, the authors say.

BMC Evol. Biol. 14, **70 (2014)**

CONSERVATION BIOLOGY

Unique birds top conservation list

An analysis of evolutionary relationships between all of the world's known birds prioritizes some of them for conservation on the basis of their genetic uniqueness.

Walter Jetz of Yale University in New Haven, Connecticut, Arne Mooers of Simon Fraser University in Burnaby, Canada, and their colleagues examined the family tree of almost 10,000 bird species. They calculated the birds' evolutionary distinctness — a measure of a species' separation from others on the family tree. Birds that ranked high in distinctness and that occupy small ranges or are threatened with extinction include the giant ibis (*Thaumatibis gigantea*) and the kakapo, a flightless parrot (*Strigops habroptilus*).

Many of these birds live outside well-known

LIFE ON WHITE/ALAMY

biodiversity hotspots, suggesting that current conservation planning does not adequately cover these evolutionary rarities.
Curr. Biol. **http://doi.org/r9f (2014)**

CIVIL ENGINEERING

Seismic 'shield' stops quake shake

An array of deep holes in the ground seems to lessen shaking in certain locations during a simulated earthquake.

Stéphane Brûlé of soil-engineering company Ménard in Nozay, France, and his colleagues drilled a grid of boreholes 5 metres deep into the soil near Grenoble. A crane then lowered a probe into the ground nearby, where it vibrated to simulate an earthquake. The boreholes were located in places where the seismic waves interfered with one another and cancelled each other out. Thus, the array of holes deflected much of the seismic energy and bounced it back towards the source.

The approach could lead to new ways to protect buildings from shaking during earthquakes, the authors say.
Phys. Rev. Lett. 112, **133901 (2014)**

NEUROBIOLOGY

Surprising effects of prion drug

A chemical that combats pathogenic prion proteins in infected mouse cells worsens the problem in cells from other species. The finding could explain why the drug, quinacrine, has been ineffective in many clinical trials.

Prion infections turn healthy proteins into abnormally folded forms, which cause fatal neurodegenerative diseases in humans and other animals. Quinacrine reduces this misfolding in mouse cells, but Glenn Telling and his colleagues at Colorado State University in Fort Collins discovered that the drug has the opposite effect in deer, elk and moose cells, causing the proteins to misfold even more. The researchers think that small differences in prion protein sequences between species could be to blame.

Drug developers will need to rethink how they screen molecules for antiprion activity, the authors say.
Proc. Natl Acad. Sci. USA **http://doi.org/r9d (2014)**

MATERIALS

Printer squirts out nanotubes

Inkjet printers can produce thin films of carbon nanotubes for use as electrodes in stretchy electronic circuits.

Yongtaek Hong and his colleagues at Seoul National University printed layers of single-walled carbon nanotubes onto a stretchable silicon-based material. The authors found that the electrical properties of the films improved after washing them with water and soaking them in diluted nitric acid. Furthermore, a film with five layers of nanotubes performed better than a single layer, maintaining conductive properties under 100% tensile strain.

This method is simpler and more scalable than previous ones, the authors say.
Appl. Phys. Lett. 104, **113103 (2014)**

NEUROSCIENCE

Turn on the light to make myelin

Brain circuits change throughout life, and researchers in California have discovered a mechanism for one such change: the thickening of the myelin sheath that surrounds nerve fibres and helps neurons to fire.

Michelle Monje and her co-workers at Stanford University School of Medicine studied mice that had been engineered so that light can stimulate neurons in the brain's premotor cortex. This stimulation resulted in the generation of more cells called oligodendrocytes, which make myelin, and a thickening of the myelin sheath in this and other brain regions. Furthermore, mice that were stimulated with light and had thicker myelin showed better motor function than normal animals.

The results could point to ways of boosting myelin formation in neurodegenerative diseases such as multiple sclerosis, the authors say.
Science **http://doi.org/r9g (2014)**

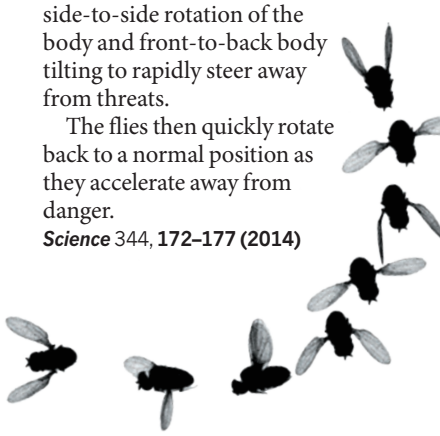
BIOMECHANICS

Fast moves of fleeing fruit flies

To dodge predators, flies in flight execute banked turns in just a few wingbeats — much faster than the steering motions that have been previously observed in flies.

Michael Dickinson and his colleagues at the University of Washington in Seattle used three high-speed cameras operating at 7,500 frames per second to capture the flight responses of a fruit fly species (*Drosophila hydei*; **pictured**) when it evades a threat looming in front of it. They found that with slight changes in wing motion, the insects use a combination of side-to-side rotation of the body and front-to-back body tilting to rapidly steer away from threats.

The flies then quickly rotate back to a normal position as they accelerate away from danger.
Science 344, **172–177 (2014)**



FLORIAN MUJURES

SOCIAL SELECTION

Popular articles on social media

Lionfish prove a main draw on Twitter

Lionfish took a bite of Twitter attention at the start of this month in a paper that reveals some unintended effects of population-control measures that could undermine future efforts.

Isabelle Côté at Simon Fraser University in Burnaby, Canada, and her team, looked at what happens after invasive predatory lionfish (*Pterois volitans/miles*) were culled at coral-reef sites in the Bahamas. The effects on surviving fish were marked: they became less active and hid deeper in the reefs during the day compared with fish in reefs where no culls took place. The wary lionfish also seemed able to spot approaching divers from a greater distance.

As Côté pointed out on Twitter, these changes in behaviour could lead to underestimating the size of the lionfish population.
PLoS ONE 9, **e94248 (2014)**

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