RESEARCH HIGHLIGHTS

ANIMAL BIOLOGY

Savvy spiders

J. Exp. Biol. **213,** 2372–2378 (2010)

Jumping spiders have exceptional eyesight compared with other creatures of their size, but biologists may have underestimated the visual acuity of one of their pairs of eyes.

The spiders have a principal pair that faces forwards and has excellent resolution but a very narrow field of view, and two or three secondary pairs that detect motion over a wider field. Daniel Zurek and his colleagues at Macquarie University in Sydney, Australia, used dental silicone to cover all but one pair of eyes — the set of secondary ones that faces forwards — in 52 jumping spiders (*Servaea vestita*). They then presented the arachnids with moving dots on a screen, and with live, tethered house flies, the spiders' favoured prey.

The spiders oriented themselves in the direction of the dots and began stalking the flies. This pair of secondary eyes, the authors say, may be the most versatile element of the creatures' visual system, providing both spatial acuity and motion detection. **J.F.**

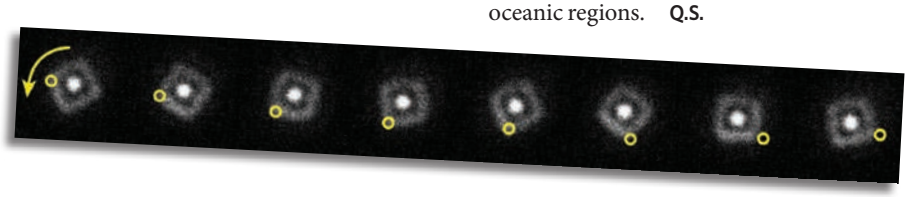
X. J. NELSON

NANOTECHNOLOGY

Photons make light work

Nature Nanotechnol. doi:10.1038/nnano.2010.128 (2010)

Light particles carry momentum but, individually, not enough to move a physical object. Now Xiang Zhang and his colleagues at the University of California, Berkeley, have found a way of putting light to work. The team designed a nanometre-scale gold 'motor' with a physical structure that maximizes the strength of its interaction with light at specific wavelengths.



The light acted like a person pushing a swing, making the motor spin. The torque generated was strong enough to visibly rotate a micrometre-sized square silica disc (pictured) attached to the motor. The researchers say that the motor could eventually be used as the basis for tiny wireless devices. **G.B.**

ATMOSPHERIC CHEMISTRY

Airborne alcohol

Atmos. Chem. Phys. **10,** 5361–5370 (2010)

One in three ethanol molecules in the atmosphere originates from industrial sources and biofuels, scientists have calculated.

Ethanol derived from biomass has been widely promoted as a substitute for fossil fuels. But the overall impact of increased ethanol burning on atmospheric chemistry is largely unknown.

Vaishali Naik, then at Princeton University in New Jersey, and her colleagues used available observations and a global chemical-transport model to constrain the poorly defined global ethanol budget. They estimate that terrestrial plants produce about nine million tonnes per year, whereas five million tonnes come from anthropogenic sources, and a further half a million tonnes from biomass burning. However, the authors warn that the uncertainties are large, particularly for the ethanol concentrations over remote oceanic regions. **Q.S.**

CELL BIOLOGY

Protein clean-up crew

Science doi:10.1126/science.1191542 (2010)

Cystic fibrosis is caused by mutations in a protein called CFTR, which is found in cells' outer membranes. Attempts to express a functional version of the mutant protein have failed, partly because the rescued protein is rapidly degraded. Gergely Lukacs of McGill University in Montreal, Canada and his colleagues have identified the proteins that work together to eliminate this and other defective proteins from the outer membrane.

They found that a protein called Hsc70, helped by other molecular 'chaperones', recognize mutant CFTR at the cell surface that has not been properly folded into its three-dimensional structure. This biochemical pathway may serve as a back-up quality-control system for proteins that have escaped the cell's other 'housekeeping' methods, the authors say. **H.L.**

NEUROSCIENCE

Smells affect sight

Curr. Biol. doi:10.1016/j.cub.2010.05.059 (2010)

For humans and other primates, sight tends to dominate sense of smell; often what we see affects what we smell. Researchers have found evidence that the opposite may also be true: olfaction can influence visual perception.

Wen Zhou, at the Chinese Academy of Sciences in Beijing, and her colleagues showed volunteers two images, one of a rose and one of marker pens. The volunteers viewed the images through special glasses so that each eye saw a different image at the same time, although the volunteers were aware of only one image at a time. They were also exposed to odorants that smelled like either roses or pens.

The volunteers reported seeing the rose for longer periods of time when sensing the rose smell, and a similar bias when smelling the pens. The authors also show that the effect is partly subconscious. **C.L.**

CHEMISTRY

Metal–organic catalyst

Angew. Chem. Int. Edn doi:10.1002/anie.201000863 (2010)

Fuel cells and other applications depend on electro-oxidation reactions. The platinum-based catalysts generally used for these

reactions are expensive and their supply is limited, so the search is on for alternatives. Hiroshi Kitagawa of Kyoto University in Japan and his colleagues show that metal-organic frameworks (MOFs) — which have several desirable properties and consist of metals linked to organic molecules — can act as electrocatalysts.

The researchers used a thermally stable copper-based MOF to oxidize ethanol. The catalyst seemed tolerant of the reaction's oxidation products, unlike the platinum-based catalysts. Although the ethanol was only partly oxidized to acetaldehyde, the catalytic performance of the MOF was comparable to that of platinum catalysts, the team reports. **D.P.C.**

ZOOLOGY

Follow the leader

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.1001763107 (2010)

Many bird species move cohesively in flocks, but what governs the behaviour of individuals and gives rise to this collective movement?

Ryan Lukeman of St. Francis Xavier University in Antigonish, Nova Scotia, Canada and his co-workers collected and analysed photographic data on the positions, movements and interactions of individual surf scoters (*Melanitta perspicillata*). These birds are found in flocks numbering into the hundreds on the coastal waters of North America.

The authors found that individuals position themselves, on average, 1.45 body lengths from their nearest neighbour, and move with a mean speed of two body lengths per second. They move in line with those in front of them and, if they get too close, will shift sideways. **N.G.**

GENETICS

Breaking the silence

Genome Biol. doi:10.1186/gb-2010-11-6-r63 (2010)

Genes can be silenced by the attachment of methyl groups to specific points in their DNA, but how is such silencing reversed in mammalian cells? Michael Rehli at University Hospital Regensburg in Germany and his colleagues conducted genome-wide scans for demethylation to find out whether the process is actively mediated by enzymes or occurs passively as cells divide.

Most studies so far have looked at dividing cells, but Rehli's team instead screened non-dividing white blood cells as they specialized to become dendritic cells. Demethylation occurred at the same loci in different individuals, suggesting that it is an active process. Demethylation was also coupled with another gene-regulatory event, suggesting that demethylation is involved in activating genes. **A.K.**

CARDIOVASCULAR BIOLOGY

Low B cells, low plaques

J. Exp. Med. doi:10.1084/jem.20100155 (2010)

Heart disease has a plethora of contributory factors, with inflammation and other immune reactions among the key mediators. Studies in mice reveal that, contrary to previous results, the mature form of an immune cell known as a B cell promotes atherosclerosis — the build-up of fatty plaques on arterial inner walls.

Ziad Mallat at the French National Institute for Health and Medical Research in Paris and his colleagues depleted B cells in three mouse models of atherosclerosis. They found reduced plaque development compared with untreated mice, even though blood cholesterol levels were similar. B-cell depletion led to decreased activation of T cells, which are known to enhance plaque formation, and a shift towards greater production of an immune modulator that protects against atherosclerosis. **C.L.**

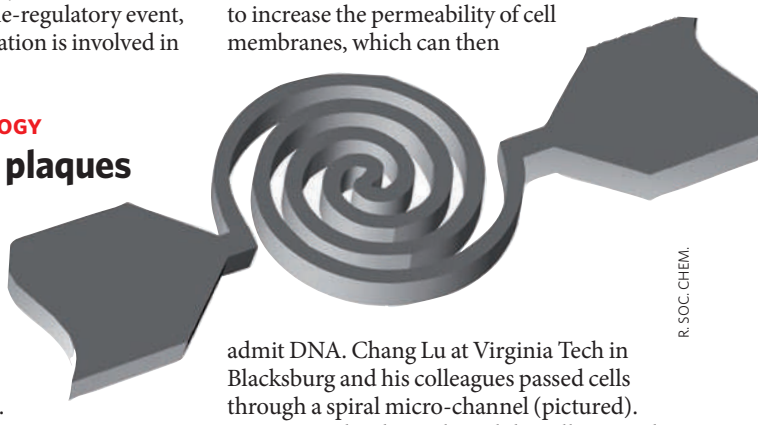
BIOTECHNOLOGY

Swirling cells

Lab Chip doi:10.1039/c004472e (2010)

A laboratory process that uses an electric field to transfer genes into cells has been given a boost by researchers, who have doubled its efficiency.

Electroporation relies on electric pulses to increase the permeability of cell membranes, which can then admit DNA. Chang Lu at Virginia Tech in Blacksburg and his colleagues passed cells through a spiral micro-channel (pictured). Vortices in the channel swirl the cells around, exposing their entire membrane area to the electric field, rather than just a small portion as in traditional techniques.



R. SOC. CHEM.

This method could be scaled up or down to process varying sizes of cell sample, the authors write. **D.P.C.**

JOURNAL CLUB

Tecumseh Fitch
University of Vienna

A cognitive biologist foresees breakthroughs in understanding vocal learning.

Vocal learning — the capacity to reproduce sounds heard in the environment — is key to human speech. Humans are alone among primates in having vocal-learning abilities, but a surprising variety of non-primates, such as songbirds and parrots, are also excellent vocal learners. The list of mammals with the ability is comparatively short, comprising humans, some whales and seals, and probably elephants. Now research on tropical bats has added another creature to the list.

Mirjam Knörnschild at the University of Erlangen-Nuremberg in Germany and her colleagues studied sac-winged bats (*Saccopteryx bilineata*) in Costa Rica (M. Knörnschild *et al. Biol. Lett.* **6,** 156–159; 2010). Male *Saccopteryx* produce elaborate courtship displays that include complex songs. Surprisingly, young bats also produce songs, and acoustic analysis showed that as the bats grew older, their songs became more like those of the local territorial male. For about half the pups, the local male was not their father, ruling out simple genetic effects. Moreover, pups' songs often became less species-typical over time, ruling out simple maturation. This research thus provides the first clear evidence for complex vocal learning in bats.

The finding is exciting for several reasons. First, the species is the only mammalian vocal learner that could conveniently be kept and eventually bred in the lab, opening the door to detailed scientific investigation. Second, previous work suggests that the *FOXP2* gene, which is known to be involved in vocal learning in humans and birds, has also been under strong selection in bats, although we don't yet know why. Echolocation is probably part of the answer, but this study suggests that social communication could be another. I believe that research on *Saccopteryx* will usher in an era of increased understanding of mammalian vocal learning.

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