RESEARCH HIGHLIGHTS

Selections from the scientific literature

PHYSICS

'Nanoear' hears small sounds

By using laser beams to trap a gold nanoparticle, researchers in Germany have developed a sensitive sound-wave detector.

Tightly focused laser beams, known as optical tweezers, have been used to manipulate microscopic objects for two decades. Andrey Lutich, Jochen Feldmann and their co-workers at the Ludwig–Maximilians University in Munich used a similar approach: they suspended a 60-nanometre gold nanoparticle in water in the focal spot of a laser beam. They sent sound waves through the water and measured changes in the particle's constrained motion. The authors calculate that the nanoparticle can pick up sounds as low as –60 decibels, making the set-up a million times more sensitive than the human ear.

Phys. Rev. Lett. 108, **018101 (2012)**

J. DIEGMANN

EVOLUTION

Colour vision aids the hunt

Primates with three types of colour receptor in their eyes capture more insect prey than those whose eyes have two. But the latter are not without advantage — they are better at detecting and catching camouflaged prey.

The primates of mainland Africa and Asia all have three types of colour receptor, making them 'trichromats'. Some in the Americas can be trichromat or dichromat. Hannah Buchanan-Smith at the University of Stirling, UK, and her colleagues studied trichromatic and dichromatic tamarins (*Saguinus* spp.; pictured) in captivity and in the field.

Other research has shown that trichromacy may also assist primates in spotting ripe fruits and young leaves. The persistence of dichromacy may result from the advantage it provides in detecting concealed prey, the authors say.

Anim. Behav. **http://dx.doi.org/10.1016/j.anbehav.2011.11.023 (2012)**

CARDIOVASCULAR BIOLOGY

Stranded cells fuel plaques

One contributor to the build-up of fatty plaques in artery walls is a signalling protein that blocks the emigration of a major plaque constituent from the deposits.

Fat-laden white blood cells called macrophages are abundant in atherosclerotic plaques. Kathryn Moore at New York University and her colleagues found that these cells produce netrin-1, a protein that can guide the migration of white blood cells and the growing tips of neurons. But expression of netrin-1 in plaques blocked macrophage responses to chemical cues that would normally direct them out of the plaques.

Furthermore, mice lacking the netrin-1 gene had less atherosclerosis. These findings suggest that netrin-1 could provide a new drug target.

Nature Immunol. **http://dx.doi.org/10.1038/ni.2205 (2012)**

CELL BIOLOGY

No centrosome, no problem

Planarian flatworms have rid their cells of centrosomes, organelles that are found in nearly every animal cell. The structures anchor microtubule filaments that control cell division, cell migration and cell orientation.

Juliette Azimzadeh and Wallace Marshall at the University of California, San Francisco, and their team noticed that the flatworm *Schmidtea mediterranea* lacks centrioles — which make up the centrosomes — in dividing cells. They found centrioles only in certain cells that help the worms to glide across surfaces, feed and sense their environment.

The *S. mediterranea* genome is missing several genes needed to form centrioles; most flatworms have a full suite of centrosome genes. The authors suggest that planarians shed their centrosomes because, unlike many other animals, they rely on a form of embryonic development that does not depend on a cell's orientation.

Science **http://dx.doi.org/10.1126/science.1214457 (2012)**

CLIMATE-CHANGE ECOLOGY

Extinctions underestimated

More species may become extinct as a result of climate change than previously thought, a modelling study suggests.

As the climate warms, many species are predicted to shift their ranges to stay within comfortable temperature zones. However, some species will be better able to do so than others. Mark Urban at the University of Connecticut in Storrs and his colleagues have created a model that takes into account the competition that species face for habitats when they move to new ecosystems. They modelled the effect of 4 °C of warming over 100 years on 40 simulated species, and found a much higher number of extinctions than did models that do not account for species competition and species' differing dispersal abilities.

Even species with broad heat tolerances might be outcompeted — either by the arrival of newcomers in their current habitats or by native species in ecosystems that become habitable to them in future.

Proc. R. Soc. B **http://dx.doi.org/10.1098/rspb.2011.2367 (2012)**

DEVELOPMENTAL BIOLOGY

Stem cells of the eye

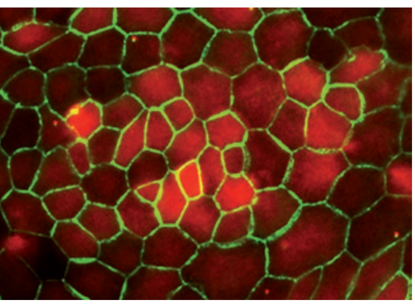
Retinal cells that are normally dormant *in vivo* are still capable of dividing *in vitro*, and can even take on properties seen in stem cells.

Retinal pigment epithelial (RPE) cells form a supporting layer in the retina and are implicated in various eye diseases, including some that lead to blindness. Sally Temple at the Neural Stem Cell Institute in Rensselaer, New York, and her colleagues isolated RPE cells, which are normally dormant throughout life, from human donor eyes. When cultured in certain growth conditions, the cells divided and showed characteristics of stem cells. The cells could also produce RPE and develop into neural, bone and fat cells, and displayed markers of some of these cells after being injected into chick embryos.

These RPE-derived cells represent a new type of stem cell from the central nervous system, the authors say.

Cell Stem Cell 10, **88–95 (2012)**

ELSEVIER



CANCER

Immune cell boosts cancer

Skin immune cells that present fragments of invaders to the immune system also promote skin cancer in response to a powerful carcinogen.

Michael Girardi at Yale University in New Haven, Connecticut, and his colleagues exposed the skin of mice to DMBA, a laboratory chemical representative of common carcinogens in industrial pollution. Mice engineered to be deficient in Langerhans cells, the immune cells in question, were almost completely resistant to developing skin cancer. By contrast, the Langerhans cells of normal mice metabolized DMBA to an intermediate that induced a cancer-causing mutation in the DNA of adjacent skin cells.

When the intermediate was applied directly to the skin of the mice, both types developed skin cancer.

Science 335, **104–108 (2012)**

NEURODEVELOPMENT

Culprit in deafness

Age-related hearing loss often results from damage to the outer hair cells in a highly specialized component of the inner ear called the organ of Corti. Researchers at Washington University in St. Louis, Missouri, looked at how the development of these cells is regulated and identified a protein that is required for their normal development in mice.

David Ornitz and his colleagues discovered that mice lacking the protein FGF20 are deaf but otherwise healthy. The protein functions at a particular developmental stage to prime specific cells in the organ of Corti for further maturation. Without this factor, the outer hair cells and supporting cells in this part of the inner ear fail to develop, resulting in congenital deafness.

The authors speculate that mutations in the *FGF20* gene could be a cause of deafness in humans.

PLoS Biol. 10, **e1001231 (2012)**

BIOTECHNOLOGY

Silkworms spin spider-like silk

Spider silk is tough and has many potential applications, but spiders' territorial nature makes them hard to farm. Researchers have therefore engineered silkworm moths that can produce threads of comparable strength.

Donald Jarvis at the University of Wyoming in Laramie and his colleagues built a silk gene that combines sequences from the golden silk orb-weaver spider (*Nephila clavipes*) and the silkworm moth (*Bombyx mori*; **pictured**). The team transferred the genetic construct into the genome of *B. mori* and then harvested the resulting larvae's silks, which comprise a mixture of natural and synthetic silk proteins.

F. PUPIN/FLPA

The material is stronger and stretchier than normal *Bombyx* silks and is as tough as spider draglines. It could be harvested for biomedical applications such as surgical sutures.

Proc. Natl Acad. Sci. USA **http://dx.doi.org/10.1073/pnas.1109420109 (2012)**

COMMUNITY CHOICE

The most viewed papers in science

NEUROSCIENCE

How the brain slows with age

HIGHLY READ on www.jneurosci.com in December

In the brain, a drop in the activity of just one gene decreases neurons' ability to change the strength of their connections — a hallmark of age-related cognitive decline.

The gene, *Bdnf*, encodes a protein that helps neurons in cognitive centres of the brain to form connections called synapses. Cui-Wei Xie and her colleagues at the University of California, Los Angeles, analysed brain slices from young, middle-aged and aged rats. Aged rat brains showed a decrease in the addition of acetyl groups to histones — proteins that package up DNA — in the regulatory regions of the *Bdnf* gene, reducing the gene's expression. Treating the brain slices with chemicals that mimic the BDNF protein or inhibit histone deacetylation increased the density and strength of neuronal connections.

J. Neurosci. 31, **17800–17810 (2011)**

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