

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)

## 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

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## NEUROSCIENCE

## How the brain slows with age

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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)

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



F. PUPIN/FLOPA

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.

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.

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