RESEARCH HIGHLIGHTS

Selections from the scientific literature

ECOLOGY

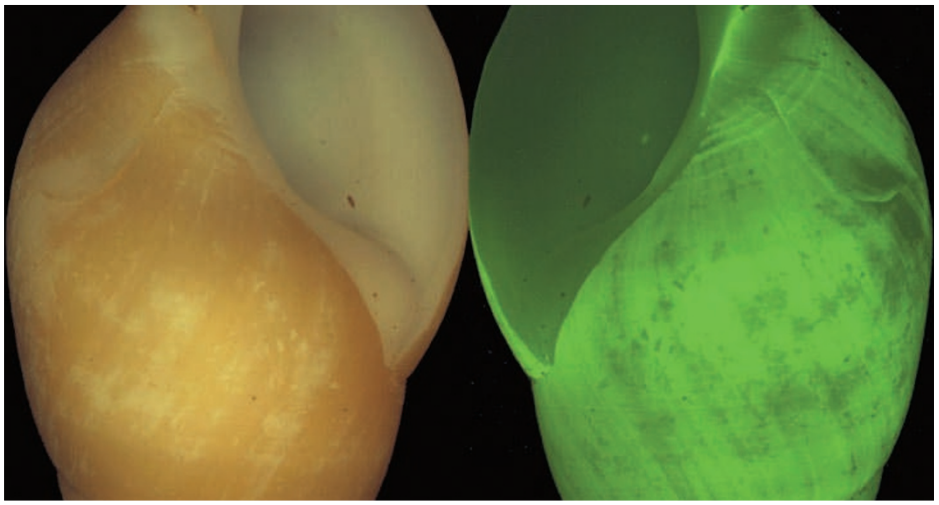
Hotter climate, altered breeding

As Earth warms, amphibians are shifting their breeding times at unprecedented rates.

Four out of ten amphibian species studied at a South Carolina wetland either delayed or advanced their breeding — depending on their breeding season — by 15.3–76.4 days over a 30-year period. For two of the species, *Ambystoma opacum* and *Eurycea quadridigitata*, this coincided with a 1.2 °C increase in overnight air temperature during their pre-breeding and breeding periods.

Brian Todd at the University of California, Davis, and his team say that the altered breeding times, which range from 5.9 to 37.2 days per decade, are among the greatest rates of change seen in ecological life-cycle events. The changes could affect the dynamics of the larger amphibian larval community, including resource availability and predation rates.

Proc. R. Soc. B **doi:10.1098/rspb.2010.1768 (2010)**



R. SOC.

ZOOLOGY

Snail shells spread light around

A marine snail has a shell that is remarkably well adapted for diffusing the light that it emits to ward off predators.

Stimulating *Hinea brasiliana* snails (**pictured** left), by tapping them or placing them in contact with potential predators, causes them to emit a blue-green light from defined areas of their body, report Dimitri Deheyn and Nerida Wilson of the Scripps Institution of Oceanography in San Diego, California. The shell directly transmits most wavelengths of light, with the exception of blue-green ones. These are instead spread by the shell from the limited production regions of the snail's body over a much larger area (right).

The shell produced brighter and larger areas of diffused light than a commercial diffuser. Such shells allow snails to produce visible and extensive bioluminescent signals from their protected position inside the shell.

Proc. R. Soc. B **doi:10.1098/rspb.2010.2203 (2010)**

MATERIALS SCIENCE

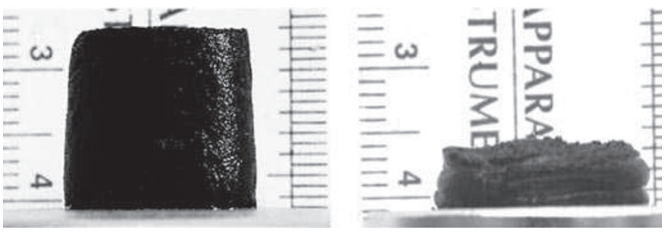
Magnetic gel delivers drugs

Drugs and cells can be delivered on demand by a porous material engineered to compress in response to an applied magnetic field.

David Mooney at Harvard University in Cambridge, Massachusetts, and his team prepared an alginate-based gel with micrometre-sized pores, and paramagnetic iron nanoparticles embedded throughout. On exposure to a magnetic field, the nanoparticles put the squeeze on the ferrogel. The authors used this to release a drug payload in *in vitro* experiments and, by implanting the gel into mice, for localized release of dye-stained stem cells.

With a reversible volume reduction of more than 70% (**pictured**), such ferrogels may also find applications as actuators and sensors in biomedical applications.

Proc. Natl Acad. Sci. USA **doi:10.1073/pnas.1007862108 (2010)**



NATL ACAD. SCI.

ANTHROPOLOGY

DNA from across the ocean

A handful of Icelanders may be descendents of a Native American woman ferried to the island hundreds of years before Christopher Columbus reached the New World.

In a tiny proportion of the country's residents, DNA sequences from cell organelles called mitochondria (mtDNA) resemble those of some Native Americans. Unlike nuclear DNA, mtDNA is inherited only from the mother.

Sigríður Sunna Ebenesersdóttir at deCODE Genetics in Reykjavík and her colleagues traced the sequence variants back to four Icelanders born in the early 1700s. However, genetic differences between them suggest that the mtDNA derived from a woman who arrived in Iceland much earlier — possibly around

the time the Vikings started exploring the Americas in about AD 1000. Because Native American populations were decimated after the arrival of the Europeans, the lineage may be missing from contemporary populations. DNA analysis of the remains of ancient Native Americans could provide a more definitive link.
Am. J. Phys. Anthropol. 144, **92–99 (2011)**

GLACIOLOGY

Imaging grooves from glaciers

Developments in radar technology have allowed geoscientists to 'see through' a Greenland glacier and construct three-dimensional topographic maps of its bed.

Kenneth Jezek of Ohio State University in Columbus and his team used high-resolution radar tomography and synthetic-aperture radar data to measure ice thickness in a region of the Jakobshavn Glacier. They found that as the glacier slides over its bed, it cuts large-scale ridge–groove features into the bedrock that are similar to landforms found on deglaciated terrain. The orientation and dimensions of the grooves suggest that the glacier has been flowing persistently in the same direction.

Understanding past glacier movement and bedrock geomorphology helps researchers to forecast climate-driven changes in the seaward flux of ice sheets.
Geophys. Res. Lett. **doi:10.1029/2010GL045519 (2010)**

CANCER

Tumours aided by immune cells

Zebrafish cells with the propensity to give rise to tumours behave similarly to wounded tissue, and call for assistance from the immune system. So say Paul Martin at the University of Bristol, UK, and his colleagues, who imaged the interactions between the cells in real time.

The authors expressed a cancer-associated mutant form of the Ras protein in zebrafish (*Danio rerio*). Because zebrafish larvae are translucent, the team was able to visualize fluorescently labelled immune cells as they responded to the transformed cells.

Cells expressing mutant Ras, and their healthy neighbours, released hydrogen peroxide, attracting immune cells called neutrophils and macrophages, which tethered themselves to the transformed cells. Blocking hydrogen peroxide synthesis — and so the recruitment of the immune cells — slowed the proliferation of transformed cells, suggesting that early immune responses may support tumour development.
PLoS Biol. 18, **e1000562 (2010)**

VISION SCIENCE

Man or woman? Depends on view

Whether a face looks like that of a man or a woman depends on the part of the retina on which the image lands.

Eleven volunteers were asked to identify the gender of a series of faces (**pictured**) presented in one of eight possible visual-field locations relative to a central point. Arash Afraz at the Massachusetts Institute of Technology in Cambridge and his co-workers found that two identical faces were perceived to be of different gender if they were presented simultaneously in specific, different locations. Volunteers' responses became more consistent across the visual field as the images grew in size.

The researchers think that the perceptual variation may result from the small size of the stimuli relative to that of the receptive field. The small number of brain cells analysing the images at any given location may have varying responses; these are averaged out by a larger image, which stimulates a greater number of cells.
Curr. Biol. 20, **2112–2116 (2010)**

ELSEVIER

DEVELOPMENTAL BIOLOGY

Immune system emerges in layers

The human immune system develops in waves, the first of which begins even before birth. Fetal and adult T cells originate from different stem-cell populations, allowing the fetal immune system to better tolerate foreign antigens — namely the mother's.

Joseph McCune at the University of California, San Francisco, and his colleagues compared human fetal blood stem cells and T cells with those of adults. After implantation in mice that permit human blood-cell maturation, fetal stem cells were more likely than adult ones to develop into regulatory T cells. These suppress immune activity, enhancing tolerance to antigens.

Fetal stem cells and T cells also had different gene-expression profiles from the adult versions of these cells. Statistical analysis revealed that developmental stage accounted for most of these differences.
Science 330, **1695–1699 (2010)**

COMMUNITY CHOICE

The most viewed papers in science

NEUROSCIENCE

Better memory with less microRNA

HIGHLY READ on jneurosci.org in November

Learning and memory in mice seem to be enhanced by the loss of small RNA molecules called microRNAs (miRNAs) in the brain.

Witold Konopka at the German Cancer Research Center in Heidelberg and his colleagues deactivated the gene for Dicer, a key enzyme in miRNA synthesis, in forebrain neurons of adult mice. Twelve weeks later, the mice showed improved learning and memory in a behavioural test. This was mirrored by increased numbers of a type of dendritic spine in mutant neurons that is associated with learning. After 20 weeks, however, some of the neurons had degenerated, confirming the importance of microRNAs for neuronal survival.
J. Neurosci. 30, **14835–14842 (2010)**

PALAEOANTHROPOLOGY

Neanderthal family tree

Neanderthals living 49,000 years ago may have abided in small clans banded together by their male kin.

Carles Lalueza-Fox at Pompeu Fabra University in Barcelona, Spain, Antonio Rosas at the National Museum of Natural Sciences in Madrid and their colleagues analysed the remains of 12 Neanderthals. They sequenced certain regions of the mitochondrial DNA extracted from fragments of bones and teeth.

The results showed that the group's three adult males were close relatives, but the three adult females were not. The authors further inferred that an infant and two juveniles were offspring of two of the adult females. The team suggests that the individuals represent a social unit based on patrilocality, in which individuals live with the adult male's family.
Proc. Natl Acad. Sci. USA **doi:10.1073/pnas.1011553108 (2010)**