

GLACIOLOGY

Cooling no aid to shrinking glacier

A temporary cooling of the ocean around Antarctica's fastest-melting glacier failed to stop its retreat into the sea.

The Pine Island Glacier in West Antarctica is currently the largest glacial contributor to global sea-level rise. Knut Christianson at the University of Washington in Seattle and his colleagues used Global Positioning System receivers, ocean moorings and satellite radar observations to monitor the glacier and the adjacent ocean from 2009 to 2014. They found that a 60% drop in ocean heat content between 2012 and 2013 did not slow the overall thinning of the ice sheet, which boosts glacier flow and ice discharge into the ocean.

Cold ocean and climate conditions would probably need to persist for several decades to reverse the glacier's retreat, the authors say.

Geophys. Res. Lett. <http://doi.org/br3p> (2016)

NEUROPSYCHOLOGY

Pain passed on by smell

Mice housed in the same room as one another can pass certain types of pain to each other through smell.

Exposure to inflammatory molecules or withdrawal from drugs or alcohol can cause hyperalgesia, a painful hypersensitivity to touch, heat or chemical irritants. Andrey Ryabinin and his colleagues at Oregon Health and Science University in Portland found that when mice were subjected to these pain-inducing treatments, untreated mice in the same room also acquired hyperalgesia. Moreover, mice in a separate room began



CAROLE FRITZ

GENOMICS

Bison's history in DNA and cave art

Europe's largest land mammal may be a hybrid of two extinct species.

Julien Soubrier and Alan Cooper at the University of Adelaide in Australia and their colleagues analysed mitochondrial DNA from 65 fossil specimens of bison, including the threatened European bison (*Bison bonasus*), ranging from 14,000 to more than 50,000 years old. They conclude that *B. bonasus* is a hybrid of two animals: the steppe bison (*Bison priscus*), the Eurasian ancestor of the American bison

that became extinct more than 11,000 years ago, and the aurochs (*Bos primigenius*), the ancestor of modern cattle. The team estimates that the hybridization occurred at least 120,000 years ago.

Cave art seems to support the replacement of one species by another. Drawings dating to roughly 30,000–36,000 years ago showed animals resembling steppe bison (pictured), whereas art about 17,000–12,000 years old depicts animals similar to the European bison. *Nature Commun.* 7, 13158 (2016)

displaying this pain sensitivity after exposure to bedding used by the hyperalgesic animals in the first room. The authors conclude that the pain is transmitted by an olfactory cue.

Social transfer of pain could play a part in chronic pain in humans, especially in cases without apparent physiological cause, the authors suggest. *Sci. Adv.* 2, e1600855 (2016)

MATERIALS

Film self-heals like insects do

The browning of fruit and healing in insects has inspired the development of a material

that regenerates and 'heals' itself after being damaged.

Surface injuries in fruit and insects expose phenolic compounds, which are then oxidized, forming a protective surface. Haeshin Lee and his colleagues at the Korea Advanced Institute of Science and Technology in Daejeon, South Korea, created a solution containing a phenol compound and a polyamine. When catalysed by oxygen, the chemicals reacted much as they do in fruit and insects, forming a film at the surface. When parts of the film were peeled away, it 'healed' itself, a process the authors repeated 40 times without seeing any

measurable loss of strength.

Unlike other self-healing materials, the film does not require external stimuli such as increased pressure or temperature to trigger healing. *Adv. Mater.* <http://doi.org/f3r9bw> (2016)

EVOLUTION

How snakes lost their legs

Two studies pinpoint a stretch of DNA that could explain how snakes evolved from four-limbed animals.

A team led by Len Pennacchio and Axel Visel at Lawrence Berkeley National

S. ZIESE/NEWSCOM

Laboratory in California analysed the ZRS DNA sequence — which regulates a key limb-development gene called Sonic hedgehog (*SHH*) in a range of animals — in the genomes of various snakes. The authors found that snakes' ZRS sequence differs markedly from that of other vertebrates. Mice in which the ZRS had been replaced by the cobra or python version did not express *SHH* in their developing limbs and were born with stumps instead of legs.

In a separate study, Francisca Leal and Martin Cohn at the University of Florida in Gainesville identified a series of deletions in the ZRS common to several snake species, but not seen in limbed vertebrates. In experiments in mice and cell culture, these mutations reduced the activity of the ZRS. *Cell* 167, 633–642 (2016); *Curr. Biol.* <http://doi.org/br4z> (2016)

PLANT SCIENCE

How some plants adapt to shade

Shade-loving *Begonia* plants have iridescent blue leaves as a result of a cell organelle that allows them to efficiently harvest light in low-light conditions.

Plants rely on organelles called chloroplasts for photosynthesis. Heather Whitney at the University of Bristol, UK, and her colleagues used light and electron microscopy to study the structure of a variant of these organelles, called an iridoplast, in the surface layers of *Begonia* plants (hybrid of *B. grandis* and *B. pavonina*, pictured). The team found that the

iridoplasts' membranes are stacked in piles of three or four in a highly regular manner — a structure not seen in normal chloroplasts.

Data modelling showed that this structure allows iridoplasts to absorb predominantly green light, which is abundant in forest shade, and enhances photosynthetic efficiency by up to 10%.

Nature Plants <http://dx.doi.org/10.1038/nplants.2016.162> (2016)

EVOLUTION

Fast but invisible evolution

The rate of evolution is consistent across many fossil lineages, even if some show little physical change.

Such seemingly unchanged fossils — described as being in stasis — have often been interpreted as evidence for slow evolution. Kjetil Lysne Voje at the University of Oslo analysed published data on 450 fossil lineages, calculating the rate of evolution and morphological change. In lineages in stasis, he found that traits constantly fluctuated, but these shifts did not lead to large evolutionary changes in a particular direction. However, the traits still evolved just as much as those in lineages that saw major directional changes.

Long periods of stasis in the fossil record are evidence for stable environmental conditions that allowed ecological niches to persist for millions of years, Voje suggests. *Evolution* <http://doi.org/br3n> (2016)

CANCER IMMUNOTHERAPY

Multi-pronged tumour attack

A cocktail of antibodies and proteins can wipe out large tumours in mice — even if the tumours are not particularly visible to the immune system.

Immunotherapies unleash immune-system responses against cancer, but generally fail against large, established tumours in mice. Dane



Wittrup and Darrell Irvine at the Massachusetts Institute of Technology in Cambridge and their colleagues cooked up an immunotherapy with four ingredients: a tumour-targeting antibody, the immune-stimulating protein interleukin-2, a vaccine containing fragments of tumour proteins, and an antibody that blocks an immunosuppressive protein called PD-1.

This unleashed antibodies and immune cells called T cells against the tumour; these even attacked tumour proteins that were not targeted directly by the cocktail. The treatment worked against both tumours transplanted into mice and large tumours grown in mice, which are typically less visible than transplanted tumours to the mouse immune system. *Nature Med.* <http://dx.doi.org/10.1038/nm.4200> (2016)

ENVIRONMENTAL SCIENCE

Heat-polluted rivers ranked

The Mississippi and Rhine rivers are two of the most polluted by heat, mainly as a result of warm-water discharge from power plants.

Catherine Raptis at the Swiss Federal Institute of Technology in Zurich and her colleagues studied this 'thermal pollution', which can disrupt aquatic ecosystems. They quantified the thermal emissions from power plants worldwide, and found that the Mississippi River in the United States received the most heat. They then used a global model to

simulate the impact of power plants on river temperatures and found that the Rhine River in Europe (pictured) had the greatest total percentage of thermally polluted waters.

European rivers showed the most extensive thermal pollution, with readings often well above regulatory limits. *Environ. Res. Lett.* 11, 104011 (2016)

ELECTRONICS

Quantum bits wired up

Scientists have demonstrated a device that can interconnect as many as 100 qubits — the units of information future quantum computers will use to perform calculations that are impossible for conventional computers.

The 'quantum socket' — built by Matteo Mariantoni at the University of Waterloo in Canada and his collaborators — is a 3D arrangement of wires that link superconducting loops, each of which encodes a qubit. The device also enables individual qubits to be read and written on using microwave pulses. The team optimized the system to work at the extremely low temperatures required for superconductivity.

The researchers say that the design could be scaled up to as many as 100,000 qubits, enabling complex quantum computations. *Phys. Rev. Appl.* 6, 044010 (2016)

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