

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## GLACIOLOGY

### Data mix-up in sea-ice record

The recent, mysterious expansion of Antarctic ice could be overestimated because of a data-analysis error, according to US scientists.

Ian Eisenman at the Scripps Institution of Oceanography in La Jolla, California, and his colleagues found the mistake when they compared two versions of satellite data on Southern Hemisphere sea ice that were calibrated differently. The incorrect calibration of one of the data sets might account for more than half of the jump in Antarctic sea-ice growth.

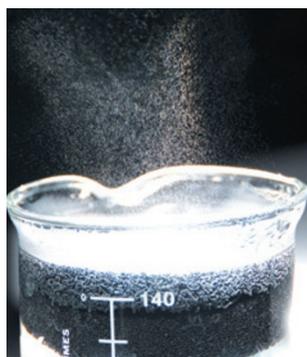
The finding means that either the 2007 or the 2013 report by the Intergovernmental Panel on Climate Change reflects this error, but the authors were not able to determine which one. *Cryosphere* 8, 1289–1296 (2014) For a longer story on this research, see [go.nature.com/owasxc](http://go.nature.com/owasxc)

## MATERIALS

### Sponge takes light to make steam

A sponge-like device absorbs water and solar energy to generate steam efficiently (pictured).

Gang Chen at the Massachusetts Institute of Technology in Cambridge and



his colleagues placed a layer of graphite flakes on top of a piece of carbon foam. The foam floats in water, soaking it up and wicking the liquid to the graphite, which absorbs solar radiation. Thanks to the insulating foam, heat builds up in the porous graphite layer, causing the absorbed water to evaporate.

The apparatus can trap 85% of the incoming solar energy to generate steam when sunlight is focused to ten times its normal intensity. The device could help to purify and desalinate water in remote areas, the authors say. *Nature Commun.* 5, 4449 (2014)



## ECOLOGY

### Predictable patterns for coral-reef pest

Modelling how ocean currents spread the larvae of coral-eating starfish around Australia's Great Barrier Reef can help to identify areas that are prone to damaging epidemics of the pest.

A team led by Karlo Hock of the University of Queensland in St Lucia, Australia, used a computer model to study the distribution of larvae of the voracious crown-of-thorns starfish (*Acanthaster planci*; pictured) in the Great Barrier Reef. Areas of the reef that are

densely connected to each other through ocean currents were more likely to experience an outbreak, and to amplify it into a wider problem. The authors' model also accurately identified the specific region where epidemics most often originate.

The team suggests that careful study of reef connectivity could help to control future starfish outbreaks.

*J. Appl. Ecol.* <http://doi.org/tvs> (2014)

## CHEMISTRY

### Fighting ants make rare fluid

An ionic liquid has been observed for the first time in nature — as a mixture of venom from two rival ant species.

The tawny crazy ant *Nylanderia fulva* is displacing fire ants (*Solenopsis invicta*) in the southern United States, in part by detoxifying its enemy's venom using its own poison. Researchers led by James Davis of the University of South Alabama in Mobile show that the resulting brew

consists of ions instead of electrically neutral molecules.

The finding suggests that ionic liquids, which are commonly used in industry, also have important biological functions.

*Angew. Chem. Int. Ed.* <http://doi.org/f2s5zj> (2014)

## GEOMORPHOLOGY

### Beaches erode without storms

Sea-level rises that are unrelated to major storm events could be eroding coastlines as much as hurricanes do.

Weather and oceanographic processes that are not linked to storms cause sea levels to rise over weeks to months, but their effects have been overlooked in models of beach erosion. So Ethan Theuerkauf and his colleagues at the University of North Carolina's Institute of Marine Sciences in Morehead City studied sediment cores from six sites along Onslow Beach on the US east coast after a year of frequent sea-level changes but no major storms. They compared these cores with those obtained after a storm year and found similar levels of erosion.

The authors suggest that sea-level changes could become more frequent in this region because climate change is predicted to weaken the Gulf Stream, which can lead to these sea-level anomalies.

*Geophys. Res. Lett.* <http://doi.org/ttn> (2014)

## IMMUNOLOGY

## Inflammation on the clock

An internal clock regulates inflammation in mouse lungs.

Symptoms of some human lung diseases, including asthma, tend to vary in severity according to the time of day. Andrew Loudon and David Ray at the University of Manchester, UK, and their colleagues found that immune responses to a bacterial toxin are regulated by a circadian clock in mouse lungs. The recruitment of immune cells called neutrophils and the expression of several immune-related proteins responded rhythmically to the toxin, with neutrophil recruitment peaking at dawn.

Deleting a key 'clock gene' weakened responses to bacterial infection and reduced the effect of glucocorticoid steroids, which normally suppress inflammation. Chronic lung inflammation could be partly caused by circadian disruption, the authors say. *Nature Med.* <http://dx.doi.org/10.1038/nm.3599> (2014)

## CLIMATE SCIENCE

## Warming from coupled climates

Links between the climate over the North Pacific and the North Atlantic oceans could lead to abrupt climate change.

Researchers have debated whether temperature and ocean fluctuations were in sync with each other during past climate changes. Summer Praetorius and Alan Mix of Oregon State University in Corvallis studied oxygen isotopes as a proxy for ocean temperature in three sediment cores from the Gulf of Alaska covering the past 18,000 years.

By comparing the Alaska samples to cores from northern Greenland, the scientists found that climate variables such as temperature changed synchronously between about 15,500 and 11,000 years ago — shortly before the end of the last ice age.

The authors suggest that this link could have shifted heat in both oceans towards the poles at the same time, triggering abrupt climate change. They add that similar connections may be important for future warming.

*Science* 345, 444–448 (2014)

## OPTICS

## Transistor uses single photons

Two teams in Germany have built transistors that control light at the single-photon level.

Transistors that switch light instead of electrical current can enable ultra-fast computing. But making optical transistors with 'gain' — when one photon affects many others to drive further switches — has been tricky because photons do not interact with each other.

To overcome this problem, a team at the Max Planck Institute of Quantum Optics in Garching and a separate group at the University of Stuttgart passed a single photon through a cloud of ultracold rubidium atoms.

## SOCIAL SELECTION

Popular articles on social media

## Beef's big impact on Earth

Beef is suddenly big on social media, thanks to two recent papers investigating the global effects of livestock farming. They make the case that beef production has a bigger impact on greenhouse-gas emissions and on the use of nitrogen and water than does the production of pork and poultry, for instance. Tim Thomson, a physician and molecular biologist at the Molecular Biology Institute of Barcelona in Spain, tweeted: "Do not imitate Americans: Eat less beef and you will mitigate environmental costs of diet." But Jared Decker, a beef-cattle geneticist at the University of Missouri in Columbia, tweeted that cattle have a relatively small carbon footprint compared to other industry sectors, adding: "Wouldn't changing transportation & energy be more important?"

*Clim. Change* <http://doi.org/tvw> (2014); *Proc. Natl Acad. Sci. USA* <http://doi.org/tvx> (2014)



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The photon converted one atom into a type of large, excited particle called a Rydberg atom, which blocked the next photon from passing through.

In the Stuttgart team's transistor, one photon diverted another 10, whereas in the Max Planck device, a photon controlled a further 20.

*Phys. Rev. Lett.* 113, 053602 (2014); 113, 053601 (2014)

## EVOLUTION

## Sperm are speedier in groups

In the face of competition, sperm cells travel faster when

they move together in groups of an optimal size.

A team led by Heidi Fisher at Harvard University in Cambridge, Massachusetts, studied rodent sperm cells under a microscope, and used a mathematical model to analyse their swimming behaviour. They found that, in comparison to solitary sperm or those in larger groups, intermediate-sized aggregates of six or seven sperm (**pictured**) tend to migrate the fastest, by taking a more direct path.

Sperm cells from a sexually promiscuous species of deer mouse, *Peromyscus maniculatus*, were faster and more likely to form optimally sized clumps than were similarly shaped sperm from a monogamous sister species, *Peromyscus polionotus*.

The results show how sexual selection can shape the evolution of cooperation. *Proc. R. Soc. B* 281, 20140296 (2014)

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