

PROTEINS

Antifreeze protein has a heart of ice

A molecule that prevents the blood of winter flounder (*Pseudopleuronectes americanus*) from freezing is the first protein discovered to have a water-filled core.

Peter Davies of Queen's University in Kingston, Canada, and colleagues crystallized a protein called Maxi, which binds ice crystals to prevent larger ice structures from forming. Unlike most proteins, which have hydrophobic inner surfaces that exclude water, the researchers found that Maxi's core is full of water.

The inner surface of each Maxi protein holds about 400 water molecules in ordered structures layered between the protein's chains. This water structure sticks outside the protein, where it appears to bind to ice.

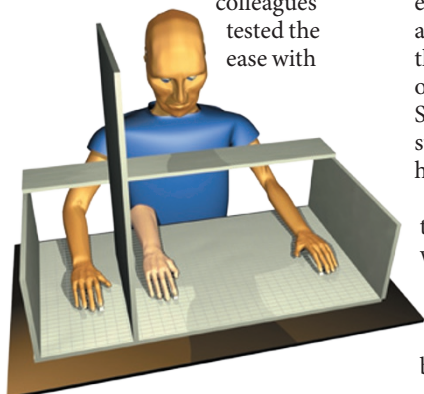
Science 343, 795–798 (2014)

NEUROLOGY

Implications of a gentle caress

Soft, slow stroking of the skin contributes more to a sense of body ownership than other types of touch.

Haike van Stralen at Utrecht University in the Netherlands and her colleagues tested the ease with



which study participants could be deceived into feeling that a rubber hand was part of their own body. Volunteers watched the fake hand being stroked quickly or slowly by either a cosmetic brush or a rough plastic cloth, while their real hand was touched out of sight (pictured).

Soft, slower stroking gave a stronger illusion that the fake hand was their own.

The authors propose that the C tactile nerve fibres, which are activated by soft stroking of limbs at around 3 centimetres per second, may modulate how the brain integrates information

about the body's limbs from different senses (such as sight and touch).

Cognition 131, 147–158 (2014)

REGENERATIVE MEDICINE

Stem cells make muscles stronger

Manipulating muscle stem cells in older people could promote regeneration and prevent muscle breakdown.

Bradley Olwin at the University of Colorado Boulder and his colleagues demonstrated that a protein called p38 prevents stem cells in old muscles from renewing.

When the authors took muscle stem cells from old mice and treated the cells with drugs to suppress p38, this allowed the stem cells to respond to growth signals and to replicate themselves.

In a separate study, Helen Blau and her colleagues at Stanford University in California grew old muscle stem cells on a gel while treating them with p38 inhibitors. The researchers then transplanted the stem cells into the muscles of living old mice, in which they began repairing the degenerating muscle tissue. When the group tested these muscles, they



ATMOSPHERE

Turbines shoot upside-down lightning

Wind turbines emit lightning flashes upwards, producing these electrical discharges at regular intervals relative to the turbine's rotation, and can do so tens of kilometres away from an active thunderstorm area.

Joan Montanya at the Polytechnic University of Catalonia in Terrassa, Spain, and his colleagues plotted radio emissions from lightning strikes detected by a mapping array system installed on the east coast of Spain.

Later, a high-speed video was used to capture the flashes (pictured). The authors found that turbine blades send electrical discharges upwards in synchronization with their rotation; these discharge episodes lasted for more than an hour under certain storm conditions. The results confirm that rotating wind turbines can initiate lightning more easily than static objects, the authors say.

J. Geophys. Res. Atmos. <http://doi.org/rfj> (2014)

were stronger in response to a stimulus than muscles that had received non-treated stem cells.

Nature Med. <http://doi.org/rhg>; <http://doi.org/rhh> (2014)

ANIMAL BEHAVIOUR

Picky spiders prefer virgins

Male black widow spiders (*Latrodectus hesperus*) prefer their female mates to be healthy and chaste — a rare demonstration of mate selection by males.

Emily MacLeod and Maydianne Andrade at the University of Toronto Scarborough, Canada, studied whether male black widows are fussy about females. Males overwhelmingly chose to mate with well-fed females who had not previously mated, both in controlled field studies and in the wild.

Male spiders' preference for well-fed virgins could be strong enough to cause females to have evolved traits, such as the production of sex pheromones, that entice males and advertise the female's status, say the authors.

Anim. Behav. 89, 163–169 (2014)

CANCER

Unmasking the real risk genes

Cancer researchers have found part of the answer in the case of the 'missing heritability' — the mismatch between genetic disease risk and common genetic variants.

It has long been thought that common variants might be weakly linked to disease because they are co-inherited with rare, nearby genetic variants. These variants are much more predictive of disease, but are themselves too rare to be discovered, even in studies with large sample sizes.

Zsafia Kote-Jarai of the Institute for Cancer Research in Sutton, UK, and her colleagues report the first evidence for this 'synthetic association' in cancer. They show that four

common genetic variants in or near the *HOXB13* gene are associated with a roughly 30% increase in cancer risk and are almost always inherited with a rare gene variant, which itself predicts an approximately 400% increase in risk for the disease. *PLoS Genet.* 10, e1004129 (2014)

CONSERVATION

Birds should fear windows

Collisions with windows are the second-largest human-related source of US bird mortality (after house cats), with low-rise buildings and homes responsible for most deaths.

Scott Loss of the Smithsonian Conservation Biology Institute in Washington DC and his colleagues examined 23 studies of bird collisions, allowing them to estimate that between 365 million and 988 million birds are killed every year by hitting buildings.

Despite the problem of bird strikes on skyscrapers being well publicized, the team found that these impacts represented less than 1% of deaths.

Several bird species, including the golden-winged warbler (*Vermivora chrysoptera*) and the painted bunting (*Passerina ciris*) were particularly collision-prone. *Condor* 116, 8–23 (2014)

MATERIALS

A bulk graphene mimic

Physicists have identified a material that can conduct efficiently in multiple layers.

After the rush of interest in the atom-thick layers of carbon known as graphene, materials scientists turned to metal dichalcogenides — layered compounds that are also good conductors of electrical current. Rhenium disulphide now joins the promising candidates in this family.

Junqiao Wu at the Lawrence Berkeley National Laboratory in California and his colleagues

COMMUNITY CHOICE

The most viewed papers in science

OBESITY

Conflicts mar studies of sweet drinks

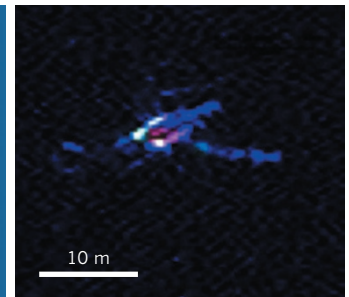
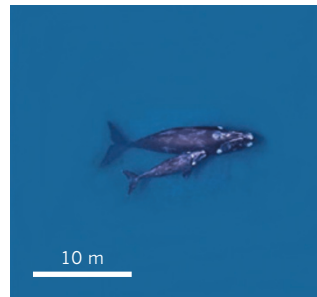
HIGHLY READ
on plosmedicine.org
13 Jan–12 Feb

Research exploring possible links between sugar-sweetened drinks and weight gain could be biased by financial conflicts of interest.

Maira Bes-Rastrollo of the University of Navarra in Pamplona, Spain, and her colleagues combed three databases for systematic reviews about the association between sugar-sweetened beverages and weight gain. The team found 18 conclusions in 17 such reviews, and 6 of those papers contained disclosures of financial ties to the food industry.

Of the 12 conclusions that had no reported financial conflict of interest, 83.3% said that consumption of sugar-sweetened beverages could be a risk factor for weight gain. But the same percentage of conclusions with a reported financial tie to industry said that there was insufficient evidence of a link.

PLoS Med. 10, e1001578 (2014)



discovered that bulk samples of the material have a direct bandgap, a gap in energy levels that can be used to absorb or emit light efficiently. Other members of the family have this type of bandgap only when isolated in monolayers.

Nature Commun. 5, 3252 (2014)

REMOTE SENSING

Counting whales from space

Researchers have for the first time counted whales from space, tallying 55 "probable" southern right whales and several other whale-like objects off the coast of Argentina.

Peter Fretwell and colleagues at the British Antarctic Survey in Cambridge, UK, analysed a single high-resolution WorldView2 satellite image

(pictured, right; an aerial photograph is shown for comparison, left) from Earth-imagery company DigitalGlobe. The image covered Península Valdés, a breeding area for a major population of southern right whales (*Eubalaena australis*).

The team found that all nine available spectra could reliably identify whales at the surface, and a far-blue 'coastal band' that penetrates deeper into the water pinpointed possible whales below the surface. An automated detection system found 89% of the whales that had been classified manually as probable sightings.

PLoS ONE 9, e88655 (2014)

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