

PHYSIOLOGY

How cold triggers fat formation

In frigid temperatures, mice ramp up the production of heat-generating brown fat by decreasing the levels of a small RNA molecule.

Because brown fat burns energy — unlike its unpopular cousin, white fat — its production is an attractive target for obesity and diabetes therapies. Markus Stoffel at the Swiss Federal Institute of Technology in Zurich and his colleagues found that exposure to cold reduced the expression of microRNA-133 in brown and subcutaneous white fat. Inhibiting miRNA-133 promoted brown-fat formation, whereas forcing miRNA-133 expression switched off brown-fat production.

The small RNA acted by directly inhibiting PRDM16, a protein that is central to the production of brown fat from white-fat-cell precursors. *Nature Cell Biol.* <http://dx.doi.org/10.1038/ncb2612> (2012)

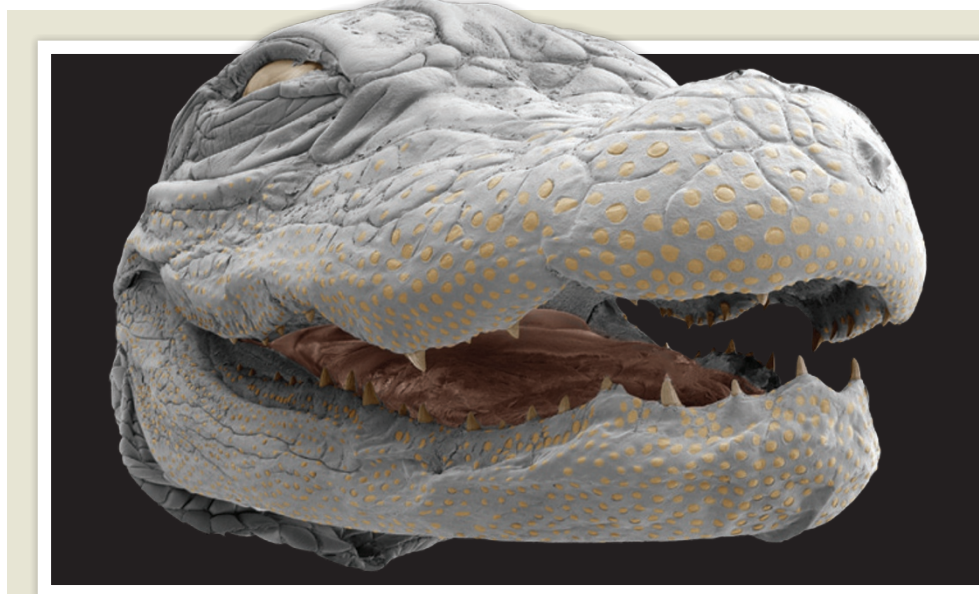
OCEANOGRAPHY

Thinning ice more fragile and mobile

The pronounced thinning of Arctic sea ice has made the ice pack more brittle and susceptible to wind drift.

The volume of Arctic sea ice decreased by one-third during 2007–11 compared with the 1979–2006 mean. In a model simulation, Jinlun Zhang at the University of Washington in Seattle and his colleagues demonstrate that the decline in volume substantially reduces the mechanical strength of the ice, thus boosting ice-drift speed and deformation rates.

Forecasts of ice-edge locations will become more challenging as the thinning



ZOOLOGY

Thick-skinned but sensitive

Crocodiles and alligators may sense their prey using tiny bumps on their mouths that are highly sensitive to touch.

Kenneth Catania and Duncan Leitch at Vanderbilt University in Nashville, Tennessee, investigated the raised bumps — called integumentary sensory organs — in 18 American alligators (*Alligator mississippiensis*; hatchling pictured) and 4 Nile crocodiles (*Crocodylus niloticus*). Confocal microscopy revealed that the bumps (pictured yellow), which are packed

most tightly around the teeth and mouth, share similar structures with tactile skin receptors in mammals. The bumps seemed to be insensitive to electrical current or water salinity, but showed nerve responses when stimulated with a range of levels of force — responding to low levels with a sensitivity exceeding that in primate fingertips.

The authors suggest that the animals use the sensitive bumps to locate prey, and to identify food and other items inside their mouths.

J. Exp. Biol. 215, 4217–4230 (2012)

and weakening of sea ice leads to a state of free drift, the authors note.

Geophys. Res. Lett. <http://dx.doi.org/10.1029/2012GL053545> (2012)

NEUROSCIENCE

Blind reading with sounds

Blind adults taught to ‘read’ using sounds that represent letters use the same area of the brain’s visual cortex that sighted humans use when reading.

Using a program that ‘describes’ images in sound,

Amir Amedi at the Hebrew University of Jerusalem in Israel and his team trained eight congenitally blind people to decipher the shapes of letters and objects such as faces and tools. The authors then imaged participants’ brains as they listened to sounds associated with letters or other objects. When the volunteers read using the sounds, they activated the same part of the visual cortex — the visual word form area (VWFA) — as sighted controls did when viewing letters.

The work shows that the VWFA is not dependent on visual information alone,

and suggests that the visual cortex may be trained to help recognize the environment, even in those who are blind from birth.

Neuron 76, 640–652 (2012)

MATERIALS

Counting loops in gels

Polymer networks, such as rubber and nylon, consist of linked chain-like or branched molecules that almost always contain loops — structural imperfections that weaken a network’s connectivity and

lower the material's elasticity.

Jeremiah Johnson and his colleagues at the Massachusetts Institute of Technology in Cambridge have developed a method to count the number of the most common loops in polymeric materials. The authors broke a hydrogel, a type of polymer network that soaks up water, into quantifiable fragments that reflected the connectivity of the original network, then used mass spectrometry to count the loops. They found that too many loops prevented the gel from forming.

The researchers say they are now using their method to correlate the effects of loops on the mechanical properties of a variety of polymer networks. *Proc. Natl Acad. Sci. USA* <http://dx.doi.org/10.1073/pnas.1213169109> (2012)

ANIMAL BEHAVIOUR

Wrens learn as embryos in the egg

A single song element is all that superb fairy-wren nestlings need to include in their begging calls to get fed by their mothers, and, in an unusual example of prenatal learning, the nestlings seem to learn this 'password' as embryos.

Adult superb fairy-wrens (*Malurus cyaneus*; pictured) use these begging calls to distinguish their offspring from those of two cuckoo species that often invade their nests. Sonia Kleindorfer at Flinders University in Adelaide, Australia, and her team analysed recordings of the fairy-wren calls and found that each nest had a common begging call different from those of all other



D. WATTS/NATUREPL.COM

nest. That call contained a signature element also found in the call the mother made while incubating her eggs. When the team swapped eggs around across 22 nests, nestlings from those eggs begged using the calls of their foster, not their biological, mothers, suggesting that the calls were learned. *Curr. Biol.* <http://dx.doi.org/10.1016/j.cub.2012.09.025> (2012)

NEUROTECHNOLOGY

Brain-machine does the two-step

Brain-machine interfaces (BMIs) detect and use brain activity to perform an intended task, and could be invaluable to people with paralysis. Typically, BMIs are able to process only single movements, but one developed by Ziv Williams at Harvard Medical School in Boston, Massachusetts, and his colleagues can control a series of motions — potentially expanding the complexity of tasks that BMIs can perform.

The team recorded brain activity in monkeys that were trained to move a computer cursor with their paws to each of two areas on a screen in a particular order. This revealed activity in two distinct groups of neurons in the brain's premotor cortex that was associated with each of the upcoming movements. The authors then programmed a computer to decode this signal from the brain and found that the mind-controlled computer moved the cursor at about the same speed that the monkeys achieved with their paws. *Nature Neurosci.* <http://dx.doi.org/10.1038/nn.3250> (2012)

NEUROSCIENCE

When neurons mature too early

A genetic mutation linked to intellectual disability and autism causes the premature formation of functional connections between brain cells during a crucial window of development early in life.

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CHEMISTRY

Mega-MOF's super surface

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Metal-organic frameworks, or MOFs, are of interest for applications such as catalysis and gas storage. Researchers now report a method that allowed them to synthesize these porous crystals with record-breaking surface areas.

Omar Farha at Northwestern University in Evanston, Illinois, and his colleagues created two copper-based MOFs, each with a surface area of approximately 7,000 square metres per gram. To help boost surface area, they used supercritical carbon dioxide to activate the MOFs, avoiding framework collapse, which can occur when the solvents used in MOF synthesis are removed.

Moreover, the authors calculated that by using acetylenes, rather than more bulky phenyls, as links in their framework, they could further increase the theoretical maximum surface area of MOFs to as high as 14,600 square metres per gram, roughly 40% higher than some previous estimates, the team suggests.

J. Am. Chem. Soc. 134, 15016–15021 (2012)

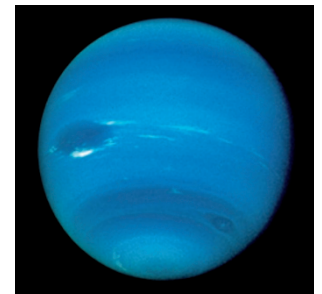
Mutations that inactivate one copy of the gene *SYNGAP1* often cause intellectual disability in humans. Gavin Rumbaugh of the Scripps Research Institute in Jupiter, Florida, and his team found that mice with a similar mutation produce neurons that mature too quickly after birth and become overactive in a brain region important for cognitive function. Mice with one copy of *SYNGAP1* have memory problems and are prone to seizures — a symptom in humans with the mutations.

Correcting the mutation in mice after this developmental period had little effect on the symptoms, and introducing the mutation into adult mice did not affect neuronal function — suggesting that the activity of the *SYNGAP1* protein during this developmental window has long-lasting effects. *Cell* 151, 1–15 (2012)

ASTRONOMY

More co-orbiters for Neptune

Some astronomers think that Neptune (pictured) can no longer capture objects whose



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orbits around the Sun are similar to its own. But Carlos and Raúl de la Fuente Marcos at the Complutense University of Madrid in Spain, have discovered that four objects originally classified as minor planets are actually co-orbiters that joined Neptune's orbit as recently as 50,000 years ago.

The work brings to 14 the number of objects that, like Neptune, orbit the Sun every 165 years. The four latest objects are not in the plane of the Solar System and follow eccentric paths. One is likely to diverge from its current path just 2,000 years from now.

Astron. Astrophys. 547, L2 (2012)

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