RESEARCH HIGHLIGHTS

Selections from the scientific literature

METABOLISM

Fat-molecule drop boosts metabolism

Metabolic health can be improved in mice by inhibiting the formation of compounds called ceramides in fat cells under the skin.

Ceramides are fatty molecules that have been associated with obesity and metabolic disease. Bhagirath Chaurasia at the University of Utah in Salt Lake City and his colleagues found that obese mice that could not make ceramides in fat tissue had improved energy metabolism. The mice also showed decreased inflammation and increased sensitivity to insulin (diminished sensitivity is a hallmark of type 2 diabetes). The reduction of ceramide levels in subcutaneous fat cells was linked to a cellular shift from an energy-storage mode to an energy-burning one.

The authors also report that patients with obesity and type 2 diabetes had more ceramides in subcutaneous fat cells than people of the same weight without diabetes.

Cell Metab. **http://doi.org/bsn2 (2016)**

SUNSET AVENUE PRODUCTIONS/GETTY

GEOPHYSICS

Volcano sneaks in magma sideways

The Mount St Helens volcano in the United States has crooked plumbing. Rather than sitting above the magma source that feeds it, the mountain is off to one side.

A major eruption in 1980 saw 57 people killed by the volcano, which is in Washington state. Steven Hansen at the University of New Mexico in Albuquerque and his colleagues set off explosives around Mount St Helens and measured the way the seismic waves travelled through the ground. They confirmed that the rock beneath the mountain is too cold to create magma. Instead, the molten rock that feeds the volcano seems to come from off to the east.

The sideways plumbing helps to explain why the mountain remains active despite lying to the west of most neighbouring volcanoes.

Nature Commun. *7,* **13242 (2016)**

ZOOLOGY

Thorny devil may drink from sand

A desert lizard survives in arid conditions by harvesting and drinking water from puddles, and possibly even from moist sand.

The Australian thorny devil (*Moloch horridus*, **pictured**) has a micro-structured skin surface with capillary channels that collect and transport water to the animal's mouth. Philipp Comanns at RWTH Aachen University, Germany, and his colleagues found that this capillary system fills up completely when the animal stands in a puddle, allowing the lizard to drink the water. Conversely, when the lizard stands on moist sand, the capillary network fills to only about 59% of its capacity, and the animal is not able to drink this water. But tests of wet sand on skin replicas showed that moisture can be extracted from sand and pulled into the capillaries by gravity to fill them.

M. horridus has been observed in the wild shovelling wet sand onto its back, and the authors say this increases the contact area between skin and sand, boosting the volume of water it can collect and drink.

J. Exp. Biol. *219,* **3473–3479**

EVOLUTION

Cat DNA shaped by diet

Carnivores have experienced stronger natural selection than plant-eating animals, perhaps because of their limited diet.

Joo-Hong Yeo at the National Institute of Biological Resources in the Republic of Korea and his colleagues compared the genomes of 18 mammals, including carnivores such as leopards, omnivores such as humans, and herbivores such as giant pandas. They found that carnivore genomes have lost many genes for carbohydrate digestion, and share changes to genes involved in muscle strength and agility, making them good hunters. By contrast, omnivore and herbivore genomes shared

YVA MOMATIUK & JOHN EASTCOTT/ MINDEN PICTURES/FLPA

fewer adaptations with others in their groups, suggesting that their diets have imposed weaker selection compared with that of carnivores.

Many big cats showed recent losses in genetic diversity, suggesting that population declines may be linked to their strict diet.

Genome Biol. 17, **211 (2016)**

ASTROPARTICLE PHYSICS

Cosmic rays make more muons

Particle showers caused by natural ultra-high-energy collisions in Earth's atmosphere produce more muons — heavier cousins of the electron — than current physics models can explain.

Using the Pierre Auger Observatory in Argentina, Glennys Farrar of New York University and her colleagues studied showers of particles produced when 411 ultra-high-energy cosmic rays — atomic nuclei thought to originate outside the Galaxy — collided with air molecules. They also studied the fluorescent light the cascades created. The team found that the collisions, which are 10 times more energetic than those generated at the Large Hadron Collider (LHC) near Geneva in Switzerland, produced 30–60% more muons than simulations based on LHC results predict.

The results suggest that either the underlying models contain flaws, or that physics is fundamentally different at these higher energies.

Phys. Rev. Lett. 117, **192001 (2016)**

PLANT BIOLOGY

Plants transmit light down stems

Plant stems can act like fibre-optic cables, piping light from above ground down to the roots.

Plants' roots produce proteins that respond to light, but it was not clear how light reached below the ground. Chung-Mo Park of Seoul National University, Ian Baldwin of the Max Planck Institute for Chemical Ecology in Jena, Germany, and their team investigated this in thale cress (*Arabidopsis thaliana*). They found that illuminating the plant shoot altered gene expression in the roots, even when they prevented light from shining through the soil. Light in the red to near-infrared range was efficiently conducted through stem and root tissues.

Plants bearing a mutation in a light-responsive protein called HY5 showed abnormal root growth in response to shoot illumination, suggesting that light-sensing in plants is necessary for normal root development.

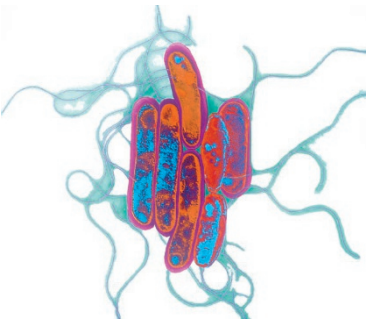
Sci. Signal. 9, **ra106 (2016)**

MICROBIAL EVOLUTION

Legionnaires' strains adapt well

Bacteria responsible for many cases of Legionnaires' disease emerged only in recent decades and seem to be adapting to human environments.

Legionella pneumophila (**pictured**) is found in aquatic environments worldwide and can contaminate water supplies, causing outbreaks of



LINDA STANNARD, UCT/SPL

pneumonia that can be fatal. A team led by Julian Parkhill at the Wellcome Trust Sanger Institute in Hinxton, UK, and Carmen Buchrieser at the Pasteur Institute in Paris sequenced the genomes of 337 *L. pneumophila* isolates belonging to 5 types that cause almost half of all cases of Legionnaires' disease in northwest Europe. Sequence

HEUNGJIN RYU

analysis suggested that the 5 types emerged independently during the past few decades and spread around the world.

The recent emergence and spread of these lineages suggests that people infected with the bacterium are helping to disseminate it and that it is adapting to man-made water systems, the authors say.

Genome Res. 26, **1555–1564 (2016)**

ZOOLOGY

Old apes can't see up close

The discovery that bonobos lose their close vision with age, as humans do, offers clues to the cause of this visual decline.

Heungjin Ryu of Kyoto University in Japan and his colleagues took photos of 14 wild bonobos ranging between 11 and 45 years of age as they groomed family and friends (**pictured**) — a behaviour that requires careful inspection. The team found that the distance from eyes to fingers was significantly longer in older animals than in younger ones. Moreover, a comparison with older images of grooming for one of the individuals, called Ki, showed that the distance had increased from about 12 centimetres in 2009 to roughly 17 centimetres in 2015. Bonobos tended to exhibit this 'long-sighted' condition, known as presbyopia, from about age 40.

The results suggest that presbyopia is caused not by human activities such as reading and computer work, but by natural ageing of the primate eye.

Curr. Biol. 26, **R1–R3 (2016)**

FLUID DYNAMICS

Fluid spills from strange straws

A straw's shape has a counter-intuitive effect on the ability of fluids to flow inside it, according to a theoretical study.

If a cylindrical container with open ends is turned on its side, a liquid contained in it tends to stay inside because of surface tension, provided the container is narrow enough. However, Carlos Rascón of Carlos III University in Madrid and his collaborators have shown that fluid in containers with certain other shapes — those that are elliptical or triangular in cross-section, for example — will flow out no matter how narrow the tubes are. The team calculated that surface-adhesion forces will work together with gravity to make fluids spread along the entire length of the vessel, and ultimately escape.

The researchers say the finding has potential applications in microfluidic devices, and plan to test their predictions experimentally.

Proc. Natl Acad. Sci. USA **http://doi.org/bspc (2016)**

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