

## GENETICS

### Disease mutations but no disease

An analysis of genetic data from more than half a million people has uncovered 13 individuals who have disease-causing mutations but are healthy.

Mendelian diseases such as cystic fibrosis begin in childhood, can be caused by a single mutation and lack effective treatments. Rong Chen at the Icahn School of Medicine at Mount Sinai in New York City and his colleagues looked for mutations in 874 genes — linked to nearly 600 childhood genetic diseases — in roughly 589,000 people. They found 13 resilient people with mutations that usually cause 1 of 8 severe Mendelian diseases.

Further study of such individuals could lead to discoveries of gene variants that protect against disease, and could even lead to new treatment strategies, the authors say.

*Nature Biotechnol.* <http://dx.doi.org/10.1038/nbt.3514> (2016)

## ECOLOGY

### Catfish face migration barriers

Amazonian catfish make the longest known freshwater migrations, covering thousands of kilometres, but their epic voyages are threatened by new dams.

*Brachyplatystoma* catfish can measure up to three metres in length, and are top predators. To study their migrations, Fabrice Duponchelle of the Institute of Research for Development in Montpellier, France, and his colleagues analysed the strontium isotope ratio in ear bones



## GEOLOGY

### Fluid flow in landslides

Vibrations that ripple through rocks as they tumble downhill explain why some landslides travel farther than expected. The finding could help towns to better prepare for landslide hazards.

In 'long runout' landslides, falling rocks can move tens to hundreds of kilometres on flat land — more than ten times the height from which they fell. A team led by Brandon Johnson of Brown University in Providence, Rhode Island, modelled the forces in such landslides. The scientists found that vibrations caused by slides of sufficient size reduce the pressure between rock fragments, effectively lowering friction and allowing the rocks to flow like a fluid over long distances.

A similar effect could also occur along geological faults during earthquakes.

*J. Geophys. Res. Earth Surf.* <http://doi.org/bd4x> (2016)

from 37 *Brachyplatystoma rousseauxii* captured near breeding areas in the Amazon basin. The authors found correlations between the strontium make-up of the bones and that of rocks in different parts of the river system. They suggest that young fish migrate downstream in the lower Amazon, then return upstream as

adults, swimming some 8,000 kilometres to the area where they were hatched.

Two dams built recently on the Madeira River could prevent the fish from reaching their spawning grounds, which could have ripple effects through Amazonian food webs, the authors warn.

*J. Appl. Ecol.* <http://doi.org/bd45> (2016)

## ASTRONOMY

### Black-hole disk launches jet

Scientists have caught one of the best glimpses yet of a jet of plasma streaming from the black hole at the heart of a distant galaxy.

Intense magnetic fields around black holes are thought to launch these beams, which travel nearly at the speed of light, but the beams' exact origins remain unknown.

Bia Boccardi of the Max Planck Institute for Radio Astronomy in Bonn, Germany, and her colleagues used a global array of radio telescopes to image the base of the jet at the core of the galaxy Cygnus A at high resolution. They found that the base is hundreds of times wider than the event horizon of the black hole, extending into the swirling disk of material that surrounds it.

This suggests that the rotation of the disk helps to launch the jet.

*Astron. Astrophys.* 588, L9 (2016)

## ANTHROPOLOGY

### War uncommon in prehistoric Japan

Hunter-gatherers living in Japan thousands of years ago were not particularly violent, adding weight to a contentious idea that violence and warfare were not the norm in early history.

Hisashi Nakao at Yamaguchi University in Japan and his colleagues analysed published data on the skeletal remains of hunter-gatherers from Japan's Jomon period, between 13,000 BC and 800 BC. The team calculated the percentage of skeletons showing evidence of fatal injuries from violence, and found that mortality from violence was low, averaging

1.8% over the entire Jomon period. Violent injuries were evenly distributed across the country, and the researchers found no hotspots of violence that might indicate warfare.

The findings are inconsistent with the idea that warfare is inherent in human nature, the authors say. *Biol. Lett.* 12, 20160028 (2016)

## MICROBIOLOGY

## Salmonella live on thanks to toxin

A toxin protein secreted by typhoid-causing bacteria seems to keep infected hosts alive, allowing the bacteria to persist in the body.

*Salmonella enterica* Typhi (*S. Typhi*), which causes typhoid fever in humans but not in mice, produces a DNA-damaging protein. To study this toxin's role in mouse infections, Teresa Frisan at the Karolinska Institute in Stockholm and her team engineered another strain of *S. enterica*, called *S. Typhimurium* (which causes illness in mice but does not normally make the typhoid toxin) to make the part of the toxin that damages host DNA.

Mice infected with the toxin-producing strain were less likely to become severely ill and had less gut inflammation than did mice infected with a control strain. Toxin-producing bacteria could still be found in the livers of mice six months after infection, in contrast to the control strain, which was undetectable in mice that survived the initial infection.

*PLoS Pathog.* 12, e1005528 (2016)

## ASTROCHEMISTRY

## Sugars made in simulated space

A key sugar found in DNA has been created in the laboratory under conditions similar to those around comets.

Ribose forms the backbone

of DNA and RNA, but its ancient origin remains a mystery. Cornelia Meinert and Uwe Meierhenrich of the University of Nice Sophia Antipolis in France and their team created an artificial comet by condensing water, methanol and ammonia in a vacuum chamber at  $-195^{\circ}\text{C}$ . The material was irradiated with ultraviolet light to simulate the formation of cometary ices. The residues that formed when the material was warmed to room temperature contained ribose and other, similar sugars in amounts that were much greater than just trace levels.

The authors suggest that comets and meteorites are the source of organic molecules that made life possible on Earth.

*Science* 352, 208–212 (2016)

## HEART DISEASE

## Molecule melts away cholesterol

The next weapon against heart disease could be a compound that is currently used to make drugs more soluble.

In atherosclerosis, plaques containing crystallized cholesterol clog up blood vessels. Eicke Latz of the University Hospital in Bonn, Germany, and his colleagues tested a compound called 2-hydroxypropyl- $\beta$ -cyclodextrin, which increases the solubility of cholesterol, to see whether it reduced the plaques. They found that plaques shrank in atherosclerotic mice that had consumed cyclodextrin (blood vessel **pictured** left, cholesterol

crystals in white), compared with plaques in the blood vessels of untreated animals (**pictured** right).

The drug bound to and dissolved the cholesterol crystals. It also increased cholesterol metabolism in immune cells called macrophages, which usually contribute to atherosclerosis by triggering inflammation in response to excess cholesterol. Cyclodextrin reprogrammed the cells in plaques, leading to increased transport of the dissolved cholesterol away from the plaques, and reducing harmful inflammation. Some of the same effects were seen in human plaque samples treated with the compound.

*Sci. Transl. Med.* 8, 333ra50 (2016)

## BIOCHEMISTRY

## Bioplastic made from glucose

Researchers have combined three biochemical pathways to produce a biodegradable plastic from glucose in the laboratory.

Some industrial chemicals are made by microorganisms in bioreactors, but reengineering the organisms' metabolic pathways to boost yields is challenging, so researchers are keen to find cell-free production methods. Polyhydroxybutyrate bioplastic (PHB) can be made without cells, but the process requires expensive starting materials. To lower costs, James Bowie and his colleagues at the University of California, Los Angeles, devised a cell-free way to make PHB out of glucose.

They designed a synthetic biochemical cycle comprising parts of three enzyme-driven pathways. Using two different concentrations of glucose, the team generated PHB at 86% and 94% yields. The yields and production rates were close to those required by industry.

With further improvements, this synthetic biochemistry approach could be used to produce chemicals at low cost, the authors say.

*Nature Chem. Biol.* <http://dx.doi.org/10.1038/nchembio.2062> (2016)

## NEUROIMMUNOLOGY

## Protein linked to immune privilege

A protein found in neurons helps to limit inflammation in the central nervous system (CNS), contributing to the system's specialized immune environment.

The CNS can stave off excessive inflammation. This 'immune privilege' has been attributed to the blood-brain barrier that restricts the entry of certain immune cells, but recent work has suggested a role for other cells and molecules. Lieping Chen at Yale University in New Haven, Connecticut, and his colleagues found that SALM5, a protein involved in neuronal growth and development, inhibits inflammation in the mouse CNS. In animals with an autoimmune CNS disease, blocking a receptor for SALM5 or treating with an antibody against SALM5 aggravated symptoms. Applying SALM5 to certain immune cells in a lab dish suppressed their response to a pro-inflammatory molecule.

The findings could lead to treatments for inflammatory neurological diseases, the authors suggest.

*Sci. Adv.* 2, e1500637 (2016)

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