

## EVOLUTION

### Penis bone lost through evolution

Our monogamous lifestyle may explain why humans, unlike many other mammals, lack a penis bone.

The bone, called a baculum, rests at the end of the penis and is thought to provide structural support and prolong copulation. Matilda Brindle and Christopher Opie at University College London analysed the size of bacula in nearly 2,000 species of mammal, including primates and carnivores. They found that species that copulate for longer tend to have longer bacula. The same is true of animals that have more than one mate or have seasonal-breeding patterns, which lead to intense competition between sperm from different males after mating.

The results show that the baculum first evolved 145–95 million years ago, in the common ancestor of primates and carnivores. It disappeared from the human lineage after our split with chimpanzees, and this may have coincided with the switch towards a more monogamous lifestyle, the authors say.

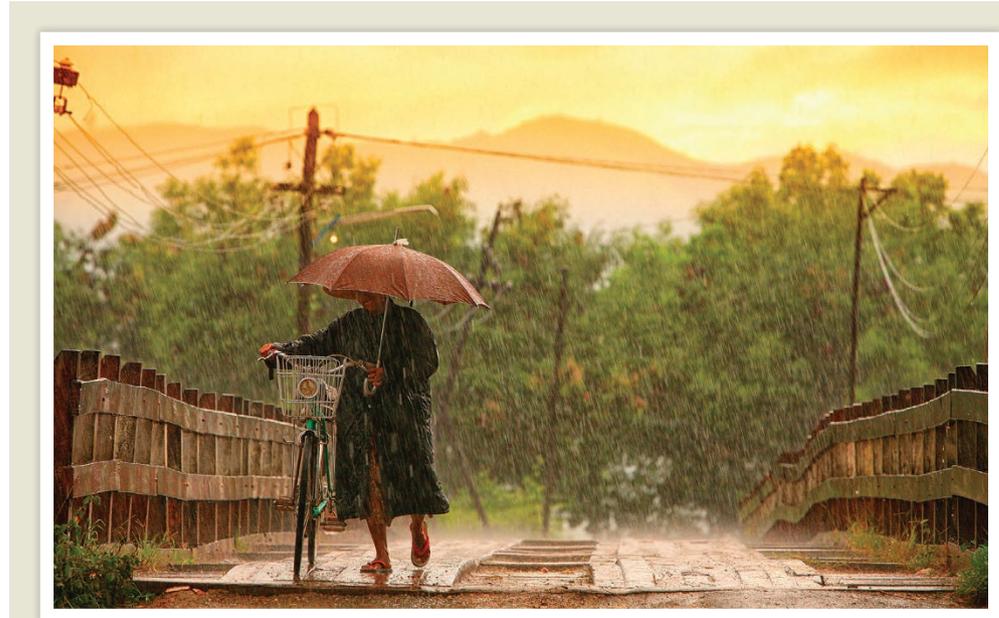
*Proc. R. Soc. B* 283, 20161736 (2016)

## APPLIED PHYSICS

### Device breaks cooling record

A cooling technology, if scaled up, could decrease temperatures by as much as 37°C — potentially boosting the capabilities of refrigeration equipment.

Shanhui Fan at Stanford University in California and his team built a device that includes a thermal emitter that gives off heat in the



DAVID SANTIAGO GARCIA/ALAMY

## CLIMATE SCIENCE

### Smaller monsoon boost predicted

Climate change may produce smaller-than-expected increases in rainfall in the world's monsoon regions over the coming decades, thanks to changes in land use.

More than 70% of the global population live in monsoon areas. Benjamin Quesada of the Karlsruhe Institute of Technology in Germany and his colleagues ran global climate models with and without projected deforestation and other land-use changes to compare how

monsoon patterns might shift by the end of the century.

The models suggest that monsoon rain will generally become more intense in a warming world. But the projected increase was 30% smaller, on average, when the team accounted for changes in land use and land cover. Shifts in monsoon rainfall might affect regional water resources and agricultural yields, the authors say. *Geophys. Res. Lett.* <http://doi.org/bv38> (2016)

mid-infrared range. Such wavelengths correspond to the 'transparency window' of Earth's atmosphere, allowing the heat radiation emitted by the apparatus to be released into space. Previous systems have reduced their temperatures by up to only 20°C in low-altitude areas with moderate humidity levels. But the team broke this record with the addition of several features, including a vacuum chamber around the emitter. This ensured that heat was emitted only into space, and not into the surrounding air, increasing the amount

of heat removed.

With further development, the technology could be used for applications including energy-efficient air conditioning.

*Nature Commun.* 7, 13729 (2016)

## AGEING

### Genes that make mice youthful

Four genes that reprogram adult cells into embryonic-like stem cells can also reverse some signs of ageing.

The four genes encode Yamanaka factors, which

are essential for embryonic development, but usually cause tumours when expressed long-term in animals. Juan Carlos Izpisua Belmonte at the Salk Institute in La Jolla, California, and his colleagues switched the genes on for two days per week over several weeks in mice that had an ageing disorder called progeria. The animals lived about 30% longer, and showed improvements in tissue healing and other signs of ageing, such as organ failure. In normal aged mice, switching on the genes led to improved recovery from

muscle injury and to other signs of youthfulness. The mice did not develop cancer.

The authors link the rejuvenation to epigenetic remodelling — changes in the chemical marks on DNA that do not alter its sequence but influence gene expression.

*Cell* 167, 1719–1733 (2016)

## HIV

## Targeting host genes for therapy

By inactivating any one of five human genes, scientists can prevent HIV from entering and growing in immune cells.

Antiviral therapies targeting host genes that the virus depends on, rather than targeting the virus itself, are promising because these genes do not mutate as frequently as viruses do. This could avoid the development of drug resistance. Bruce Walker at the Ragon Institute of MGH, MIT and Harvard in Cambridge, Massachusetts, and his colleagues screened the genome of human T cells and identified five genes not essential to cell survival whose inactivation protected cells from HIV infection. Cultured cells lacking these genes resisted HIV infection. The genes encode proteins that facilitate virus entry into human cells, and one that mediates cell aggregation, which allows the virus to spread between cells.

The authors say their approach could also be used to find drug targets for other pandemic viruses.

*Nature Genet.* <http://dx.doi.org/10.1038/ng.3741> (2016)

## OCEAN SCIENCE

## East Antarctic ice melts from below

Ocean heat is melting a floating ice shelf in East Antarctica, raising concerns of accelerated glacier discharge and sea-level rise.

East Antarctica's large ice sheet was thought to be more stable than that of

West Antarctica. But Stephen Rintoul at the University of Tasmania in Hobart and his colleagues found that increasing ocean heat is weakening the Totten Ice Shelf in East Antarctica. The shelf supports glaciers whose volume is equivalent to 3.5 metres of global sea-level rise.

The team analysed oceanographic data collected in 2015 and found deep channels at the front of the ice shelf through which large volumes of temperate deep-ocean water flow into the ice shelf's cavity. *Sci. Adv.* 2, e1601610 (2016)

## ARCHAEOLOGY

## Early humans cooked vegetables

Humans cooked and ate a variety of plants — mostly grasses and aquatic plants — as early as 8,200 years ago.

Scientists have often found signs of prehistoric meat and milk processing, but direct evidence of early plant cooking has been rare. Richard Evershed at the University of Bristol, UK, and his colleagues analysed residues from 110 ancient pottery fragments discovered in the Libyan Sahara. The pieces were found in a cave and a rock shelter, both of which also housed well-preserved plants several thousand years old (legumes of *Cassia* pictured). Besides animal fats, the team found plant lipids in most of the pots.

Some pots seem to have been used exclusively for fruits and seeds, but the team also uncovered evidence of leaves and stems being cooked.

*Nature Plants* <http://go.nature.com/2gns862> (2016)



## CANCER GENETICS

## Why melanoma is worse in men

Differences in the expression of a particular gene could explain why men with skin cancer tend to have a lower survival rate than women.

The gene, *PPP2R3B*, is expressed from both X chromosomes in women and from the X and Y chromosomes in men. Alan Spatz at McGill University in Montreal, Canada, and his colleagues studied tissue samples from people with melanoma, and found that greater expression of *PPP2R3B* correlated with longer survival times. In cultured cells, high levels of *PPP2R3B* expression slowed melanoma growth by interfering with DNA replication and slowing cell division.

Expression of the gene was higher in women than men, which could explain why women with melanoma have better clinical outcomes, the authors say.

*Sci. Transl. Med.* 8, 369ra177 (2016)

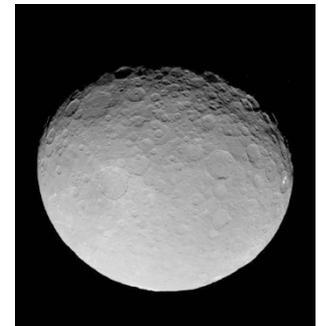
## PLANETARY SCIENCE

## Where Ceres hides its water

Frozen water has been lurking beneath the rocky surface of the Solar System's biggest asteroid since its birth billions of years ago.

NASA's Dawn spacecraft began orbiting Ceres (pictured), which is also a dwarf planet, in 2015. This allowed a team led by Thomas Prettyman at the Planetary Science Institute in Tucson, Arizona, to measure hydrogen at the asteroid's surface. Water inside Ceres chemically alters the surface, leaving a hydrogen imprint there. The highest hydrogen concentrations appeared at mid to high latitudes.

A second study looked at ice trapped in permanently shadowed regions of Ceres' surface. Of the 634 craters



studied, only 10 contained icy material, say Thomas Platz of the Max Planck Institute for Solar System Research in Göttingen, Germany, and his colleagues. Ceres, like Mercury and the Moon, can apparently trap frozen water in dark areas for long periods of time, they add.

*Science* <http://doi.org/bv3z>; *Nature Astron.* 1, 0007 (2016)

## GENOME EDITING

## Enzyme switches turn CRISPR off

Inhibitors of a gene-editing system called CRISPR–Cas9 could one day provide a safety switch, allowing researchers to halt the system's activity in cells.

CRISPR–Cas9 is a naturally occurring bacterial defence mechanism that scientists have harnessed to alter DNA sequences. Alan Davidson at the University of Toronto in Canada and his colleagues searched for bacterial proteins that block the DNA-slicing Cas9 enzyme from the bacterium *Neisseria meningitidis*, and found three families of such proteins.

The inhibitors halted CRISPR–Cas9 editing in human cells, suggesting that they could be used to better control genome editing. They could be important if CRISPR–Cas9 is to be used for gene therapy in people, or to edit the genomes of entire populations in the wild.

*Cell* 167, 1829–1838 (2016)

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