

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## MATERIALS

### Energy stored inside an aerogel

Researchers have created a promising 3D energy-storage device using a porous aerogel. These 'supercapacitors' could offer much higher power densities than conventional structures.

Mahiar Hamedi at the KTH Royal Institute of Technology in Stockholm and his colleagues coated the foamy interior of an aerogel with carbon nanotubes to create an electrode. They covered this with an insulating plastic, followed by another nanotube electrode layer. This formed a supercapacitor that showed stable charging and discharging over 400 cycles, and maintained its performance when the aerogel was compressed by up to 75%.

Aerogels have the largest internal surface area of any synthetic material, so such components could store large amounts of power in a range of electronic devices.

*Nature Commun.* 6, 7259 (2015)

## CELL BIOLOGY

### Why human eggs are error-prone

The cellular machinery for separating chromosomes is unusually unstable in human eggs. This makes the eggs prone to having abnormal numbers of chromosomes, which can result in pregnancy loss and genetic disorders.

When cells divide to make eggs or sperm, chromosome pairs separate owing to spindle-shaped cellular machinery. Melina Schuh at the MRC Laboratory of Molecular Biology in Cambridge, UK, and her colleagues observed this process in more than



SANJIT DAS/PANOS

## AGRICULTURE

### The cost of native and GM cotton crops

Native cotton in India can generate similar profits to genetically modified (GM) cotton when both are grown without irrigation.

Carla Romeu-Dalmau, Liam Dolan and their colleagues at the University of Oxford, UK, compared the economic impact of growing native Asiatic cotton (*Gossypium arboreum* L.) with that of growing American Bt cotton (Bt *Gossypium hirsutum*), which has been engineered to contain bacterial genes that make the crop resistant to insect pests. They found that farmers in the Indian state of Maharashtra spent more money to produce Bt cotton than native cotton, even though

Bt cotton generates higher yields.

The authors also looked at farming Bt cotton under different conditions, and found that the GM cotton grown under rain-fed conditions has similar economic benefits to the same cotton grown using irrigation. Although Bt cotton gives higher yields with irrigation than without, growing it under these conditions costs more and eats into profits.

Farmers should bear in mind a range of factors, including expenses and water availability, when choosing which crop to plant, the authors suggest.

*Nature Plants* 1, 15072 (2015)

100 live egg cells from women undergoing fertility treatments. They found that the chromosome segregation period was unusually long, lasting about 16 hours. In many egg cells, the spindles were unstable, causing the chromosomes to lag behind during separation, and increasing the risk that they would not reach the correct side of the spindle before the cells divided.

*Science* 348, 1143–1147 (2015)

## CLIMATE CHANGE

### Hot storms bring big rainfall swings

As temperatures rise, heavy rainfall during storms becomes even heavier, whereas lighter bursts grow less intense. This could bring storms that are more unpredictable and destructive as the climate warms.

Conrad Wasko and Ashish Sharma at the University of

New South Wales in Sydney, Australia, analysed high-resolution rainfall data from 79 locations across Australia from 1955 to 2005. They found that, at all latitudes, Australian rainfall patterns became less uniform as temperatures rose, and the authors predicted a 5–20% increase in the peak water flow rate during floods at temperatures 5 °C warmer than today.

A warmer climate could lead to short-term floods that

are more intense, the authors suggest.

*Nature Geosci.* <http://dx.doi.org/10.1038/ngeo2456> (2015)

## ANIMAL BEHAVIOUR

## Lazy male birds pay a high price

Male songbirds that sleep late risk having their female partners mate with another male.

Mating outside of a monogamous pair in birds normally happens early in the morning. To find out if rising earlier or later would affect reproductive patterns of great tits (*Parus major*), Timothy Greives of North Dakota State University in Fargo and his co-workers captured male birds in Germany and implanted them with a device that releases melatonin.

This hormone is generated mostly at night to set the circadian clock. Male tits that had night-time-like levels of melatonin around the clock began their daily activities on average 10 minutes later than the control group. Their nests also contained more offspring fathered by another male, suggesting that the late-rising males were less able to defend their mates.

The results demonstrate how sexual selection affects circadian rhythms in the wild. *Funct. Ecol.* <http://doi.org/44c> (2015)

## EVOLUTIONARY BIOLOGY

## Galapagos iguanas share genes

Swimming lizards on one of the Galapagos Islands are evolving into new species, but they also seem to be mating with lizards from neighbouring islands — possibly helping to incorporate adaptations from other populations into their gene pool.

Sebastian Steinfartz at the Technical University of Braunschweig in Germany and his colleagues

analysed the genomes of more than 500 Galapagos marine iguanas (*Amblyrhynchus cristatus*; pictured) from the island of San Cristóbal in the Galapagos. They found evidence of ongoing hybridization between lineages from different islands, along with speciation in the San Cristóbal population.

This simultaneous hybridization and speciation could have contributed to the evolutionary success of the marine iguana, the authors say. *Proc. R. Soc. B* 282, 20150425 (2015)

## MATERIALS

## Tiny robot fuelled by light

A microscopic 'walker' just a few tens of micrometres in size can shuffle, rotate and even jump, powered only by light.

Hao Zeng and Diederik Wiersma at the University of Florence in Italy and their co-workers created their device using materials called liquid crystalline elastomers, which contract and expand like muscles. They added a light-sensitive dye, attached four cone-shaped legs made from acrylic resin and focused a laser beam on the robot. The device walked in a straight line on a patterned surface and even jumped up to 100 times its own body length.

Such a robot could be powered by ambient light alone, and could be modified to perform other actions such as swimming, the authors say. *Adv. Mater.* <http://doi.org/12747b> (2015)

## ASTRONOMY

## Megaflare seen on star surface

Astronomers have spotted an enormous surge of light and magnetic energy on a nearby star.

A team led by Wouter Vlemmings at Chalmers University of Technology

## SOCIAL SELECTION

Popular topics on social media

### Unpaid research jobs draw criticism

Volunteer jobs are a rite of passage for many budding ecologists and wildlife biologists, but a website highlighting these unpaid positions calls them “unprofessional” and “exploitative”. Alex Bond, a conservation biologist at the RSPB Centre for Conservation Science in Sandy, UK, created the Tumblr page ‘Crap Wildlife “Jobs”’ on 31 May (<http://crapwildlifevolunteerjobs.tumblr.com>), and it already has supporters on Twitter. “Really cool (and necessary) initiative,” tweeted Julie Godbout, an environmental geneticist at Laval University in Quebec City, Canada. “Do what you love AND get paid for it.” But Stephanie Stack, an environmental scientist with the Pacific Whale Foundation in Wailuku, Hawaii, which is featured on the page, says that unpaid internships give young scientists a chance to gain valuable experience and to make connections in the field.

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near Gothenburg, Sweden, pointed the ALMA radio telescope in northern Chile at the red giant Mira A, a star 92 parsecs (300 light years) away that was once like our Sun but is now bloated in old age. ALMA’s high resolving power was able to pick out features on the stellar surface — a feat unprecedented at these wavelengths. The data revealed a bright hotspot on Mira’s surface that is roughly the same size as Mercury’s orbit around the Sun.

The star is probably unleashing energy from its magnetic field, similar to what happens on the Sun, suggesting that magnetic fields have a role even when these stars grow old. *Astron. Astrophys.* 577, L4 (2015)

## COGNITION

## Chimps’ mental capacity to cook

Chimpanzees have key cognitive abilities for cooking food — a hint that humans might have developed the capacity for cooking early in evolution.

Felix Warneken at Harvard University in Cambridge, Massachusetts, and Alexandra Rosati at Yale University in New Haven, Connecticut,



studied the cognition of chimps (pictured) by presenting them with a specially designed cooking device and raw and cooked foods such as carrots and potatoes. They confirmed that the apes prefer cooked to raw items, and found that chimps are willing to wait longer for cooked food than for raw food. The animals were able to give up their own raw food to cook it, and to save it for later cooking.

The results suggest that the last common ancestor of apes and humans had the cognitive abilities to cook food, long before humans learned to control fire.

*Proc. R. Soc. B* 282, 20150229 (2015)

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