# RESEARCH HIGHLIGHTS

*Selections from the scientific literature*

ASTRONOMY

## Magnetism drives star birth

Magnetic fields regulate how stars are born from massive clouds of interstellar gas.

A team led by Francesco Fontani at the Arcetri Astrophysical Observatory in Florence, Italy, used high-resolution data from the Atacama Large Millimeter/submillimeter Array telescope in northern Chile to create detailed maps of a particular gas cloud. They found that the gas collapsed under the force of gravity and fragmented, forming a string of clumps that aligned themselves with the magnetic field. The clumps will eventually form the cores of future stars.

The study's findings confirm theoretical predictions that magnetic fields play a major part in where proto-stars form.
***Astron. Astrophys.*** 593, **L14 (2016)**

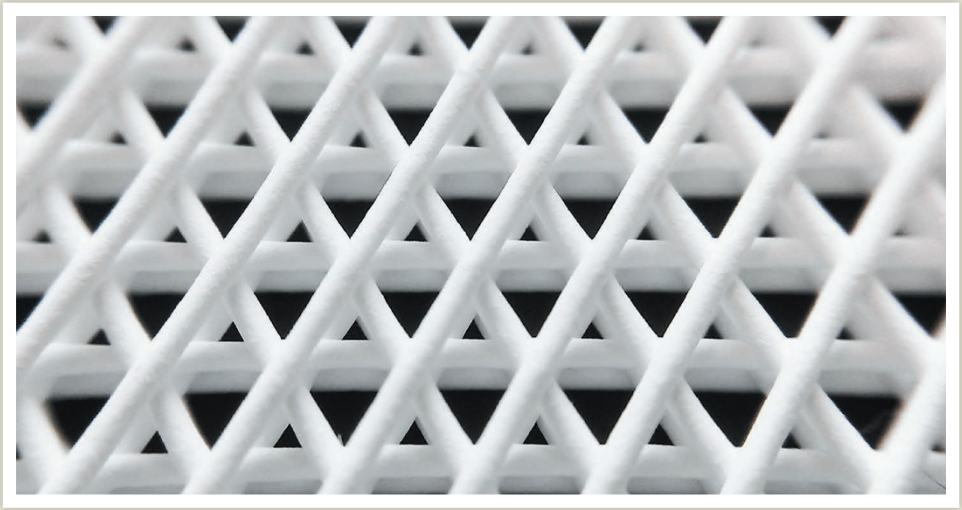
NEUROSCIENCE

## Hunger overrides other motivations

Hungry mice will seek out food in fearful situations that they would normally avoid, and researchers have pinpointed the neurons in the brain that seem to control this behaviour.

Michael Krashes at the US National Institutes of Health in Bethesda, Maryland, and his colleagues stimulated appetite-regulating neurons in the hypothalami of mice that had recently been fed, and observed their behaviour in various settings. They found that the animals were more willing than non-stimulated ones to enter open, unprotected spaces or areas infused with fox odour in order to obtain food. Hungry or brain-stimulated males also opted to pursue food rather than spend time with a female mouse.

Future studies could reveal how these neurons suppress competing drives such as fear and sociality.
***Neuron*** **http://doi.org/brbf (2016)**



ADAM E. JAKUS

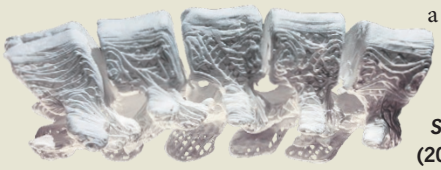
BIOMATERIALS

## 'Bones' made with 3D printer

Synthetic bones promote natural bone regeneration after being implanted into animals.

Ramille Shah at Northwestern University in Evanston, Illinois, and her colleagues used a 3D printer to generate 'hyperelastic bone'. The main component of the material was hydroxyapatite — a calcium mineral similar to one found in bone — which was mixed with one of two polymers used in medicine and tissue engineering. Grafts built with the material (main picture) and implanted into mice, rats and one macaque became integrated into tissue and stimulated bone growth without adverse effects. Moreover, a 3D-printed 'bone' shaped like a section of human femur was able to withstand loads similar to those experienced naturally.

The material can be rapidly printed into a variety of shapes (human spinal section, inset) and is easy to use in surgery, the authors say.
***Sci. Transl. Med.*** 8, **358ra127 (2016)**



ADAM E. JAKUS

MATERIALS

## Graphene oxide is stiff yet bendy

An oxidized form of graphene — single-atom-thick layers of carbon — is extremely flexible, despite also being very resistant to stretching.

Cécile Zakri at the University of Bordeaux in France and her colleagues measured how much layers of graphene oxide resist bending by using X-rays to study how easily natural ripples in the sheet can be flattened. They found that graphene oxide is about 100 times easier to bend than graphene, even though both materials have a resistance to stretching along the plane of the sheet that is comparable to that of steel.

Graphene oxide's unique combination of stiffness and superflexibility makes it a suitable material for applications such as flexible but strong electronics, say the authors.
***Proc. Natl Acad. Sci. USA*** **http://doi.org/bq7k (2016)**

CANCER IMMUNOTHERAPY

## Dual action of targeted T cells

Immune cells engineered to attack tumours can also be used to deliver cancer-fighting proteins.

T cells that have been engineered to recognize

tumours have shown promise as treatments for certain blood cancers. Hans-Guido Wendel at the Memorial Sloan-Kettering Cancer Center in New York, Karin Tarte of the French National Institute of Health and Medical Research in Rennes and their colleagues took that engineering a step further. The team found that loss of *HVEM* — a gene that is often mutated in some types of lymphoma — fosters lymphoma development in mice.

Injecting a key domain of the normal HVEM protein directly into mouse lymphoma tumours blocked their growth. The authors then engineered T cells to produce the protein and deliver it to the cancer cells, treatment that prevented tumour growth in a mouse model of lymphoma.

***Cell*** **http://doi.org/brbd (2016)**

ASTRONOMY

## How black hole obscures itself

A supermassive black hole at the core of a distant galaxy is hiding in a cloak of its own making.

Supermassive black holes are shrouded by doughnut-shaped rings of gas and dust, but scientists are not sure where these come from. A team led by Jack Gallimore of Bucknell University in Lewisburg, Pennsylvania, used the Atacama Large Millimeter/submillimeter Array in Chile to observe galaxy NGC 1068, 14.4 million parsecs (47 million light years) away. They saw hot, ionized clouds of carbon monoxide gas flying away from the galaxy's black hole in opposite directions.

This suggests that the gas originates from the disk of material swirling around the black hole and is flung off by its spinning magnetic field. The findings could alter theories of how black holes interact with their host galaxies.

***Astrophys. J.*** 829, **L7 (2016)**

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CARDIOVASCULAR BIOLOGY

## 'Good' fat may cut heart disease

Too much dietary fat is associated with heart disease, but one type of fat could help to combat atherosclerosis.

Ebru Erbay at Bilkent University in Ankara and her colleagues studied a mouse model of atherosclerosis, in which the animals develop fatty plaques in their arteries. The scientists found that mice fed a fatty acid called palmitoleate had smaller plaques than those that did not consume it. The fat seems to reduce the number of inflammatory immune cells called macrophages in the plaques. Palmitoleate also blocks a type of inflammation that is triggered by saturated fat in both mouse and human macrophages.

The effects of palmitoleate supplementation should be tested in humans as a possible preventive measure for heart disease, the authors suggest.

***Science Transl. Med.*** 8, **358ra126 (2016)**

MICROBIOLOGY

## Toad probiotic fights fungus

Treatment with a skin microbe protects captive toads against a lethal fungal infection.

Valerie McKenzie at the University of Colorado Boulder and her colleagues compared the skin microbiomes of endangered boreal toads (*Anaxyrus boreas*; **pictured**) reared in captivity with hose of wild ones. They found that the diversity of bacterial strains that inhibit the fungal pathogen Bd (*Batrachochytrium dendrobatidis*) was greatly reduced on the captive toads, and that these animals lost the protective microbes over time. As a result, after nearly eight months in captivity, all toads exposed to the fungus died. In a second experiment, inoculating exposed amphibians with a Bd-inhibiting microbe increased the animals' survival by 40%.

Long-term captivity reduces toads' exposure to beneficial environmental microbes that protect them against Bd and other pathogens, the authors say.

***Proc. R. Soc. B*** 283, **20161553 (2016)**

MATERIALS

## Shape-shifting gel blooms

A gel has been programmed to change shape on its own, without any external triggers.

Most shape-shifting materials require a shift in conditions — for example, temperature or humidity — to flip between two forms. But Andrey Dobrynin at the University of Akron in Ohio, Sergei Sheiko at the University of North Carolina at Chapel Hill and their team created a polymer hydrogel with two types of crosslink: permanent covalent bonds that allow the material to recover its initial shape after deformation, and hydrogen bonds that temporarily hold it in a different configuration. By varying factors including the speed at which the temporary deformation occurs and the length of time it is held in place, the researchers could control how rapidly the material regained its shape, without the need for a trigger. Using this approach, the team created an artificial flower with individually programmed petals that unfolded in sequence (**pictured**).

Such a material could have applications in devices such as medical implants, the authors say.

***Nature Commun.*** 7, **12919 (2016)**

CONSERVATION

## Restored forests ignore history

Forests in central Europe were once dominated by conifers, not the broadleaf trees that restoration efforts have focused on growing.

Péter Szabó at the Institute of Botany of the Czech Academy of Sciences in Brno and his colleagues examined fossil pollen from six sites in the central highland region of the Czech Republic, as well as data from a taxonomic survey conducted between 1787 and 1789. They conclude that spruce had been the dominant forest tree since 7,000 BC. This is at odds with the current restoration practice of growing beech and other broadleaf trees, which have long been assumed to be the native trees of the region.

Historical data should be taken into account when restoring forests, the authors suggest.

***Conserv. Biol.*** **http://doi.org/bq7c (2016)**

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