RESEARCH HIGHLIGHTS

Selections from the scientific literature

GENE EDITING

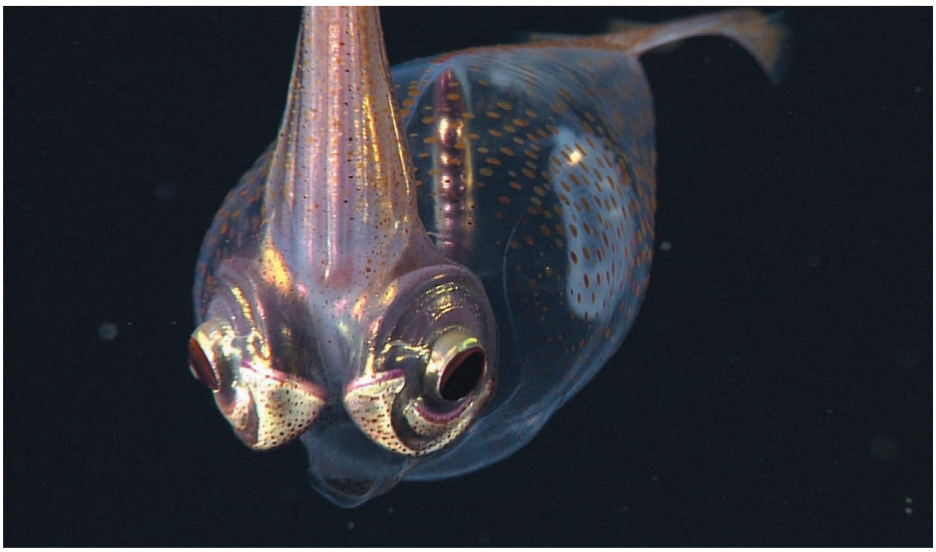
CRISPR blocks cancer growth

Knocking out genes in cancer genomes with the CRISPR–Cas9 technique decreases the ability of cancer cells to multiply.

William Hahn at the Dana Farber Cancer Institute in Boston, Aviad Tsherniak at the Broad Institute of Harvard and MIT in Cambridge — both in Massachusetts — and their colleagues silenced certain genes in 33 cancer-cell lines using CRISPR–Cas9, which can be programmed to snip DNA at specific locations. They found that in parts of the genome with multiple copies of a gene, the number of DNA breaks made by the CRISPR system was linked to a drop in cell proliferation, an outcome not seen with another gene-silencing tool called RNA interference. This effect could be the result of how CRISPR-made DNA cuts are repaired.

The results suggest that cancer cells are sensitive to site-specific DNA damage, and have implications for how experiments using CRISPR should be interpreted. Targeting genomic regions that have many repeated sequences could be a new therapeutic strategy, the authors suggest.

Cancer Discov. **http://doi.org/bjzn (2016)**



MBARI

BIOPHYSICS

How squid hide their eyes

A transparent squid may camouflage itself by activating specialized cells in its eyes.

Many marine creatures emit light to hide shadows that might be seen by predators below. To find out how animals control this bioluminescence, Amanda Holt and Alison Sweeney at the University of Pennsylvania in Philadelphia used transmission electron microscopy to study the eyes of the squid *Galiteuthis* (pictured). They found that the underside of the eye — one of the few parts of the creature that is not transparent — has fibre-like cells in a range of shapes that channel bioluminescence while leaking light at different rates.

The authors modelled how the light travels through the various cell shapes. They suggest that the squid could activate different populations of cells to vary the intensity and distribution of the light passing through them, allowing the animal to camouflage itself at any depth.

J. R. Soc. Interface 13, **20160230 (2016)**

ENERGY

Excess nitrogen spoils biofuels

Nitrogen fertilizer can boost the growth of crops for biofuel production, but applying too much can cut the climate benefits in half.

Ethanol fuel made from plant cellulose is a promising form of renewable energy. Philip Robertson at Michigan State University in Hickory Corners and his colleagues applied various amounts of nitrogen fertilizer to experimental plots of switchgrass (*Panicum virgatum*) for three years. They measured emissions of the greenhouse gas nitrous oxide (N_2O) and the leaching of nitrate, a water pollutant. The authors found that fertilizer boosted yields in the first year, but that the increase declined with subsequent applications. Levels of both emissions and leaching grew exponentially with increases in fertilizer.

The team suggests that minimizing fertilizer use will be crucial for maintaining the environmental benefits of cellulosic biofuel.

Environ. Res. Lett. 11, **064007 (2016)**

NANOSCIENCE

Tiny carbon rods blow off steam

Nanometre-sized rods of carbon can expel water in puffs of vapour when the air is already humid.

Materials such as carbon and silica gels typically pick up moisture as humidity increases. But Satish Nune and his colleagues at the Pacific Northwest National Laboratory in Richland, Washington, found that their carbon-based nanorods take up water at low humidity and then give off about half of it when the relative humidity exceeds 50–80%. The team thinks that water condenses between adjacent rods and then capillary forces draw the rods together until the water bursts from the ends of the

rods and evaporates.
Nature Nanotechnol. **http://dx.doi.org/10.1038/nnano.2016.91 (2016)**

EVOLUTION

Fish keep coming out of water

Fish have evolved to live on land multiple times, suggesting that the crucial transition from water to land during the evolution of terrestrial life may not have been unusual.

Terry Ord and Georgina Cooke at the University of New South Wales in Kensington, Australia, looked at data on the behaviour and ecology of living fish and identified 33 different families that include amphibious species, some of which seldom leave the land. In one family, the blenny fish (Blenniidae), amphibious lifestyles evolved 3–7 times. The duo observed one primarily aquatic species of blenny (*Praealticus labrovittas*) emerging onto land on warm days on the western Pacific island of Guam.

The ability to survive on land could help fish to cope with the low oxygen levels of warm seawater, and prevent them getting stuck in tidal pools, the authors propose.
Evolution **http://doi.org/bjzq (2016)**

MICROBIOLOGY

A wealth of anti-CRISPR proteins

Proteins that inhibit the activity of the CRISPR–Cas bacterial defence system could be widespread.

Viruses and other microbes often successfully transfer genes to bacteria, despite the presence of the bacterial CRISPR–Cas system, which recognizes and attacks foreign DNA or RNA. Karen Maxwell and Alan Davidson at the University of Toronto in Canada and their colleagues had previously described nine families of anti-CRISPR protein that help certain viruses to infect *Pseudomonas* bacteria. Now, using bioinformatics, the team has identified five more anti-CRISPR protein families in a range of microorganisms that inhibit CRISPR–Cas systems in *Pseudomonas aeruginosa* and *Pectobacterium atrosepticum*.

Anti-CRISPR proteins could have an important role in gene transfer between bacteria, including the spread of genes involved in antibiotic resistance, the authors say.
Nature Microbiol. **http://dx.doi.org/10.1038/nmicrobiol.2016.85 (2016)**

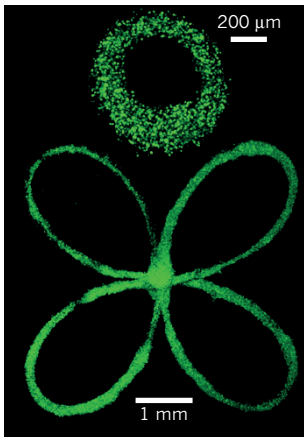
BIOMATERIALS

Liquid-like solid lets cells grow

A scaffold made of tightly packed hydrogel particles allows cultured cells to grow in custom 3D configurations.

Developed by Thomas Angelini and his colleagues at the University of Florida in Gainesville, the scaffold is made of a liquid-like solid material that temporarily becomes fluid when force is applied, and rapidly solidifies after the force is removed. Angelini's team 3D-printed clusters of various types of cell inside the liquid-like solid, creating multicellular structures in the shape of a sphere, a loop and a simple flower (**pictured**).

In contrast to other, stiffer scaffolds used for 3D cell culture, this one is not easily damaged when cells are injected into it, and does not need to be broken down by enzymes to allow cells to grow and migrate.
ACS Biomater. Sci. Eng. **http://doi.org/bjzp (2016)**



T. BHATTACHARJEE *ET AL.*/AM. CHEM. SOC.

NEUROSCIENCE

Myelin clogs up immune cells

The insulating layer around nerve fibres breaks down as mice age, and this could lead to immune dysfunction.

The myelin layer coats nerves to speed up signal transmission. Mikael Simons at the Max Planck Institute for Experimental Medicine in Göttingen, Germany, and his colleagues used electron microscopy to study the brains of mice. They found that the amount of myelin fragments increased with age and that the pieces were taken up by immune cells in the brain called microglia, which engulf debris and foreign materials. During this process, insoluble fatty aggregates accumulated in the microglia and the ability of the cells to take up material declined.

The authors suggest that microglia become overwhelmed with the growing amount of myelin debris, making them less able to function in the ageing brain.
Nature Neurosci. **http://dx.doi.org/10.1038/nn.4325 (2016)**

ARTHUR GEORGES

DEVELOPMENTAL BIOLOGY

Dragon lizard gets sex change

A shift in egg-incubation temperature can result in a genetically male lizard having a mix of male and female traits.

The sex of some reptile species is determined by genetics, but in others it depends on egg-incubation temperature. Richard Shine at the University of Sydney in Australia and his colleagues studied hatchlings and juveniles of the central bearded dragon (*Pogona vitticeps*; male **pictured**). In this species, sex is normally controlled genetically, but incubation temperatures of 32 °C and above can produce sex-reversed females from male embryos. The team incubated eggs at constant temperatures between 26 °C and 34 °C, and found that although sex-reversed females are capable of laying eggs — and even produce more eggs than genetic females — they are similar to males in their morphology and behaviour.

This mix of traits could enhance fitness under certain conditions, which could cause a rapid elimination of sex-determination genes, the authors say.
Proc. R. Soc. B 283, **20160217 (2016)**

NATURE.COM
For the latest research published by *Nature* visit:
www.nature.com/latestresearch