RESEARCH HIGHLIGHTS

Selections from the scientific literature

CANCER

How cancer skirts brain defences

Proteins that block cell death and help cells to integrate with blood vessels are crucial in the spread of cancer to the brain.

Brain metastasis is often deadly, but most cancer cells that invade the brain die without establishing a tumour. To find ways in which successful invaders bypass the brain's defences, Joan Massagué of the Memorial Sloan Kettering Cancer Center in New York and his colleagues looked at a set of genes expressed in brain metastases, focusing on two proteins called serpins.

These serpins inhibit another protein called plasminogen activator, which, the authors found, kills cancer cells in the brain. Serpin expression shielded cancer cells from cell death and helped them to spread on the surface of capillaries, establishing a blood supply in their new home.

Cell 156, **1002–1016 (2014)**

YUSHENG LIU

ARCHAEOLOGY

Ancient cheese found with mummies

The oldest known pieces of cheese have turned up in the tombs of an early Bronze Age cemetery in Xinjiang, China.

Andrej Shevchenko at the Max Planck Institute of Molecular and Cell Biology and Genetics in Dresden, Germany, Changsui Wang at the University of Chinese Academy of Sciences in Beijing, and their colleagues analysed 3,800-year-old lumps found at the neck and chest of mummies (pictured) in the cemetery and identified them as a 'kefir' cheese.

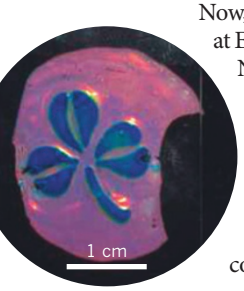
This type of cheese is made by curdling ruminant milk with a symbiotic culture of bacteria, including *Lactobacillus kefiranofaciens*, and yeast. Evidence of a kefir dairy — which makes lactose-free products — in this region explains why large-scale ruminant herding and milking spread in a population known to have been lactose intolerant, the authors say. The origin of cheese making dates back some 4,000 years earlier, but evidence for this has relied on analysis of milk fat in pottery shards.

J. Arch. Sci. **http://doi.org/rpq (2014)**

MATERIALS

Changing colour under pressure

Materials that change colour when pulled or squeezed could form the basis of display screens or sensors. But existing photonic gels, which change colour when deformed, cannot cover the entire rainbow or switch quickly.



Now, Jianping Ge at East China Normal University in Shanghai and his colleagues have created a material that can adopt every colour from red to blue and is more sensitive to pressure than previous efforts, while being just as durable. The team used a mixture of ethylene glycol and polyethylene glycol methacrylate in which silica spheres were fixed to create a softer and more elastic gel (**pictured**). Like other photonic gels, the new material works because it forms a crystalline array of spheres, which alter light reflection by shifting orientation when squeezed.

Adv. Funct. Mater. **http://doi.org/rpn (2014)**

GENETIC ENGINEERING

Genes make bacteria magnetic

Researchers have transferred genes for the production of magnetic nanocrystals from one species of bacteria to another, a step towards making bacterial bioreactors that generate such particles.

Dirk Schueler at Ludwig-Maximilians University in Munich, Germany, Youming Zhang at the Helmholtz Joint Institute at Shandong University in Jinan, China, and their team focused on roughly 30 genes from *Magnetospirillum gryphiswaldense* that enable the bacterium to produce membrane-bound, iron-based magnetic nanocrystals. Researchers inserted these genes into *Rhodospirillum rubrum*, a well-studied organism used in biotechnology, that is easier to work with. The authors found that both sets of magnetic

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particles were similar in size, structure and composition.
Nature Nanotech. **http://doi.org/rpg (2014)**

MICROBIOLOGY

Stubborn microbe finds hiding spots

Salmonella bacteria can escape antibiotics and immune-system attack by hiding inside a host's immune cells.

Roland Regoes and Wolf-Dietrich Hardt of the Swiss Federal Institute of Technology in Zurich and their colleagues infected mice with *Salmonella enterica* and then treated the animals with the antibiotic ciprofloxacin. The team found that, after most of the infection had cleared from organs, about 10% of the *Salmonella* bacteria inside lymph nodes that drain the intestines were still viable and growing. These bacteria re-established infection after antibiotic treatment.

In a separate study, Sophie Helaine, David Holden, and their colleagues at Imperial College London found that *Salmonella* cells can also persist inside macrophages that ingest them. Molecules that stimulate certain types of immune cells could, in combination with antibiotics, improve treatment.
PLoS Biol. 12, **e1001793 (2014);** ***Science*** 343, **204–208 (2014)**

ANIMAL BEHAVIOUR

Worms bond to reach new heights

To reach passing beetles, parasitic worms congregate into towers up to 30 times taller than an individual.

Hans-Joachim Knölker at the Dresden University of Technology in Germany, Teymuras Kurzchalia at the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, and their team found that juvenile *Pristionchus pacificus* secrete a waxy substance, dubbed nematoil by the authors, that functions as an adhesive between animals. This allows them to form towers with up to 1,000 individuals, reaching as high as 1 centimetre, which can attach to a host.
Nature Chem. Bio. **http://doi.org/rqt (2014)**

MATERIALS

Waste glass finds diffuse use

A by-product of antiquated glass-making processes could find a new lease of life as an optical diffuser.

Manufacturers now avoid producing crystals, called devitrite, in their soda–lime–silica glass because they degrade the material's optical qualities. But Haider Butt at the University of Birmingham, UK, and his team show that this currently undesirable form of glass can act as a diffuser, owing to the fact that needle-like crystals of devitrite scatter light to wide angles of up to 120°. Because devitrite is both a highly efficient diffuser and cheap to produce, the authors say it could be used in applications such as medical lasers.
ACS Nano. **http://doi.org/rpk (2014)**

PALAEONTOLOGY

Algae dealt blow to ancient whales

The unearthing of more than 40 marine mammal fossils (**pictured**) at a site in Atacama, Chile, has revealed that they probably died en masse in four events due to toxic algae.

Nicholas Pyenson of the Smithsonian Institution in Washington DC and his colleagues found that the fossils, including baleen and other whales, seals and an aquatic sloth, were arranged in four distinct layers, which are between 9 million and 6.5 million years old. The only modern event known to trigger such recurring and rapid die-offs of multiple species is extreme growth of toxic algae. The animals could have died after eating contaminated prey or have been directly affected by the algae's toxin. Other ocean areas that once created such blooms could harbour substantial fossil vertebrate remains, the authors say.
Proc. R. Soc. B 281, **20133316 (2014)**

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COMMUNITY CHOICE

The most viewed papers in science

NEUROSCIENCE

Hopping DNA linked to schizophrenia

HIGHLY READ on www.cell.com 27 Jan–26 Feb

Mobile DNA elements activated by environmental or genetic triggers could boost susceptibility to schizophrenia.

Tadafumi Kato at the RIKEN Brain Science Institute in Saitama, Japan, Kazuya Iwamoto at the University of Tokyo and their colleagues found higher copy numbers of a genetic element, called the L1 retrotransposon, in the DNA extracted from the post-mortem brains of patients with schizophrenia compared with that from the brains of healthy individuals. The authors also showed that the L1 elements tended to localize to genes linked to schizophrenia and neuronal synapses.

The same phenomenon was observed in mice and monkeys exposed perinatally to chemical stressors that are known to promote schizophrenia-like behaviours, and in cultured neurons derived from stem cells carrying a schizophrenia-related chromosomal deletion.
Neuron 81, **306–313 (2014)**

ZOOLOGY

Pheromone turns on goat brains

Researchers have pinpointed a molecule produced by male goats that activates reproduction in females outside of their normal breeding season.

Yukari Takeuchi at the University of Tokyo and her colleagues used a special cap to capture 18 different pheromone molecules emitted from the heads of male goats. They then exposed females to the molecules, and used implanted electrodes to monitor activity in a brain region that regulates reproduction. One molecule, 4-ethyloctanal, triggered the biggest response of all the compounds tested.

This is the first molecule shown to stimulate a key regulator of reproduction in mammals called the gonadotropin releasing hormone pulse generator.
Curr. Biol. **http://doi.org/rqv (2014)**

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