

RESEARCH HIGHLIGHTS

Selections from the scientific literature

OBESITY

Heavy toll of stomach surgery

Weight-loss surgery improves the health of fat rats, but puts their offspring at risk of obesity and diabetes.

Randy Seeley and his team at the University of Cincinnati, Ohio, put female rats on a high-fat diet and then performed surgery to excise part of the rats' stomachs. After surgery, rats ate less food, lost weight and had fewer diabetes symptoms. Their offspring, however, were smaller and more susceptible to obesity and glucose intolerance compared with pups born to obese rats that had sham surgery.

For women, the authors say, weight loss alone may not stop them from passing on the effects of obesity to their children.

Science Transl. Med. 5, 199ra112 (2013)

MATERIALS

Electronic fabrics survive the wringer

Lightweight carbon sheets can be attached securely to nylon, cotton and polyester to create textiles that conduct electricity but don't fall apart in the wash.

Byung Hoon Kim at Incheon National University in South Korea and his colleagues smeared fibres with bovine serum albumin, a protein used in many biology labs. Albumin acted as a molecular glue; by



JONATHAN WOOD/GETTY

CLIMATE SCIENCES

Australia's record rains lowered sea level

Australia soaked up so much rain between early 2010 and late 2011 that global sea levels temporarily dropped.

John Fasullo of the US National Center for Atmospheric Research in Boulder, Colorado, and his colleagues used satellite measurements and tidal gauges to show that the mean global sea level — which had been rising by around 3 millimetres per year — fell by 7 mm. Using

measurements of Earth's gravity field, the team found a parallel increase in the mass of water on land, particularly in Australia, where topography prevents most water from flowing into the ocean.

Australia's record rainfall and flooding (pictured; in Queensland) probably came from a triad of regional climate patterns, including La Niña surface cooling in the tropical Pacific. *Geophys. Res. Lett.* <http://doi.org/ngx> (2013)

changing the charge on the fibres, it attracted sheets of graphene oxide (single-atom-thick layers of carbon atoms, topped with oxygen). The modified threads remained flexible (**pictured**) and could carry a current after being bent, washed and subjected to temperatures between -53°C and 52°C .

Adv. Mater. <http://doi.org/njx> (2013)

CANCER

Revived genes give therapy a boost

A drug that inhibits DNA-modifying enzymes makes stubborn lymphoma cells sensitive to chemotherapy.

A team led by Leandro Cerchietti and Ari Melnick of Weill Cornell Medical College in New York studied drugs that prevent DNA methylation, a modification that 'silences' genes. Work in cell lines and mouse models for diffuse large B-cell lymphoma (DLBCL) showed that such a drug reactivated genes that made the anti-cancer agent doxorubicin more effective. Twelve patients with DLBCL were given an anti-methylation drug and standard chemotherapy; 11 responded. Biopsies showed decreased methylation and increased activity of a gene called *SMAD1*, which is often silenced in resistant DLBCL. The results suggest

that targeting excessive DNA methylation could reverse treatment resistance.

Cancer Discov. 3, 1–18 (2013)

ENERGY STORAGE

Power surge for flow batteries

Expensive membranes can be eliminated from flow batteries without compromising performance.

Flow batteries, used to store power in electricity grids, rely on fuels pumped through a power-generating region bounded by electrodes. Membranes typically stop fuels from reaching areas that would cause a short circuit. Some cheaper batteries are

YONG JU YUN

built so fuel flows smoothly and no membrane is required, but these have low power density and are usually not rechargeable.

Cullen Buie and his colleagues at the Massachusetts Institute of Technology in Cambridge engineered a membraneless hydrogen-bromine battery that can pump fuels at very high concentrations. The design boosts power density to three times that reported for other membrane-free batteries, and the battery can be recharged. *Nature Commun.* <http://doi.org/njt> (2013)

ATOMIC PHYSICS

Super-stable clocks

The most stable atomic clock built so far loses or gains less than one second every quintillion seconds (equal to 10^{18} seconds, or more than 30 billion years), which is about ten times better than the previous record.

Andrew Ludlow at the National Institute of Standards and Technology in Boulder, Colorado, and his colleagues used lasers to monitor the oscillation of energy levels in two sets of ultracold ytterbium atoms that had been trapped using magnetic fields and laser beams. The clocks ticked in sync with a stability of about one part in 10^{18} .

Such stable clocks could benefit satellite communication and navigation, and would enable space-based tests of general relativity to be conducted about 1,000 times more precisely than with clocks available today.

Science <http://doi.org/nj9> (2013)

NEUROSCIENCE

Single gene tweak for prion diseases

Engineered mouse strains develop rare prion diseases without the need for an infectious agent.

Susan Lindquist of the

Whitehead Institute for Biomedical Research in Cambridge, Massachusetts, and her colleagues have created mouse models for two fatal human diseases caused by prions — misfolded proteins that spur other proteins to misfold. Creutzfeldt–Jakob disease and fatal familial insomnia affect different parts of the brain and arise from different mutations in the same gene. Rather than inserting mutated genes into the mouse genome — a tactic that ineffectively mimics the disease — the researchers mutated the prion gene in place.

Single amino-acid changes in the mouse prion protein caused the brain degeneration that is characteristic of each disease, and both models produce prions that can infect other mice.

Proc. Natl Acad. Sci. USA <http://doi.org/njv> (2013)

CANCER BIOLOGY

Cancer mutation has a long reach

Some DNA mutations that promote cancer may work through extra copies not of genes, but of genetic regulatory sequences.

Duplications of the chromosomal sequences 17q23 and 20q13 predict poorer outcomes in certain breast cancers — but no genes in these regions suggest a mechanism for how. Tim Huang and co-workers at the University of Texas Health Science Center in San Antonio sequenced genomic regions that physically interact with other stretches of DNA that bind to the oestrogen receptor, a protein complex implicated in breast cancer. This identified sites within 17q23 and 20q13 called distant oestrogen response elements (DEREs), which help the genetic material to form loops that interact with far-off genomic regions. Extra DEREs promoted more looping and deregulated genes in ways expected to promote tumour growth.

Cancer Cell 24, 197–212 (2013)

COMMUNITY CHOICE

The most viewed papers in science

ANIMAL BEHAVIOUR

Whales hear the noise

HIGHLY READ
on rspb.royal-societypublishing.org in July

Simulated military sonar can cause blue whales (*Balaenoptera musculus*) to stop eating and swim away.

Jeremy Goldbogen at Cascadia Research Collective in Olympia, Washington, and Brandon Southall at Southall Environmental Associates in Aptos, California, and their colleagues attached sensors to 17 blue whales off southern California. The team tracked the animals before, during and after playing sonar-like sounds or white noise from a research vessel. Whales at the surface typically did not respond, but whales at depth often showed behaviours such as swimming faster or ceasing to feed.

Human-produced noises could keep baleen whales from foraging and so affect their fitness, the authors say. *Proc. R. Soc. B* 280, 20130657 (2013)



MICROBIOLOGY

Gut pathogen spies others' signals

A disease-causing bacterium 'eavesdrops' on another, usually harmless, bacterial species to help it survive antibiotics.

Under certain conditions, populations of *Escherichia coli* that live in the gut secrete indole, a signalling molecule that makes them more tolerant of antibiotics.

Although the gut pathogen *Salmonella typhimurium* (pictured) cannot produce indole, it still responds to it. James Collins at Boston University, Massachusetts, and his colleagues showed that *S. typhimurium* exposed to indole or to indole-producing *E. coli* survived better under antibiotics than did bacteria in indole-free conditions. In both species, indole strongly boosted the expression of stress-response genes known to help bacteria withstand drugs and assaults by the human immune system.

Such interactions between species could help harmful bacterial infections to persist, the authors say.

Proc. Natl Acad. Sci. USA <http://doi.org/njw> (2013)

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