

MATERIALS SCIENCE

Folded batteries pack power

Flexible lithium-ion batteries folded using origami techniques can store energy in a smaller area. Candace Chan and her colleagues at Arizona State University in Tempe built batteries on paper by attaching lithium metal oxide electrodes to paper coated with conductive carbon nanotubes.

They folded the paper into layers using the Miura-ori pattern, which has also been used to fold solar panels in space. Energy stored per unit area increased by a factor of 14 over the unfolded paper. Because paper-based batteries do not perform as well as standard lithium-ion batteries, the per-area capacity of the folded battery still falls below that of existing batteries.

The researchers think that other folding algorithms and robot-assisted folding would improve performance.

Nano Lett. <http://doi.org/n4d> (2013)

NEUROSCIENCE

Centipede toxin kills pain

A peptide isolated from centipede venom is as potent as morphine at treating pain in mice.

Glenn King of the University of Queensland in St Lucia, Australia, and his colleagues purified a molecule made of 46 amino acids from the venom of the



Chinese red-headed centipede (*Scolopendra subspinipes mutilans*, pictured). When tested in rat neurons *in vitro*, the peptide strongly inhibited a pain-associated sodium ion channel. It had little effect on related channels. The researchers also injected the molecule into mice that were then exposed to noxious chemicals or heat: the higher the dose, the less the animals reacted to painful stimuli. They showed no obvious side effects. The researchers suggest that this molecule, and perhaps others from centipede venoms, could yield powerful pain treatments.

Proc. Natl Acad. Sci. USA <http://doi.org/n35> (2013)

REGENERATIVE MEDICINE

Mouth-watering artificial glands

Bioengineered glands that make tears or saliva can take on the function of their natural counterparts when transplanted into mice.

Takashi Tsuji and his colleagues at the Tokyo University of Science harvested cells destined to form tear and salivary glands from mouse embryos and cultured them for three days in plastic devices that mimic conditions in developing embryos.

The bioengineered glands were implanted in mice from which the natural glands had been removed. The tissue then matured and connected with the animals' nervous systems and ducts for tears and saliva, producing the fluids in response to appropriate stimuli. *Nature Commun.* 4, 2497; 2498 (2013)

PHYSIOLOGY

Hormones tick on epigenetic clock

A mammal's annual reproductive cycle is controlled by reversible changes to DNA.

Siberian hamsters (*Phodopus sungorus*) breed during the longest days of the

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MATERIALS SCIENCE

Dirty water gets squeezed clean



Gels stuffed with nanoparticles could offer a quick, effective way to disinfect drinking water after disasters.

Silver nanoparticles are powerful microbicides, but they tend to clump, limiting contact between bacterial cells and the killing surface. Xiao Hu, Teik-Thye Lim and their colleagues at Nanyang Technological University in Singapore uniformly embedded the nanoparticles throughout a sophisticated, super-absorbent sponge.

They used the flexible, lightweight material to soak up bacterium-contaminated water for 15 seconds, then simply squeezed the water out. Microbe numbers in the recovered water fell by as much as ten million times. The gel can be repeatedly reused and, the researchers suggest, could be developed into a pocket-sized water filter for emergencies. *Environ. Sci. Technol.* 47, 9363–9371 (2013)

year; shorter days trigger a series of hormonal changes that cause their gonads to shrink. The change is tied to the nocturnally produced hormone melatonin, but how the hormone alters gene activity has been unclear.

Tyler Stevenson, now at the University of Aberdeen, UK, and Brian Prendergast of the University of Chicago in Illinois found that both shorter days and corresponding changes in melatonin reduce methylation of a key gene in the hypothalamus to launch the gonad-shrinking cascade.

The study is the first to show that cycles of DNA modification underlie seasonal changes, the authors say. *Proc. Natl Acad. Sci. USA* <http://doi.org/nz8> (2013)

MICROBIOLOGY

New bacteria from the bowels

A new evolutionary branch of bacteria has been discovered in human guts and in groundwater.

While characterizing microbial communities in human faeces and environmental samples, a team led by Jillian Banfield at

the University of California, Berkeley, and Ruth Ley at Cornell University in Ithaca, New York, found DNA sequences that were very distantly related to photosynthetic cyanobacteria. Further sequencing produced three complete and three partial genomes for the bacteria. The authors assigned the microbes their own phylum — Melainabacteria.

The melainabacteria lack the genes required for photosynthesis and for coping with oxygen. They probably generate energy by fermenting various carbon-containing molecules, and may provide their human hosts with the vitamins B and K. *eLife* 2, e01102 (2013)

CORRECTION

The Research Highlight 'Sound shakes semiconductors' (*Nature* 502, 8–9; 2013) described methods to improve a film's superconductivity. It should have read 'conductivity'.

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