

conversion known as the piezoelectric effect.

Seung-Wuk Lee and his team at the Lawrence Berkeley National Laboratory, California, measured the charge generated by stressing self-assembled films of M13 bacteriophage, a virus that attacks only bacteria. The authors boosted the films' power output by modifying the proteins that form the phage outer coat and by stacking the films on top of each other. The team went on to build a penny-sized generator containing the films, which produced enough power to light up a liquid-crystal display.

The viral power generator could be used as an environmentally friendly component in nanodevices, the authors suggest.

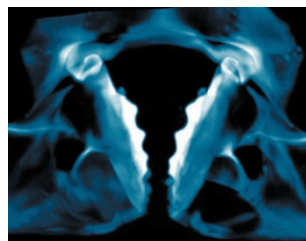
Nature Nanotechnol. <http://dx.doi.org/10.1038/nnano.2012.69> (2012)

EVOLUTION

Tooth-enamel similarities

The teeth of a freshwater crustacean are coated with a wear-resistant, enamel-like layer similar to that on vertebrate teeth. This is an example of convergent evolution in which a biological trait develops independently in separate lineages.

Researchers including Amir Berman at Ben-Gurion University in Beer-Sheva, Israel, and Barbara Eichmayer at the Max Planck Institute of Colloids and Interfaces in Potsdam, Germany, used Raman spectroscopy to analyse the mandibles of *Cherax quadricarinatus* crayfish. On the surface of the molar teeth, the researchers



found a layer of fluorapatite crystals (**pictured, white**), which are chemically similar to the carbonated hydroxyapatite found in vertebrate teeth.

The results indicate that comparable chewing needs led to the independent evolution of similar tooth structures in species from different lineages. *Nature Commun.* 3, 839 (2012)

NUCLEAR PHYSICS

Fingerprint of nuclear fuel

Plutonium-239 is used in nuclear weapons, but it has been difficult to detect in the lab. Researchers in New Mexico have now succeeded in measuring the isotope's nuclear magnetic resonance (NMR) signal.

Interactions within plutonium atoms have frustrated attempts over the past 50 years to find the NMR signal of pure plutonium. To reduce the impact of these interactions, Georgios Koutroulakis and his colleagues at the Los Alamos National Laboratory analysed plutonium dioxide, PuO₂ — which has a more stable NMR signal than other plutonium compounds — at a very low temperature.

Teasing out the atom's signature in other compounds could be difficult, but at least now researchers know where to look, the authors say.

Science 336, 901–904 (2012)

ECOLOGY

Outpaced by climate change

Mammals could find it more difficult to adjust their geographical ranges as the climate warms than previously thought.

Carrie Schloss and her colleagues at the University of Washington, Seattle, studied the ability of 493 mammalian species to move to new habitats with suitable climates when the projected temperature increases in the

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GEOENGINEERING

Cooling effects of white roofs

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Increasing the ability of urban roofs and pavements to reflect the Sun's heat would decrease the average global temperature by less than 0.1 °C over the next 300 years, according to climate simulations.

Hashem Akbari and his colleagues at Concordia University in Montreal, Canada, used a global climate model, along with estimates of the extent of the world's urban areas, to predict what would happen if urban solar reflectivity rose from roughly 15% to 25%. Depending on which set of urban data they used, the researchers found that the resulting global cooling ranged from 0.01 to 0.07 °C by 2300.

Although this temperature decrease is small relative to natural climate variability, the authors say that cities should promote the use of white or light-coloured surface materials because these can reduce air-conditioning usage and counteract the urban 'heat island' effect at minimal extra cost.

Environ. Res. Lett. 7, 024004 (2012)

Western hemisphere occur. The team modelled the speed at which species would need to move and compared this with their known dispersal rates. The authors found that, on average, 9.2% of species at any given location will be unable to outrun climate change. Reductions in range size will be widespread, affecting 87%, with 20% of these reductions due to species' inability to relocate. Primates, which do not disperse as readily as other mammals, are likely to be among the most vulnerable. *Proc. Natl Acad. Sci. USA* <http://dx.doi.org/10.1073/pnas.11167911109> (2012)

ZOOLOGY

Star's five-legged coordination

Brittle stars use their five limbs to crawl along the sea floor in a bilateral manner, even though their bodies have radial, not bilateral, symmetry.

Henry Astley at Brown University in Providence, Rhode Island, measured the movements of 13 *Ophiocoma echinata* brittle stars



(**pictured**). He found that the creatures coordinate their limb movements, rather than having each leg react independently to stimuli. The animals move along the axis of a central limb, held either in front of or behind the body, and turn by re-designating the central limb rather than by rotating the body.

Brittle stars are unusual in having limbs with different, interchangeable roles in locomotion that are not constrained by anatomy. *J. Exp. Biol.* 215, 1923–1929 (2012)

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