

RESEARCH HIGHLIGHTS

Selections from the scientific literature

CHEMISTRY

When alkanes turn tail

Alkanes are molecules that contain only carbon and hydrogen atoms, connected by single bonds. Short-chain alkanes such as butane and octane — which contain linear chains of four and eight carbon atoms, respectively — stretch out in extended zig-zags. However, longer hydrocarbon chains tend to fold themselves into hairpin structures.

Ricardo Mata, Martin Suhm and their colleagues at the University of Göttingen, Germany, determined the point at which this transition becomes energetically favourable. The researchers performed spectroscopy on supersonic jets of alkane molecules at temperatures of 100–150 kelvin — and found that the folded structure becomes more stable than the extended conformation when an alkane chain is around 18–19 carbon atoms long.

The result broadly agrees with the authors' quantum calculations, and can be used to train computer models of molecular mechanics.

Angew. Chem. Int. Edn
<http://dx.doi.org/10.1002/anie.201202894> (2012)

PALAEONTOLOGY

Excavation of a digger

Examination of a 57-million-year-old nearly complete fossil skeleton (selected bones pictured) has advanced a long

debate over the place of the mammal *Ernanodon antelios* in evolutionary history.

The fossil of the ancient mammal was discovered in rocks in Mongolia. Peter Kondrashov and Alexandre Agadjanian from the Borissiak Paleontological Institute of the Russian Academy of Sciences in Moscow describe *E. antelios* as having strong forelimbs and large claws, which it used to scratch and dig for food. Examination of the bones

led the authors to suggest that the mammal is more closely related to pangolins than it is to armadillos and anteaters.

J. Vertebr. Paleontol. 32, 983–1001 (2012)



MATERIALS

Why barnacles stick around

Barnacles are among the clingiest of creatures, but how they manage to stick so tenaciously to surfaces is unclear.

When Jaimie-Leigh Jonker of the National University of Ireland, Galway, and her colleagues examined the barnacle *Lepas anatifera*, they found that its adhesion system is radically different from that of other clingy sea creatures, such as mussels and tubeworms.

Large, single-cell glands in *L. anatifera* secrete a clumpy substance filled with sticky proteins, although exactly how the glue works remains mysterious.

Researchers hope that future studies of barnacle glue will yield better adhesives, particularly for medical applications.

J. Morphol. <http://dx.doi.org/10.1002/jmor.20067> (2012)

OCEAN BIOCHEMISTRY

The mystery of high seas methane

Marine microbes offer a plausible explanation for the surprising abundance of methane in oxygenated parts of the ocean.

Scientists have previously theorized that ocean methane might be a by-product of microorganisms' use of methylphosphonic acid as a source of phosphorus. But it was unclear where the acid itself came from. William Metcalf and Wilfred van der Donk at the University of Illinois in Urbana and their colleagues show that a

microbe called *Nitrosopumilus maritimus* carries genes that encode a pathway for methylphosphonate synthesis.

A crucial gene in this pathway is also found in many other marine microbes, suggesting that these organisms may be the source of the unexplained ocean methane.

Science 337, 1104–1107 (2012)

EVOLUTIONARY ANTHROPOLOGY

Small families in rich societies

The tendency of families in wealthier societies to produce fewer children is hard to explain in evolutionary terms. A study of Swedish families

R. HOODINOTT/NATUREPL.COM

examines the paradox, known as demographic transition.

One model proposed to explain the phenomenon holds that fewer offspring receive more resources, making them more likely to have offspring themselves. The model posits that richer people might have fewer children, but would ultimately have more descendants over subsequent generations.

Not so, say Anna Goodman of the London School of Hygiene and Tropical Medicine and her team. In their analysis of 14,000 Swedish people born between 1915 and 1929 and their descendants, small family size predicted greater socioeconomic success in children, grandchildren and great-grandchildren, particularly among families that already had high socioeconomic status. But small family size did not translate into greater reproductive success among the descendants.

Proc. R. Soc. B <http://dx.doi.org/10.1098/rspb.2012.1415> (2012)

BOTANY

Plants split cells to put down roots

Plants cells cannot migrate, so plants control the development of multilayered tissues such as roots through asymmetric cell divisions that create layers with different identities and functions.

A team headed by Athanasius Marée of the John Innes Centre in Norwich, UK, and Ben Scheres at the University of Utrecht in the Netherlands unravelled the molecular pathway that regulates these cell divisions in the root tip. Stem cells in the model plant *Arabidopsis* are triggered to divide unevenly by a positive feedback loop that takes effect when a protein called RETINOBLASTOMA ceases to inhibit another, called SCARECROW. Gradients of a growth hormone and a protein called SHORT ROOT ensure that this loop is triggered in

the correct place. Protein degradation during the division prevents the process from continuing indefinitely.

Cell <http://dx.doi.org/10.1016/j.cell.2012.07.017> (2012)

ASTROPHYSICS

Disintegrating planet spotted

NASA's Kepler spacecraft seems to have spotted a distant, rocky planet that is falling apart.

Kepler hunts for planets beyond the Solar System by searching for steady, periodic dimming in the light of parent stars, which indicates the passage of an orbiting body. In the case of the star KIC 12557548, however, the drop in starlight varies in strength with each passage. Scientists have suggested that this variability is a sign of an orbiting planet that is trailed by a large dust cloud.

Matteo Brogi of Leiden University in the Netherlands and his team modelled the dust cloud and found that its presence could indeed explain the Kepler data. The cloud is probably the result of the planet being bombarded by so much stellar radiation that it has begun breaking up into dust. *Astron. Astrophys.* <http://dx.doi.org/10.1051/0004-6361/201219762> (2012)

BIOGEOSCIENCES

Pruning back carbon estimates

Incorporating tree-height data into calculations of the amount of carbon stored in tropical forests reduces the estimates by roughly 13%.

Ted Feldpausch of the University of Leeds, UK, and his team analysed data from 327 tropics-wide plots, as well as 20 sites where tropical trees have been cut down, collecting data on factors such as the weight and height of the trees, and their carbon density. The team found that information on tree height was crucial for making accurate biomass estimates, and that the relationship between height

COMMUNITY CHOICE

The most viewed papers in science

ANTHROPOLOGY

Hunter-gatherer workout disproved

HIGHLY READ
on www.plosone.org
in August

Despite their very different lifestyles, a hunter-gatherer expends about the same amount of energy each day as the average person in Europe or the United States.

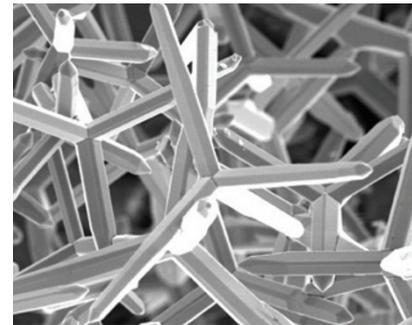
For 11 days, Herman Pontzer of Hunter College in New York and his colleagues measured daily energy expenditure and physical activity levels in 30 adults from a Hadza hunter-gatherer group in Tanzania. Controlling for factors such as age, sex, body fat and body mass, the researchers compared their results to individual and population data from a spectrum of societies, including Western countries. Hadza individuals walk longer distances and forage for resources. So, unsurprisingly, they had higher physical-activity levels than Westerners. However, on average, both groups used the same amount of energy on a daily basis, as well as when walking or resting, suggesting that the rate of energy expenditure is an evolved trait that is independent of culture.

Obesity trends in Western populations could be unrelated to a sedentary lifestyle, the researchers suggest. *PLoS ONE* 7, e40503 (2012)

and carbon storage varied by region.

The authors underscore the importance of including better data in biomass maps, in which field measurements are increasingly being integrated with remote-sensing data to improve accuracy.

Biogeosciences 9, 3381–3403 (2012)



MATERIALS

Sticking the unstickable

Researchers have succeeded in sticking together two supremely unsticky polymers — Teflon and cross-linked poly(dimethylsiloxane), the slippery coating used as backing paper for stickers.

The secret to their success lies in tetrapodal zinc oxide crystals: micrometre-scale structures (pictured) shaped rather like children's jacks. Strewing these between the polymers and heating the resulting sandwich to 100°C for 40 minutes creates a kind of 'micro/nano Velcro'. The polymers can be peeled apart

only by applying a force of about 200 Newtons per metre — more than that required to unstick Scotch tape.

Rainer Adelung and his team at the University of Kiel, Germany, did not stick the unstickable for glory alone. Stuck together, these surfaces will have applications in technologies such as membranes for separating liquids, and biomedical implants.

Adv. Mater. <http://dx.doi.org/10.1002/adma.201201780> (2012)

NATURE.COM

For the latest research published by Nature visit:

www.nature.com/latestresearch

ADV. MATER.