

# RESEARCH HIGHLIGHTS

Selections from the  
scientific literature

## CHEMISTRY

### Greenhouse gas finds a use

A potent greenhouse gas that is a by-product of refrigerant production can be used to add a fluorine-based group to molecules — a desirable reaction in the manufacture of drugs and agrochemicals.

G. K. Surya Prakash and his colleagues at the University of Southern California in Los Angeles report that the gas — which has the formula  $\text{CF}_3\text{H}$  and is known as fluoroform or HFC-23 — can be reacted with other molecules, resulting in the addition of  $\text{CF}_3$  to carbon, silicon, boron or sulphur atoms. The reaction occurs under simple conditions and provides a rare use for a chemical with a global-warming potential 11,700 times greater than that of carbon dioxide.

*Science* 338, 1324–1327 (2012)

## ANTHROPOLOGY

### Romani have Indian ancestry

The 11 million members of Europe's largest minority group, the Romani (pictured), are descended from a single population that left India some 1,500 years ago and dispersed across Europe through the Balkans.



David Comas at Pompeu Fabra University in Barcelona, Spain, Manfred Kayser at Erasmus University in Rotterdam, the Netherlands, and their colleagues analysed

the genomes of 152 Romani individuals from across Europe and compared them with those of populations worldwide. European Romani probably originated from northern and northwestern India.

Genetic analysis suggests that, after leaving India, Romani ancestors interbred with local populations on the way to the Balkans before beginning to spread throughout Europe around 900 years ago. Since then, Romani have interbred with local populations in Europe. *Curr. Biol.* <http://dx.doi.org/10.1016/j.cub.2012.10.039> (2012)



## URBAN ECOLOGY

### Cigarette butts repel nest pests

City-dwelling sparrows and finches incorporate the butts of smoked cigarettes into their nests, seemingly to ward off parasitic mites.

Isabel López-Rull and her colleagues at the National Autonomous University of Mexico in Mexico City found that nests of house sparrows (*Passer domesticus*) and house finches (*Carpodacus mexicanus*; pictured) with higher levels of cellulose acetate, a component of cigarette butts, had fewer mites. The researchers attached fibres from either smoked or unsmoked cigarette filters to parasite-attracting heat traps and placed them in 27 sparrow and 28 finch

nests. Traps bearing fibres from smoked filters, which contain more nicotine than those of unsmoked ones, captured fewer mites, suggesting that nicotine — and perhaps other compounds in cigarettes — repel the parasites.

Birds have long been known to line their nests with vegetation that deters parasites, and the authors suggest that the use of cigarette butts is an urbanized form of this earlier adaptation.

*Biol. Lett.* <http://dx.doi.org/10.1098/rsbl.2012.0931> (2012)

For a longer story on this research, see [go.nature.com/ygvtvn](http://go.nature.com/ygvtvn)

## DEVELOPMENT

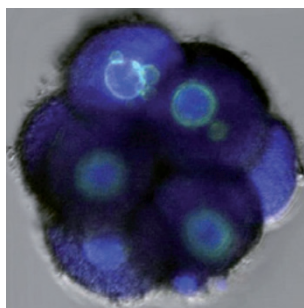
### Early signs of embryo trouble

Human embryos with genetic defects may exhibit unusual cellular behaviour by the time they reach the four-cell stage, about 48 hours after fertilization.

Renee Reijo Pera at Stanford University in California and her colleagues analysed the genetics of 45 single-celled embryos left over from *in vitro* fertilization procedures. About 75% of the embryos contained an abnormal number of chromosomes, with two carrying three copies of

VICTOR ARGAEZ/R. SOC.

TIM GRAHAM/GETTY



chromosome 21, which leads to Down syndrome. Time-lapse imaging revealed that normal embryos underwent precisely timed cell divisions, whereas 70% of embryos with abnormal chromosome counts did not. The researchers also observed that cells in abnormal embryos often fragmented into tiny pieces containing chromosomes (**pictured**).

Automated image tracking of cell division and fragmentation could provide a non-invasive tool to screen embryos for healthy *in vitro* fertilization candidates, the authors say. *Nature Commun.* 3, 1251 (2012)

## QUANTUM PHYSICS

## Atom cooled to ground state

Using a tightly focused beam of light as optical tweezers, researchers have confined a single neutral atom for long enough to cool it to its lowest-energy quantum state, a requirement for many quantum-computing applications.

Researchers have previously cooled charged atoms in a similar way, but uncharged atoms may be more appealing for use in quantum devices because they do not interact with electric fields. Cindy Regal and her collaborators at JILA, a joint research institute of the US National Institute of Standards and Technology and the University of Colorado at Boulder, first used optical tweezers to trap an individual rubidium atom. Then, using a laser-based technique called Raman sideband cooling, they cooled the atom to its near-motionless ground state. *Phys. Rev. X* 2, 041014 (2012)

## CLIMATE CHANGE

## Rain shifts bear human fingerprint

Summer rainfall patterns in the Southern Hemisphere have changed markedly in response to rising greenhouse-gas concentrations and ozone-layer depletion, both caused by human activity.

Since the 1960s, southern regions at mid-latitudes have become drier whereas a zone around Antarctica has grown wetter. John Fyfe at the Canadian Centre for Climate Modelling and Analysis in Victoria, British Columbia, and his colleagues found that the observed trends agree with predicted precipitation patterns obtained from a set of 29 climate models.

They found that greenhouse gases and ozone changes were primarily responsible for the shifts in precipitation levels. Moreover, natural climate variability cannot explain the observed and modelled trends, the team found.

*Geophys. Res. Lett.* <http://dx.doi.org/10.1029/2012GL054199> (2012)

## PLANETARY SCIENCE

## Surprises beneath Moon's surface

The crust beneath the Moon's heavily battered surface is almost entirely pulverized, indicating that it took an even greater beating from space debris during the Solar System's first billion years than planetary scientists suspected.

Maria Zuber at the Massachusetts Institute of Technology in Cambridge and her colleagues report these and other findings from NASA's twin lunar-orbiting spacecraft, known as GRAIL, in a trio of articles. The twin craft probe the Moon's interior by mapping the lunar gravitational field. GRAIL data have also revealed that the Moon's average crust is considerably thinner than previously

## COMMUNITY CHOICE

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## BEHAVIOUR

## Hormone may aid monogamy

**HIGHLY READ**  
on [jneurosci.org](http://jneurosci.org)  
in November

Men in monogamous relationships keep their distance from good-looking women after receiving nasal puffs of oxytocin — the human hormone that has been linked to romantic attraction — whereas single men do not.

René Hurlemann at the University of Bonn, Germany, and his colleagues recruited 86 heterosexual men who were either single or in stable monogamous relationships. The volunteers were asked to choose how close to stand to female or male experimenters, or to perform a similar task using photographs. Compared with single men and partnered men who had received a placebo, partnered men given oxytocin stood 10–15 centimetres farther away from women they deemed attractive, and approached pictures of attractive women more slowly. No effect was seen with the male experimenters.

The authors suggest that oxytocin could help to maintain fidelity in romantic relationships.

*J. Neurosci.* 32, 16074–16079 (2012)

estimated — measuring between 34 and 43 kilometres — suggesting that some of the fracturing caused by space debris could have penetrated the full depth of the crust and into the mantle. Such deep fracturing, which would also be expected on Earth and Mars, could have created porous structures that held hot groundwater for long periods, providing possible niches for life in the early Solar System.

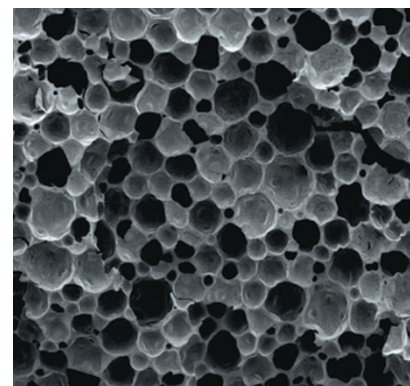
*Science* <http://dx.doi.org/10.1126/science.1231507>; <http://dx.doi.org/10.1126/science.1231530>; <http://dx.doi.org/10.1126/science.1231753> (2012)

## MATERIALS

## Foams for cell-friendly scaffolds

Porous foams with nanometre-scale patches to which cells and proteins can adhere could one day be used in tissue engineering.

A group led by Giuseppe Battaglia at the University of Sheffield, UK, and Adam Engler at the University of California, San Diego, used an established technique to



create porous polystyrene-based foams (**pictured**). By incorporating various other polymers into their foams, the researchers controlled the surface topology of the pores and thus the distribution and size of the places where cells and proteins could attach over three dimensions.

The technique could allow bioengineers to create self-assembling scaffolds that control, for example, where stem cells adhere.

*J. Am. Chem. Soc.* <http://dx.doi.org/10.1021/ja308523f> (2012)

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