

# RESEARCH HIGHLIGHTS

Selections from the scientific literature

## ORGANIC CHEMISTRY

### Iron eases tough synthesis

A new catalyst will help chemists to make complex molecules from simple building blocks.

In drug discovery, chemists first identify a promising organic molecule, but can then end up synthesizing thousands of analogues in the hope of improving the potential drug's properties. One modification that is often desired is swapping a carbon atom for a nitrogen atom in a ring, but standard processes for this are inefficient. Elisabeth Hennessy and Theodore Betley at Harvard University in Cambridge, Massachusetts, designed an iron-containing compound that activates a normally unreactive carbon–hydrogen bond. This speeds up and simplifies the desired chemical synthesis by allowing a greater range of precursors to be used.

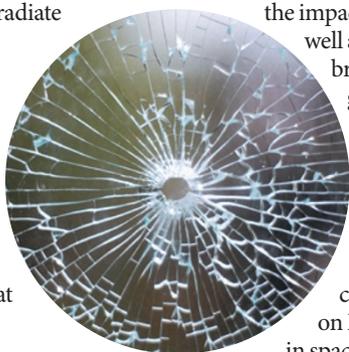
*Science* 340, 591–595 (2013)

## PHYSICS

### Clues from shattered glass

The cracks that radiate from a hole in a broken window (pictured) reveal quantitative information about the shattered material and the projectile that smashed it.

Nicolas Vandenberghe and his colleagues at Aix-Marseilles University in France studied such cracks by firing bullet-shaped steel cylinders at sheets of glass and plastic. The team used a high-speed camera to



show how the cracks formed and spread. The number of radial cracks increased with the impact speed, as well as the material's brittleness. The group developed a mathematical model that accounted for these observations. This model could be relevant on Earth and in space — helping forensic investigators to reconstruct crimes, and helping astrophysicists to analyse impact craters on distant planets and moons. *Phys Rev. Lett.* 110, 174302 (2013)



## VOLCANOLOGY

### Small eruptions get their due

The scale for classifying volcanic eruptions may underplay the danger of weak explosions.

A team led by Bruce Houghton at the University of Hawaii in Honolulu studied material that erupted in 2008 from Kilauea volcano, Hawaii. The largest eruption shot out 310 cubic metres of ash and rock, but ranked only as a category 0 — the lowest possible on the Volcanic Explosivity Index, which is based mainly on how much material is ejected.

Although category 0 is described as

non-explosive, the 2008 Kilauea eruptions were not — they were just low volume. The authors propose splitting the existing category 1 into two, and adding categories down to –6.

Such adjustments could permit more accurate descriptions of small eruptions and allow hazard managers to better communicate the risk to people living near or visiting volcanoes.

*Geology* <http://dx.doi.org/10.1130/G34146.1> (2013)

## ECOLOGY

### Cheats make yeast unsteady

By fostering freeloaders, charitable yeast cells put their communities at risk.

Alvaro Sanchez and Jeff Gore of the Massachusetts Institute of Technology in Cambridge engineered yeast to be either generous cells, which break down complex sugars to forms that are available to the community; or cheating cells, which rely on others for fuel. When the two strains were mixed in different ratios, the researchers found that — over many generations — large, stable populations formed in which less than 10% of

the yeast population could support an overwhelming majority of freeloaders. However, these mostly mooching communities were prone to extinction: when the researchers simulated environmental disturbance by diluting the populations, they crashed. Such dynamics could help biologists to explain the evolution and variation seen in cooperative communities. *PLoS Biol.* 11, e1001547 (2013)

## ASTRONOMY

### Baby star wind travels far

What happens in a star-forming galaxy does not stay in a star-forming galaxy.

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