Molecular biology

Yeast put through the changes with RNA

Genes Dev. **18,** 794–804 (2004)

The fission yeast *Schizosaccharomyces pombe* exists in two mating types — or 'sexes' — known as P and M. Both types can divide to yield daughter cells of the opposite sex, but what triggers the 'switching' process has been unclear. Sonya Vengrova and Jacob Z. Dalgaard show that RNA is involved.

The yeast's genome has a region called *mat1*, which contains one of two pairs of genes that determine mating type — one pair is found in the *mat1* region in P cells, the other in M cells. The 'recombination' event that underlies switching shuffles one set of genes or the other into the *mat1* region to be expressed, but quite how was not known. Vengrova and Dalgaard find that, during DNA replication, one or two nucleotides of RNA become inserted into the *mat1* region at a precise position. These 'imprints' are silent for one cell cycle, but during the next round they act as a block, halting DNA replication. This sparks off recombination and leads to mating-type switching. **Helen R. Pilcher**

Meteorology

Dusty satellite data

Geophys. Res. Lett. doi:10.1029/2003GL019338 (2004)

The dust storms that blow across the Sahara Desert influence climate by absorbing or reflecting sunlight and altering the composition of clouds. Satellite data now show that existing analyses, used for various applications, may underestimate the speed at which dust plumes race away from one of the region's most important birthplaces of these storms.

Ilan Koren and Yoram J. Kaufman studied data obtained by NASA's Terra and Aqua satellites as they passed over the Bodele depression, northeast of Lake Chad. Here, a gap between the Tibesti and Ennedi mountains to the northeast forces winds across the depression, kicking up dust storms as they pass. As Aqua passes over the depression around three hours after Terra, the authors were able to follow the dust's progress.

After examining 15 storms between January and April 2003, Koren and Kaufman calculate that the dust clouds are blown along at around 13 m s^{-1} — about double the speed calculated from previous ground-based measurements. What's more, the authors estimate that a minimum wind speed of some 10 m s^{-1} is needed to kick a dust storm into action. When the dust reaches Africa's west coast, however, where metereological observatories are more common, the satellite and ground-based data are in much better agreement. **Michael Hopkin**

Ecology

Fungal stowaways

Mycol. Res. (in the press)

The US Army may have unwittingly killed hundreds of pine trees on a presidential Italian estate. Genetic analysis suggests that the trees were infected with an American fungus, perhaps imported by US troops during the Second World War.

Paolo Gonthier *et al.* analysed DNA samples taken from fungi at the base of seven dead trees. They found that the fungi were an eastern North American form of *Heterobasidion annosum*, a pest that decays the root system of pine trees. Four sequenced genes bore no relation to the European version of the fungus, matching instead the DNA of the North American species.

The researchers speculate that the fungus was transported to Europe by US troops in 1944, when they set up camp on the presidential estate of Castelporziano near Rome, which has been closed to the public for centuries. The pathogen might have stowed away in transport crates or other military equipment made from wood from infected North American trees. **Helen R. Pilcher**

Physics

Liquid waves refract back

Phys. Rev. E **69,** 030201 (2004)

Light waves refract when they travel from one material into another, bending towards — but never crossing — the normal (an imaginary line perpendicular to the interface between the two materials). In 2000, however, it was discovered that, in specially designed materials, electromagnetic waves can experience negative refraction, with the refracted ray being bent past the normal.

Xinhua Hu *et al.* have conducted a simple experiment to prove that surface waves on a liquid can also refract in this unusual way. They filled a transparent tank with low-viscosity liquid and upright copper cylinders, then generated surface waves that travelled over the cylinders. As the wave frequency is increased, projected images of the waves show their focal point to be moving further away from the lens, and above about 5.8 Hz there is a transition from normal to negative refraction (pictured). The cylinders act as a 'superlens', bending the spreading water waves back towards a focal point on the opposite side of the barrier to the source. This matches theoretical predictions, and neatly mirrors the phenomenon of negative refraction seen for electromagnetic waves. **Mark Peplow**

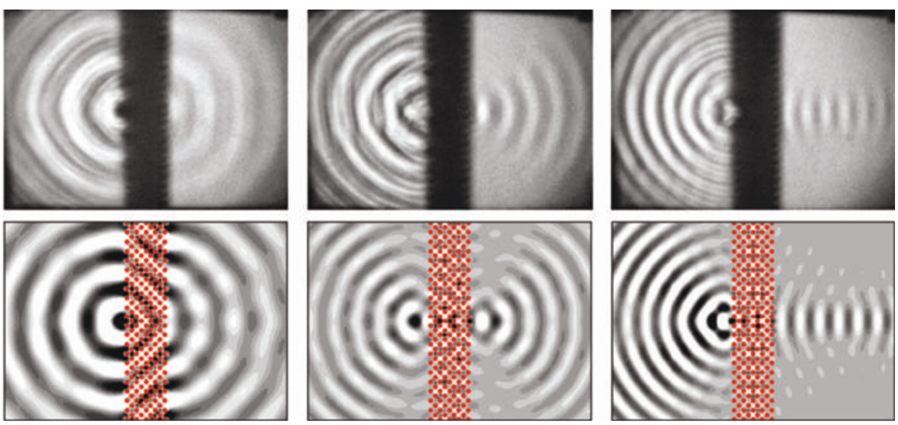
Nanoengineering

Much ado about nothing

Appl. Phys. Lett. **84,** 2644–2645 (2004)

'Nothing' is a relative concept, but the emptiness of the little vacuum pocket created by Wei-Qiang Han and A. Zettl could hardly be more absolute. The so-called ultrahigh vacuum of conventional technology typically achieves pressures of less than 10^{-9} torr, but Han and Zettl have made a cavity in which they estimate the pressure to be around 10^{-84} torr. In comparison, outer space — at around 10^{-12} to 10^{-13} torr — is positively crowded.

The authors made their nanoscale cavity by using the electron beam of a transmission electron microscope to cleave a nanocrystal of potassium chloride that plugs the internal channel of a boron nitride nanotube. The nanocrystal has a width of 1.59 nm — six atomic layers — and fits almost perfectly within a nanotube of 2.3 nm inner diameter. Yet at room temperature the crystal slides spontaneously along the tube in a random walk. So when it is cleaved in two, the two fragments can move apart to create a cavity between them: an empty space preserved by an atomically tight seal at either end. **Philip Ball**



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Waves on a liquid surface are refracted by a slab of copper cylinders (dark/red band). In experiment (top) and simulation (bottom), there is a transition from normal refraction to negative refraction as the frequency of the waves increases (left to right).