University of Texas at Austin exposed a type of virus called a T7 bacteriophage to a toxin that increased its mutation rate by 2–3 orders of magnitude, to about four mutations per genome each generation. After 200 generations, the virus's fitness had increased, rather than decreasing as expected. The genomes were riddled with hundreds of deleterious mutations, but 28 adaptive mutations, mostly in DNA-metabolism genes, reached high frequencies.

MOON MATTERS

Lunar hideaway

Geophys. Res. Lett. doi: 10.1029/2009GL040635 (2009)

A craft orbiting the Moon has discovered an apparent 65-metre-wide opening into a deep lava tube, offering a possible site for a station from which to travel farther into space.

Junichi Haruyama of the Japanese Institute of Space and Astronautical Science in Sagamihara and his team estimated from shadows that the tube is 80–88 metres deep, enough to shield a space outpost from meteors.

The tube is in the Marius Hills region of a volcanic province on the near side of the Moon. The SELENE polar orbiter, which operated from September 2007 until June this year, photographed the tube with a terrain camera and a multi-beam imager.

R. ANDREWS

NEUROLOGY

Impossible movements

Proc. Natl Acad. Sci. USA doi: 10.1073/pnas.0907151106 (2009)

Scientists can alter people's perception of their bodies by playing with their sensory input, for example by using trick mirrors or touch. Now Lorimer Moseley of the Prince of Wales Medical Research Institute in Sydney, Australia, and Peter Brugger of University Hospital Zurich in Switzerland show that the sensation of having impossible bodily forms can be generated using thought alone.

The team asked seven amputees who have a phantom arm to perform a wrist movement with the phantom limb that would be impossible with an actual wrist. Four were able to learn the movement, which induced a change in body image and made some previously easy movements of the phantom arm more difficult.

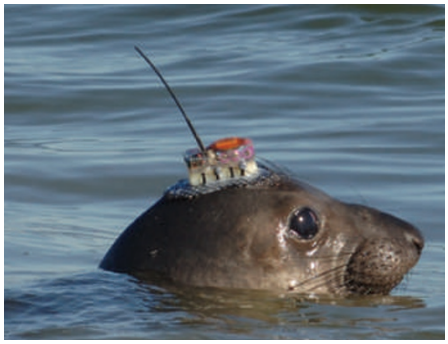
ANIMAL BEHAVIOUR

Deep sleep

Biol. Lett. doi:10.1098/rsbl.2009.0719 (2009)

Northern elephant seals (*Mirounga angustirostris*) spend months at sea, surfacing only briefly between 20-minute dives. Yoko Mitani of Hokkaido University in Japan and her colleagues attached data recorders to six animals (see picture, below) to see if they could be resting on 'drift dives', which involve little or no active swimming.

During such dives, they found, the seals descend rapidly to at least 135 metres, then roll onto their backs and drift downwards, wobbling like a falling leaf. This slows the descent rate significantly.



The authors suggest the seals dive quickly to below where killer whales and great white sharks normally hunt and then go belly-up to avoid sinking too far into the depths while they nap.

ECOLOGY

Boom and bust

Ecol. Lett. doi:10.1111/j.1461-0248.2009.01391.x (2009)

In an ecological system with two predator and two prey species, theory predicts two ways in which the species' population dynamics can become coupled. If both predators eat both prey, then prey populations will oscillate together, booming when predators are rare and crashing when predators, faced with a prey glut, boom in turn. But if each predator eats a separate prey, and the two prey species compete, theory says the prey populations will oscillate out of sync from one another, as first one, then the other, dominates resources.

Jef Huisman of the University of Amsterdam and his colleagues studied eight years of measurements from a Baltic Sea plankton community maintained in a laboratory. From amid the chaos of thousands of population measurements, they were able to discern for the first time in real life two coupled predator–prey cycles oscillating out of sync, showing strong effects of prey competition.

Correction

The Research Highlight 'Galaxy size matters' (*Nature* **461,** 1177; 2009) gave the wrong distances for the 225 galaxies surveyed by Sune Toft and his colleagues. They are actually between 4.4 billion and 5.9 billion parsecs from Earth.

JOURNAL CLUB

Jan Zaanen
Leiden University, the Netherlands

A theoretical physicist journeys to a hairy black hole's horizon.

Rumour has it that Steven Spielberg is producing the ultimate science fiction movie, using state-of-the-art general-relativity simulations to create a realistic image of the warped space-time near a black hole. But wouldn't it be great to see such worlds in real life? In fact, you can: by extending your eyesight with 'AdS/CFT', a mathematical result of string theory that describes a 'through the looking-glass' experience that would embarrass the imagination of Lewis Carroll.

AdS/CFT states that information about the strange world of the black hole is, in a very indirect way, encoded in or 'imaged' by the properties of certain quantum-weird forms of matter. Scientists realized recently that these 'quantum critical' states of matter are routinely produced in condensed-matter laboratories. But a particular prediction of AdS/CFT made the string theorists nervous: the event horizon of the special black hole that is imaged by the quantum critical electrons seems to imply that the latter should show a macroscopic entropy at zero temperature. It has further been predicted that the black hole would be unstable and would eventually suck up 'stuff' from its surroundings, covering its horizon with 'hair' (S. A. Hartnoll *et al. J. High Energy Phys.* **2008,** 015; 2008). In the electron system, out of the blue and at a quite low temperature, some unexpected order will set in that removes the ground-state entropy, giving it a unique ground state.

Intriguingly, I learned the other day that condensed-matter experimentalists, unaware of the string theorists' nervousness, are now in the grip of the same idea. The latest thermodynamic experiments on quantum-critical electrons are suggestive (albeit inconclusive) of a developing zero temperature entropy — for the experimentalists, a catastrophe — interrupted at a very low temperature by the onset of an exotic quantum liquid crystalline order (Z. Fisk *Science* **325,** 1348–1349; 2009). It may be that we don't need spacecraft or Spielberg to visit black holes, just a little patience with the condensed-matter experimentalists.

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