# RESEARCH HIGHLIGHTS

PARTICLE PHYSICS

## Neutrinos on ice

*Phys. Rev. Lett.* **99,** 171101 (2007)

A large-scale experimental simulation has bolstered an ambitious project to detect neutrinos from space as they hit huge swathes of polar ice.

Neutrinos can provide insights into fundamental physics and stellar nuclear fusion. But because they barely interact with matter, they are very hard to detect.

The project, called ANITA (pictured right), aims to use balloon-borne detectors to scour the Antarctic ice sheets for radio-frequency Cerenkov emissions produced by charged particles kicked up by the incoming neutrinos. But these emissions had not previously been detected in ice.

Using the Stanford Linear Collider to fire neutrinos into a 7.5-tonne block of ice, Peter Gorham of the University of Hawaii and his colleagues have verified that these Cerenkov emissions are indeed produced in ice and can be detected with the balloon instruments.

J. KOWALSKI

BIOLOGY

## Changed in a flash

*Proc. R. Soc. B* doi:10.1098/rspb.2007.0966 (2007)

A predatory coral-reef fish called the bluestriped fangblenny (*Plagiotremus rhinorhynchos*) swiftly changes colour — from various earth tones to black with an electric-blue stripe (pictured below) — to camouflage itself as a harmless fish species.

The ability to change colour was already known, but Karen Cheney and her colleagues at the University of Queensland in Australia have now shown that it occurs when the fangblenny swims among the fish it mimics — juvenile cleaner fish (*Labroides dimidiatus*). In so doing, the fangblenny can approach fish that are expecting to be cleaned, and then take a bite out of them.

The researchers caught fangblennies from the Great Barrier Reef, and observed them in tanks with both cleaner fish and other types of fish. Their findings are the first to show that a vertebrate will switch its colour back and forth depending on the presence of the mimicked species.

K. CHENEY

ANIMAL BEHAVIOUR

## Breaking the rule

*Proc. R. Soc. B* doi:10.1098/rspb.2007.1056 (2007)

'The island rule' is an old saw of ecology. Small mammals on islands evolve bigger body size than their mainland counterparts; large mammals shrink. The rule recently grabbed attention when people delighted in visions of Flores Island in the Pleistocene, during which miniature humans (*Homo floresiensis*) might have hunted giant rats and lizards.

In the most rigorous test yet of this hypothesis, Shai Meiri of Imperial College, London, and his colleagues looked at 1,184 island–mainland population pairs both separately and in an analysis that took into account their phylogenic relationships. They found that the island rule does not hold true across all mammals. It does seem to hold for some groups: mice are often bigger on islands and deer are often smaller. The fact that these groups have many members may have swamped the data set and given rise to an overgeneralization.

MICROBIOLOGY

## Crowd control

*PLoS Biol.* **5,** e302 (2007).

The shape of the bacterium *Escherichia coli* might have evolved to cope with life in tight spaces, researchers suggest.

Bacteria can fill tiny cracks and crevices with ordered colonies united by an active cell-to-cell communication system. Andre Levchenko of Johns Hopkins University in Baltimore, Maryland, and Alex Groisman of the University of California, San Diego, and their colleagues observed *E. coli* cells as they colonized chambers in a microfluidic device, which is designed to force fluids into tiny spaces.

Simulations based on their observations showed that the length-to-width ratio of the bacteria enables cells to avoid a traffic jam or being damaged by other cells while leaving the confining chambers of the device. The organization of the colony also helps to maintain nutrient flow to every cell.

GENOMICS

## A head-scratcher

*Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.0706756104 (2007)

Fungi associated with human dandruff have suprising similarity to other skin-colonizing organisms, genome sequences reveal. This insight might lead to targets for treatment of various skin disorders.

Tom Dawson of Proctor and Gamble and his collaborators sequenced the genomes of *Malassezia globosa* and, less thoroughly, *Malassezia restricta*. They then compared the sequences with those of a closely related plant pathogen, *Ustilago maydis*, and a distantly related human pathogen, *Candida albicans*, which causes thrush.

Despite an overall genomic similarity, *U. maydis* and *Malassezia* differ in the proteins they secrete. *Malassezia* secretes proteins that metabolize lipids and fats from the host's skin that are similar to those of the distantly related *C. albicans*, probably because they evolved to live in similar niches.

Researchers also discovered that *Malassezia* might be able to reproduce sexually.

NANOTECHNOLOGY

## Tiny tunes

*Nano Lett.* 10.1021/nl0721113 (2007); *Nano Lett.* 10.1021/nl0714839 (2007)

Two groups of researchers have constructed radios out of nanotubes.

Alex Zettl and his colleagues at the University of California at Berkeley exposed a nanotube with a charged tip to radio waves. The waves cause the tip to vibrate, and when the frequency of the incoming wave matches the resonance frequency of the tube, the device can convert the transmission into an audible signal.

Meanwhile, Chris Rutherglen and Peter Burke of the University of California, Irvine, developed their own nanotube radio by exploiting the nonlinear current–voltage characteristics of a single-walled carbon nanotube that was fixed to electrodes at both ends.

Zettl's team picked up the Beach Boy's song Good Vibrations on their machine, and Burke's team broadcast harp music from Turlough O'Carolan, a blind musician from the seventeenth century.

IMMUNOLOGY

## It's not you, it's your protein

*Nature Immunol.* doi:10.1038/ni1527 (2007)

The success of bone-marrow transplants could depend on a mouse protein called Sirpa. Jayne Danska at the Hospital for Sick Children Research Institute in Toronto, Canada, and her colleagues explain why one strain of mice with a mutation that severely compromises its immune system can accept bone marrow, whereas other strains with the same mutation kill the invading cells.

The team's special strain of mice boasts a version of Sirpa that silences the immune system's onslaught. Adding this version to immune cells in a Petri dish allows bone-marrow cells grown with them to flourish and produce blood cells. Found on host macrophages, Sirpa recognizes a protein on bone-marrow cells called CD47.

The researchers hope to determine whether the 10 or more versions of Sirpa found in human populations can explain transplant failures between seemingly matched patients.

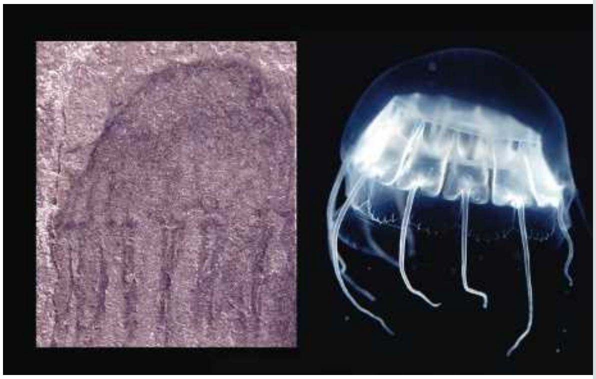
PALAEONTOLOGY

## Ancient jellyfish

*PLoS ONE* **2,** e1121 (2007)

The discovery of jellyfish fossils dating from about 500 million years ago (pictured below left) shows that the complex invertebrates evolved much earlier than was previously thought. Four types of jellyfish, peeled from the shale of northwestern Utah, are the earliest known definitive examples of these animals. Previously, the earliest jellyfish fossils came from Pennsylvania shale quarries and were dated to about 320 million years ago.

Lead author Paulyn Cartwright of the University of Kansas in Lawrence says that the new fossils from the Marjum Formation reinforce the view that relatives of today's drifting marine life (pictured below right) also lived during the Cambrian period.



B. LIEBERMAN; K. RASKOFF

NANOCHEMISTRY

## Gene boxes

*J. Am. Chem Soc.* **129,** 13376–13377 (2007)

DNA is emerging as an ideal material for construction of nano-objects because it can be programmed to self-assemble into double-stranded segments according to its base sequence. But building three-dimensionally with DNA has generally been cumbersome and messy. Making objects that are topologically complex, such as cubes, has required many synthetic steps and has given only a low yield.

Faisal Aldaye and Hanadi Sleiman of McGill University in Montreal, Canada, have now developed a versatile way to make various DNA polyhedral nanostructures at a stroke. They create prefabricated polygonal rings of single-stranded DNA, which can then be efficiently linked into cage-like shapes with the addition of complementary linking strands. One of these cages can even change shape.

# JOURNAL CLUB

**Clive R. Bagshaw**
**University of Leicester, UK**

**A biochemist is excited by a universal glue for molecular biology.**

Investigating the dynamic properties of proteins at the level of a single molecule allows insight into properties that are masked in ensemble studies. I have often found that the hardest part of such studies is immobilizing the molecule on a silica surface in a 'permanent' way that retains the molecule's function.

The proteins we investigate are usually prepared with a His-tag — comprising 6+ engineered histidine residues — that binds, via a chelated nickel ion, to nitriloacetic acid (NTA), aiding purification on an NTA affinity column. Immobilization through this tag would therefore be an attractive option. But alas, this is only partly successful using the standard NTA group because proteins have a significant probability of detaching from the silica support on the timescale of minutes.

But surely a chemist somewhere has improved on this technology? Thanks to Google, I found the work of Jacob Piehler who, in 2005, introduced tris-NTA, a cyclam ring with three groups attached to it. Tris-NTA shows a thousand-fold higher affinity for His-tags in the presence of nickel than NTA and a dissociation half-life of many hours.

Piehler and colleagues have gone on to exploit this technology as a general means of attaching fluorophores to His-tagged proteins and, most recently, as a convenient way of specifically conjugating proteins to streptavidin (A. Reichel *et al. Anal. Chem.* doi:10.1021/ac0714922; 2007).

The streptavidin–biotin complex is another widely-used 'glue' in biotechnology, but the use of an intermediate tris-NTA–biotin adaptor broadens its application to His-tagged proteins and renders the attachment reversible on addition of excess imidazole. I look forward to using this technology in our single-molecule studies, for which such a reversible glue has the same appeal as a Post-It note.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**