

RESEARCH HIGHLIGHTS

The long bask

Curr. Biol. doi:10.1016/j.cub.2009.04.019 (2009)

The question of where basking sharks — the world's second largest fish — in the western Atlantic go in winter has been answered.

Gregory Skomal of the Massachusetts Division of Marine Fisheries in Oak Bluffs and his colleagues tagged 25 basking sharks (*Cetorhinus maximus*) with temperature, depth and light-level recorders that popped off after a given interval. Reconstructing six of the creatures' travels, the researchers found that the sharks covered distances of about 9,000 kilometres and dived to depths of up to 1,000 metres, heading to deep tropical waters in the winter.

The sharks were formerly thought to be restricted to temperate waters, and the researchers are not sure why they travel so far. Perhaps, they speculate, their young are born deep in the tropics.

For a longer story on this research,
see <http://tinyurl.com/pwusgt>.



L. PITKIN/NHPA

ECOLOGY

Bouillabaisse

Glob. Change Biol. doi:10.1111/j.1365-2486.2009.01875.x (2009)

A study of larvae of fishes off southern California has shown for the first time how climate change can affect the distribution and abundance of species.

Chih-Hao Hsieh, now at the National Taiwan University in Taipei, and his colleagues studied 34 species. When comparing data from a cooler period of 1951–1976 with those from a warmer time of 1977–1998, the team found a significant shift in the vertical or lateral distribution of 16 species, and that eight species had shifted their larger geographical distribution. The plankton-eating fishes typically sought cooler waters.

Surprisingly, the group found an overall increase in abundance, and that offshore fishes moved closer to shore. Thus climate change can drive species into new habitats, which could have unexpected ecological consequences.

ASTRONOMY

Strange star

Astrophys. J. **697**, L63–L67 (2009)

Astronomers have spotted a star with an unique mix of chemical elements in the Milky Way's halo, suggesting that stars in the Galaxy's outer reaches are more varied than previously believed.

David Lai of the University of California, Santa Cruz, and his colleagues studied 27 stars

in the Galactic outer halo, some 50,000 light years from Earth and beyond. Spectral analysis of one star's light showed that it contains high amounts of calcium relative to other elements such as iron and magnesium.

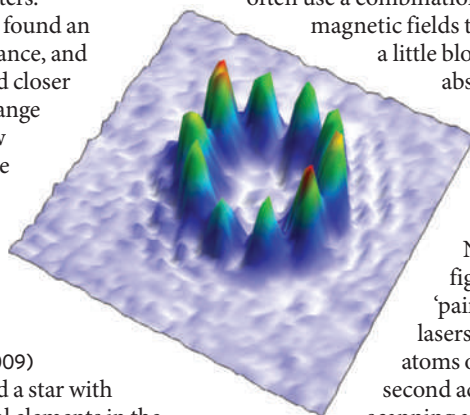
The authors say that the star may have been accreted into the outer halo from another nearby star system, suggesting that the Galaxy's history is more dynamic than thought.

QUANTUM PHYSICS

Atomic painting

N. J. Phys. **11**, 043030 (2009)

Bose–Einstein condensates (BECs) are clouds of ultracold atoms that behave as a single, giant quantum object. Physicists often use a combination of laser light and magnetic fields to trap and then cool a little blob of atoms to near absolute zero.



Malcolm Boshier and his colleagues at Los Alamos National Laboratory in New Mexico have figured out how to 'paint' a BEC using two lasers. The first traps the atoms on a flat canvas; the second acts as a paintbrush, scanning a desired shape and cooling it until a BEC forms.

The group can make a BEC of rubidium atoms in any shape (example pictured left), for use in fundamental studies or quantum information processing.

GEOSCIENCES

The forever landscape

GSA Bulletin **121**, 688–697 (2009)

The rough surface of Israel's Negev Desert has the slowest rates of erosion ever measured, according to Ari Matmon of the Hebrew University of Jerusalem and his colleagues. His team calculated the speed of erosion there by measuring the concentration of the radioactive isotope beryllium-10 in chert clasts — little stones — collected from sites in the Negev. This isotope is formed when cosmic rays hit rocks and soils, so its concentration can indicate how long an object has been exposed to the sky.

This technique, along with others, suggests that the bits of chert covering parts of the Negev, Sinai, Sahara and Arabian deserts have been sitting there for upwards of 2 million years, making this landform the longest-lived one on Earth according to current measurements.

IMAGING

Seeing beyond skin deep

Science **324**, 804–807 (2009)

A team led by Roger Tsien of the University of California, San Diego, reports that it has engineered the first protein that emits infrared light and can be used to image intact animals.

Existing fluorescent proteins are excited by shorter wavelengths, which don't penetrate far into animals' bodies. The new proteins were made from a light-detecting pigment called a phytochrome from the bacteria *Deinococcus radiodurans*. The phytochrome

M. BOSHIER

naturally incorporates a green pigment, biliverdin, that is abundant in animal tissues. Tsien's team modified the phytochrome so that it rigidifies biliverdin, which then absorbs far-red light and emits infrared light.

The researchers showed that the modified phytochrome can be used to image an animal's inner tissues, such as the liver, and say that it could be useful in fields such as cancer and stem-cell research.

MATERIALS

Everlasting memory

Nano Lett. doi: 10.1021/nl803800c (2009)

The data packed as magnetic regions on hard disks will fade in just a few decades, as atoms vibrate and reorient themselves.

But an iron nanoparticle sheathed inside a carbon nanotube could form a protected data element, whose position would remain stable at room temperature for more than a billion years, report Alex Zettl of the University of California, Berkeley, and his team.

By applying an electric pulse, the researchers controllably shift the nanoparticle back and forth. Its position — corresponding to a '0' or a '1' — can be easily read by measuring electrical resistance across the nanotube.

A device made of bundles of individually positionable nanotubes could form an ultra-high-density data store, readable for any practical time scale, the researchers think.

POLYMER CHEMISTRY

Doughnut machine

Angew. Chem. Int. Edn doi:10.1002/anie.200900533 (2009)

In solution, block copolymers — different types of synthetic polymer linked together — spontaneously cluster into a dazzling variety of shapes, including spheres, cylinders, discs and helices. Lately, even ring doughnuts (toroids) have been observed — but never alone, and always of varying size.

Taihyun Chang and his colleagues at Pohang University of Science and Technology in Korea have now hit on a recipe of copolymer and solvent that for the first time produces pure, almost uniform toroids — all about 70 nanometres in diameter and with a ring about 30 nanometres thick in cross-section. They are stable in solution for several months.

It is not clear how these doughnuts form; potential applications include use as templates for nanometre-scale patterning. For example, the researchers use them as a template to grow rings of gold nanoparticles around the doughnuts' edges.

MICROBIOLOGY

On the surface

PLoS Pathog. 5, e1000407 (2009)

The bacterium associated with stomach ulcers creates a habitable environment by clinging to human cells and interfering with their polarity.

Helicobacter pylori avoids the stomach's lethal acidity by colonizing a thin layer of mucus that coats stomach epithelial cells. These cells are polarized — that is, the outside surface facing the stomach and the inside surface, which backs onto the underlying tissue, have different properties.

Manuel Amieva and his colleagues at Stanford University in California found that the bacterium can thrive when attached to these cells in culture, even when the culture medium lacks nutrients normally required for survival. However, *H. pylori* mutants that lacked a protein called CagA were not able to colonize the outside surface of these cells. CagA is known to alter the polarity of epithelial cells, presumably making the outside surface of the cells more like the inside surface, and thus making them colonizable.



CONSERVATION

Amphibian additions

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0810821106 (2009)

Madagascar is a biodiversity hotspot but, according to David Vieites of the Spanish National Research Council (CSIC) in Madrid and his colleagues, it may be even hotter than we think.

They sequenced the DNA of 2,850 amphibian specimens collected from more than 170 locations on the island. Analysis of these sequences suggests that at least another 129 amphibians remain to be described on Madagascar, including the frog pictured above.

At a maximum, the authors say, there may be 221 species missing from current records. This would represent an increase of almost 100% on the 244 described so far and an increase of 250% since 1991.

M. VENCES

JOURNAL CLUB

Lee Turnpenny

University of Southampton, UK

A stem-cell researcher considers an accusation of dullness.

How might hard-working scientists react to an accusation that 'modern scientists' are 'dull', as is provocatively postulated in a March editorial of the non-peer-reviewed journal *Medical Hypotheses* (B. Charlton *Med. Hypotheses* 72, 237–243; 2009). With offence? Humour? Ambivalence? Or, perhaps, in response to a jeremiad bemoaning our apparent insufficient intelligence and creativity, we might retort, "So what? Tell us something we don't know."

Because, it seems to me, most working scientists have either long since accepted that they are not of the 'revolutionary' type exemplified by greats such as Isaac Newton, Charles Darwin and Albert Einstein, or never strived to be. Gaining and retaining employment in academia is hard enough. Yes, we are of the persevering and conscientious 'normal' type — if we weren't, nothing would get done.

We know there is too much bureaucracy. And yes, there is a lot of repetitive, boring, tiresome, problematic work to be done that is unlikely to shift any paradigms (yet), but important nonetheless. Whether or not somehow creating more windows of opportunity for would-be geniuses possessed of the requisite levels of selfishness and creativity would lead to significant changes in direction is debatable. But the drudge is always necessary in a multidisciplinary collaborative enterprise.

It's not that scientists are dull per se. Rather, instead of being the 'clever crazy' type that might belong in an institution, we labour in an institutionalized occupation that demands we play by certain rules. We know we're not going to change the world, but we like to think we can contribute to the sum of knowledge. Providing we can first convince our peers. If it was easy, everybody would do it. One might add, complaining that modern science can be dull, although valid, isn't exactly a 'revolutionary' idea. Tell us something original, eh?

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