RESEARCH HIGHLIGHTS

Lifting a whale

Phys. Rev. Lett. **100,** 054502 (2008)
Engineers at Harvard University have worked out how the bumpy edge of humpback whales' pectoral fins helps the animals to perform underwater rolls and loops without stalling.

Stalling happens when a hydrofoil — in this case, a fin — climbs through a fluid at too steep an angle. This causes the flow to separate from the hydrofoil's upper surface, removing the low pressure there that causes lift.

Ernst van Nierop and his colleagues' calculations show that a bumpy fin inhibits separation of the turbulent fluid layer close to the fin surface, delaying stall to higher angles and making its onset more gradual than if the fin were smooth in shape. The lessons learned from humpbacks might be applied to wings, boats and turbine blades, they add.

P. ATKINSON/NHPA

CHEMICAL BIOLOGY

Adding an adaptor

Nature Chem. Biol. doi:10.1038/nchembio.73 (2008)
A team at the Medical Research Council in Cambridge, UK, has found a way to get cells to genetically encode the amino acid lysine with an acetyl group attached. The addition or removal of this chemical group influences a host of cellular processes, and this work paves the way for researchers to probe its involvement further.

In nature, there are 64 'codon' combinations encoding just 20 amino acids, so the code carries redundancies that synthetic biologists can exploit. Several teams have already created synthetic amino acids with no real biological significance.

Jason Chin and his colleagues used the same method of re-engineering a transfer RNA molecule, which acts as an adaptor linking each amino acid to its codon, to extend the code. But because acetylated lysines have a role in modifying how genes are expressed, and are found in p53, a protein that is associated with many cancers, this research should prove more useful.

The authors also found a way to prevent cells from removing the acetyl group after proteins had been synthesized.

ASTRONOMY

Distant inflow

Astrophys. J. **674,** 151–156 (2008)
Large inflows of gas helped to fuel star formation in galaxies in the early Universe, according to a new model. Such galaxies thrived when the Universe was only 2 billion to 3 billion years old, and were hotbeds of star birth. Although astronomers have observed gas blasting out of them, measuring the inflow of gas has proved difficult.

To maintain high rates of star formation, gas must enter galaxies at roughly the same rate that it exits or forms stars, points out Dawn Erb of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. Her model takes the Kennicutt–Schmidt law — widely used in studies of nearby galaxies to relate the density of gas in a galaxy to the amount of star formation — and considers its implications for distant galaxies.

The gas influx that the model predicts cannot be detected with current instruments. It may be the limiting factor in star formation, and thus important in the evolution of far-off galaxies, Erb adds.

GENOMICS

Inactive binding

PLoS Biol. **6,** e27 (2008)
Researchers may have been misinterpreting the results of a method that is used to identify DNA regions involved in turning genes 'on' and 'off'.

The technique, known as ChIP-chip, isolates DNA sequences bound by proteins called transcription factors, which control gene expression. Michael Eisen and Mark Biggin at the Lawrence Berkeley National Laboratory in Berkeley, California, and their colleagues have demonstrated that transcription factors often bind DNA without changing gene expression.

They used ChIP-chip to study the binding sites of six proteins that control early embryonic development in the fruitfly *Drosophila melanogaster*. The proteins attached themselves to thousands of sites in the genome — a number that greatly exceeds that of the genes thought to be under these proteins' control. Further analysis indicated that the proteins bound less strongly to sites where they did not seem to affect the expression of neighbouring genes.

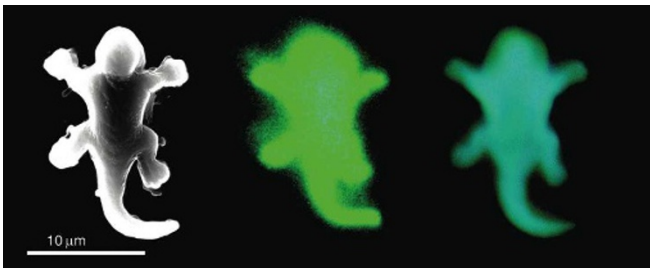
LITHOGRAPHY

Luminous lizards

Adv. Mater. doi:10.1002/adma.200702035 (2008)
Xuan-Ming Duan at the Chinese Academy of Sciences in Beijing and his colleagues have made fluorescent bull and lizard sculptures (pictured below) not much bigger than red blood cells. The tiny creatures luminesce either green or blue.

The team had already honed a technique to fashion three-dimensional sculptures, such as these animals, using a laser to pierce a translucent viscous resin. Where the laser is focused, it sets off a polymerization reaction that hardens the resin.

This time, the researchers mixed



WILEY-VCH

fluorescent nanoparticles into the goo. They found they could vary the sculptures' colours by altering the size of the nanoparticles and the tightness of the resin molecules' weave. Their animal creations are offered as proof of principle for a means of making miniature light-emitting electronics.

NANOTECHNOLOGY

Wires of code

Nature Nanotech. doi:10.1038/nnano.2008.4 (2008)

DNA's electrical properties are similar to those of graphite, report researchers in the United States who wired strands of DNA into electrical circuits and measured their conductivity. This is because both structures contain stacks of aromatic, or ring-shaped, organic molecules that have clouds of delocalized, floating electrons.

Colin Nuckolls at Columbia University in New York, Jacqueline Barton at the California Institute of Technology in Pasadena and their colleagues took a tiny electrical circuit made from carbon nanotubes and snipped it open. They then bridged the gap by attaching a stretch of DNA, modified with amine groups, through covalent bonds. They measured current flowing through the altered circuit, and compared it with the current that had flowed through the original nanotube circuit.

The findings help demonstrate that DNA could be used to turn biochemical processes into electrical signals on a very small scale.

OPTICS

Tiny holograms

Nature Photon. doi:10.1038/nphoton.2007.300 (2008)

Two scientists at Johns Hopkins University in Rockville, Maryland, have developed a way to create high-resolution three-dimensional holographic images of fluorescing samples under a microscope.

Typically, holograms are generated with a device called a laser interferometer, in which light from a reference beam interferes with that reflected by an illuminated object. But this technique is slow and can create only fuzzy holograms of microscopy samples.

Joseph Rosen and Gary Brooker used a technique known as Fresnel incoherent correlation holography, which can create a holographic interference pattern quickly, using light from a simple electric bulb. The duo captured the interference pattern with a digital camera and used computer software to recreate the hologram. Brooker says that the technique is simple, relatively inexpensive, and might one day be used to show the motion of microscopic samples in real time.

CHEMISTRY

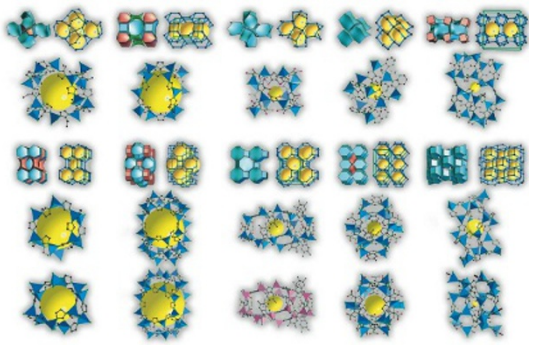
Carbon suckers

Science doi:10.1126/science.1152516 (2008)

Using techniques pioneered in drug development, researchers have synthesized metal–organic 'sponges' with an "extraordinary capacity" for storing CO_2.

Rahul Banerjee and Omar Yaghi at the University of California, Los Angeles, and their co-workers created 25 crystals called zeolitic imidazolate frameworks (ZIFs) by bringing together tiny amounts of ingredients in thousands of separate microreactions on glass plates. The method, they say, allowed the creation of structural arrangements never before seen in ZIFs (pictured below). Of the frameworks they created, 16 had new compositions and 5 had new topologies.

Three of the sponges show an amazing affinity for separating CO_2 from CO, outperforming the two previously known ZIFs and the forms of activated carbon that are currently used, for example in detergents and for refining petrol.



O. Y. YAGHI

ENVIRONMENTAL SCIENCE

Leaden appetite

J. Wildl. Manage. **72,** 240–245 (2008)

During the elk-hunting season, common ravens (*Corvus corax*) in the Jackson Hole valley in Wyoming can have more than five times the concentration of lead in their blood than they do at other times of year.

Researchers Derek Craighead and Bryan Bedrosian of Craighead Beringia South, a non-profit conservation research outfit in Kelly, Wyoming, followed the birds for a 15-month period that included two hunting seasons. They think that hunters' lead bullets fragment into hundreds of tiny pieces when they hit animals such as elk, whose carcasses ravens later eat.

The authors argue that humans and other animals that consume hunted meat might also be ingesting unsafe levels of lead.

JOURNAL CLUB

Genevieve Almouzni
The Curie Institute, Paris, France.

An expert in chromosome organization considers yeast in a new light.

As somebody who studies how DNA is packaged so that it fits inside the nucleus, and how this protein parcelling adds to the information held in the sequence of DNA bases, my work has focused on frogs and mammals. Brewer's yeast (*Saccharomyces cerevisiae*) is one of the simplest organisms with nuclei. It has proved useful to researchers like me when considering subtle influences on gene expression that are also found in higher organisms.

But we have not found a yeast 'counterpart' for some mechanisms, such as those that rely on RNA to regulate gene expression. One example is RNA interference, by which genes are 'silenced' through destruction of the messenger RNA molecules that would otherwise convey protein 'recipes' from the nucleus to the cytoplasm. But this does not rule out similar effects on gene expression by other means, as Françoise Stutz and her colleagues at the University of Geneva in Switzerland have found (J. Camblong *et al. Cell* **131,** 706–717; 2007).

This team stumbled across silencing of a different sort when they left plates of yeast to divide for varying amounts of time. They found that older yeast cells expressed a gene called *PHO84* less than did younger cells, and that as the amount of mRNA encoding the Pho84 protein decreased, the level of an antisense (or mirror-image) version of this mRNA increased. A series of experiments led them to propose a mechanistic model in which tuning the RNA degradation machinery stabilizes the antisense transcripts, promoting modifications of chromatin — the DNA–protein complexes that make up chromosomes — and, in turn, regulating gene expression.

No one yet knows how common this effect is in yeast, nor whether it occurs in more complex life-forms. But this paper does serve as a lesson to revisit our assumptions.

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