RESEARCH HIGHLIGHTS

Oily snack

J. MORGAN/ALAMY

Nature Biotechnol. doi:10.1038/nbt1232 (2006)

A marine bacterium that guzzles oil has had its genome sequenced, offering the first complete guide to how such bacteria thrive. This should help environmental scientists work out how to promote the growth of such bacteria in oil spills, so speeding the pollution's clean up.

Vitor Martins dos Santos of the German Research Centre for Biotechnology in Braunschweig and his colleagues studied *Alcanivorax borkumensis*, a microbe that feeds exclusively on oil. Its genome contains sequences that encode surfactants, for example. Part water- and part oil-soluble, these surfactants would help break up the oil. The researchers also identified previously unknown enzymes that might have applications in industry.

NEUROBIOLOGY

Enhanced sense of smell

Cell **126,** 403–413 (2006)

Some remarkable cross-chromosome canoodling explains how each neuron in the mouse nose manufactures only one of the 1,300 receptor proteins for detecting smell, according to new research.

Using fluorescent labels, Richard Axel and his colleagues at Columbia University, New York, show that a known DNA 'enhancer' region on one chromosome is associated with the single, active copy of a smell receptor gene on a different chromosome.

The researchers propose that the control region randomly interacts with and switches on just one receptor gene in each neuron. Mice genetically engineered to carry extra enhancers manufactured more receptors.

This type of gene regulation might also control the expression of other gene families.

CIRCADIAN BIOLOGY

Clock of ages

Genes Dev. **20,** 1868–1873 (2006)

The body's internal clock is linked to how quickly we age, according to researchers in the United States.

Marina Antoch and Roman Kondratov of the Cleveland Clinic Foundation, Ohio, and their colleagues studied mice lacking the *Bmal1* gene, which encodes a core component of the circadian clock. The mice lived, on average, only half as long as normal mice and showed signs of premature ageing, such as muscle wasting, cataracts and decreased hair growth.

The accelerated ageing is likely to be caused, in part, by the fact that the mice were less able to neutralize free radicals, highly reactive molecules that damage tissue.

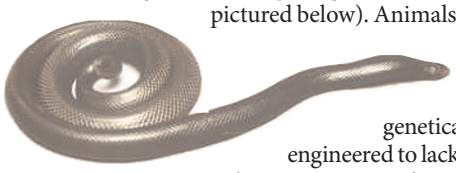
IMMUNOTOXICOLOGY

Once bitten...

Science **313,** 526–530 (2006)

Our immune system has a hitherto unheralded defence against the potentially deadly effects of toxic venom, biologists have discovered.

Researchers led by Stephen Galli of Stanford University School of Medicine in California injected mice with venom from the deadly burrowing asp (*Atractaspis engaddensis*, pictured below). Animals genetically engineered to lack the immune system's mast cells succumbed far more easily to the killer toxin.



Mast cells, the team shows, contain protein-digesting enzymes to combat toxic compounds, forming a crucial line of defence against snake bites and bee stings. The result is a surprise because mast cells, which can also trigger widespread and potentially damaging inflammation, had previously been viewed as the villain rather than the hero in the body's response to a bite.

ASTRONOMY

Explosive measuring tape

Mon. Not. R. Astron. Soc. **370,** 773–783 (2006)

Stellar explosions that astronomers had assumed to be clones of each other might stem from two different kinds of star, suggest Filippo Mannucci of the INAF Institute of Radio Astronomy in Florence, Italy, and his colleagues. This could mean that properties of the explosions, such as brightness, differ between them, which would affect how astronomers use these type 1a supernovae to measure distances in space.

The researchers studied how the rate at which supernovae happen depends on the age of the universe and the colour and nature of the galaxy in which they go off. They argue that these three data sets are best fitted by a model with two classes of type 1a supernovae: 'prompt' and 'tardy', relative to when the star formed — an idea they suggest should be further tested.

A. SHOOB, E. KOCHVA

MICROSCOPY

Time to relax

Proc. Natl Acad. Sci. USA **103,** 11440–11445 (2006)

Clever physics has helped Stefan Hell and his colleagues to picture tiny cellular features, such as the contents of compartments called endosomes, which are beyond the reach of

conventional light microscopes.

The team at the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany, had already developed a trick to boost the resolution of fluorescence microscopy from 200 nanometres — the diffraction limit — to around 60 nanometres (*Nature* **440,** 935–939; 2006).

Now the researchers show that pulsing the light used to excite the fluorescent dye can sharpen the resolution further. The pulsing pattern gives fluorescent molecules that would otherwise have become exhausted (a process known as photobleaching) time to relax, allowing the team to ramp up the laser's power and narrow the excitation beam. This made it possible to resolve features only 15–20 nanometres across.

MATERIALS CHEMISTRY

Designer glasses

J. Am. Chem. Soc. doi:10.1021/ja063353s (2006)

Researchers in Canada have figured out how to frustrate small organic molecules so that they won't form crystals. Instead, the molecules they design should form disordered glasses, useful for their optical properties.

Small organic molecules have been widely explored in crystal engineering, because they can be designed to self-assemble into specific crystalline arrays guided by intermolecular forces such as hydrogen bonding. Such designer crystals might be useful as molecular sieves or catalysts, for example.

James Wuest and his colleagues at the University of Montreal, Quebec, looked at how hydrogen bonding might, in contrast, be used to prevent crystallization. They devised molecules that form aggregates, which cannot easily be closely packed into regular arrays, and so do not crystallize.

VISION

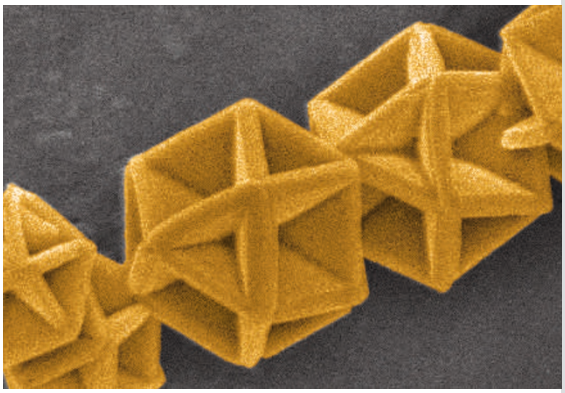
Are we missing something?

PloS Biol. **4,** e254 (2006)

Mammals are missing a photoreceptor protein found in other vertebrates, a new study has shown.

Vertebrate vision relies on opsins — proteins that transform light signals into electrical current in the outer retina. In the inner retina, photoreceptors that contribute to non-visual light responses, such as pupil constriction, depend on an opsin called melanopsin.

Jim Bellingham of the University of Manchester, UK, and his colleagues report that vertebrates other than mammals have two distinct melanopsin genes, rather than just one as was previously believed. The question now is: what are the functional consequences of having only one melanopsin? Until we find out, we won't know what we're missing.



ACS

CRYSTAL GROWTH

Star quality

Chem. Mater. doi:10.1021/cm060956u (2006)

Recipe for making geometric 'stars': dissolve copper nitrate in ethylene glycol, add sulphur and bake well. The result, report Shu-Hong Yu of the University of Science and Technology of China in Hefei and his co-workers, is microscopic crystals of copper sulphide that have a beautiful cuboctahedral form (pictured above), reminiscent of the cages drawn by M. C. Escher in his 1948 engraving *Stars*. They are composed of four intersecting hexagonal plates and contain 14 concave cavities.

RNA INTERFERENCE

Unwanted effects

J. Neurosci. **26,** 7820–7825 (2006)

Using RNA interference in brain cells can severely perturb the cells' function, report researchers from Harvard Medical School in Boston, Massachusetts. This reinforces concerns about side effects of the gene-silencing technique, highlighted in a number of recent studies.

In this work, Bernardo Sabatini and his colleagues added small RNA molecules known as short hairpin RNAs (shRNAs) to rat brain slices. Such shRNAs will silence any gene with a sequence that matches their own — through RNA interference. In this experiment, however, the chosen shRNAs targeted a sequence not found in the rat's genome, so they should have had no effect. But the treatment wreaked havoc, destroying or disturbing the connections between neurons.

The researchers think the damage was caused by an immune response.

JOURNAL CLUB

Ruth McKernan
Pfizer, Sandwich, UK

Pfizer's UK head of Discovery Biology is reminded that drug discovery is not all about science.

When I read a recent paper by Louis Staudt of the National Cancer Institute in Bethesda, Maryland, and his colleagues, it brought a lump to my throat.

As a drug-company researcher, I am always looking for better ways to find new drug targets. The paper (V. Ngo *et al. Nature* **441,** 106–110; 2006) described an elegant RNA-interference approach to identifying critical genes and pathways in B-cell lymphoma, a cancer of the lymph system.

But the work grabbed me for other reasons. It wasn't that *CARD11* — the gene that the team focuses on — offers a new approach to developing drugs for this kind of cancer. Or even that it set me thinking about how to modify the method, for application in other therapeutic areas. As a neuroscientist, I wondered whether I could use a similar approach to find genes that prolong the life of particular neurons in neurodegenerative disorders such as Parkinson's or Alzheimer's disease.

What distinguished this paper from others, for me, was the powerful reminder that drug discovery is not just about science — it's about people too.

When my father died of a B-cell neoplasm six years ago, just before the first draft of the human genome was published, we had little idea of the genes involved, far less any hope that a selective and specific treatment might one day be possible.

Behind every hopeful gene target are families such as mine. I know from experience that most approaches will fail, yet this paper and others like it represent hope for patients, and mark the pace of scientific progress.

So, when I finished reading it, I swallowed hard and returned to my work with a renewed sense of vigour.