RESEARCH HIGHLIGHTS

Leukaemia's origins

Science **319,** 336–339 (2008)

Cells that cause the most common form of childhood cancer, acute lymphoblastic leukaemia (ALL), have been identified. They could serve as a target for therapy, or may be useful for monitoring the likelihood of relapse after treatment.

Children with ALL often harbour a small population of cells with a characteristic chromosomal rearrangement. Tariq Enver at the University of Oxford, UK, and his colleagues found that a specific subset of these cells cause a leukaemia-like disease when transplanted into mice with deficient immune systems.

The researchers also found similar cells in a healthy child whose identical twin sister has ALL. These cells seem to be immature versions of the cancer-causing ones, and could become malignant if triggered by additional mutations, the authors propose.

MURPHY FAMILY

GEOLOGY

Magnetic attraction

Earth Planet. Sci. Lett. doi:10.1016/j.epsl.2007.12.006 (2007)

A four-decade-old core, taken from the sea floor off the coast of Antarctica, is revealing new details about how Earth's magnetic field operates at high latitudes.

The US Navy Ship *Eltanin* collected the 16-metre-long core from the bed of the Ross Sea in 1968. Samples from the core then sat in storage until they were studied by a group of researchers led by Luigi Jovane of the University of California, Davis. They argue that its palaeomagnetic history is one of the most detailed ever recovered from either polar region.

For instance, the core records larger-than-expected variations in the high-latitude magnetic field. These can be explained by vortices generated far beneath the polar regions.

ARCHAEOLOGY

One-tonne rat

Proc. R. Soc. B doi:10.1098/rspb.2007.1645 (2008)

The skull of an enormous but extinct rodent has been found in a boulder on the coast of southern Uruguay by Andrés Rinderknecht of the country's Museum of Natural History and Anthropology, and Ernesto Blanco of the University of the Republic, both in Montevideo.

At 53 centimetres long, the skull's size suggests that its owner weighed more than 1,000 kilograms, making it the largest rodent on record. By comparison, the world's largest extant rodent, the capybara, tips the scales at about 60 kilograms.

The new species has been named *Josephoartigasia monesi*. The size of its teeth suggest it probably lived on soft vegetation and fruit, and on the basis of dating of the rocks in which it was found, the skull is thought to be 2 million to 4 million years old.

CONDENSED-MATTER THEORY

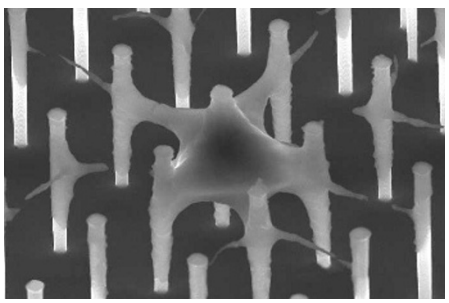
Drying drops

Europhys. Lett. **81,** 26006 (2008)

One way to make an extremely waterproof material is to dapple a chemically hydrophobic surface with microscopic pillars on which beads of water can perch. Mathilde Reyssat, now of Harvard University, and her colleagues have done exactly that.

The authors sprinkled water onto the surface of this substance and allowed the drops to evaporate. Eventually, as the drops became smaller, they collapsed, running down between the posts (pictured below, side-on).

Reyssat and her team found some curious effects. As the water droplets shrank, for example, they tended to flatten before jumping back into a spherical shape.



ZOOLOGY

Do the dance

Proc. R. Soc. B doi:10.1098/rspb.2007.1620 (2007)

A honeybee colony led by a promiscuous queen does better than one led by a faithful queen: the colony forages more, stores more food and grows faster. Heather Mattila and her colleagues at Cornell University in Ithaca, New York, think this happens because genetically diverse colonies dance more.

Honeybees 'waggle dance' to tell each other where to fly to find food. Mattila's team compared colonies in which the queen always bred with the same male to colonies ruled by a queen that had been inseminated by 15 drones. On average, worker bees from the latter category performed 36% more dances daily, kept waggling for 62% longer and communicated about food discoveries farther from the nest than did workers from single-father colonies.

ORGANIC CHEMISTRY

Remote control

Angew. Chem. Int. Edn doi:10.1002/anie.200704963 (2008)

An organic reaction that is widely used in industry should become even more useful now that chemists in Japan have managed to control which of two mirror-image versions of its products are made.

Hydrocarbon fragments attached to a magnesium atom and a halogen atom are known as Grignard reagents, and are common building-blocks in reactions that generate carbon–carbon bonds. But a mixture of 'right'- and 'left'-handed

versions of the same molecular structure is usually produced, causing problems for the pharmaceutical industry, which requires drugs to be of one particular form.

Toshiro Harada and Yusuke Muramatsu of the Kyoto Institute of Technology reacted Grignard reagents with aldehydes in the presence of a titanium complex. This generated only one of the two possible versions of the product, in fewer steps than other methods.

NEUROSCIENCE

Toxic length

Neuron **57,** 27–40 (2008)

Huntington's disease, an inherited neurodegenerative disorder, is caused by genes that encode an abnormally elongated version of the protein huntingtin. Work by Juan Botas of Baylor College of Medicine in Houston, Texas, and his colleagues challenges the prevailing view that this protein does its damage only after it has been cleaved by enzymes and imported into the nucleus.

Botas and his co-workers transferred the expanded gene that describes the abnormal protein in humans into fruitflies. They observed toxic effects on the flies' brain cells before they could detect the protein inside those cells' nuclei.

They then pinned down the neurotoxicity to increased neurotransmitter release triggered by unusually high concentrations of calcium ions in certain brain cells. Tinkering with other genes that regulate neurotransmitter and calcium dynamics suppressed some of the mutant protein's deleterious effects, they add.

MATERIALS SCIENCE

His dark materials

Nano Lett. doi: 10.1021/nl072369t (2008)

A 'super-black' material has been made by researchers at the Rensselaer Polytechnic Institute in Troy, New York. It reflects just 0.045% of all the light of a certain wavelength and is therefore the darkest synthetic material ever, according to the group, led by Shawn-Yu Lin.

The substance is composed of row upon row of vertically aligned carbon nanotubes of different lengths, most of which have multiple walls. This arrangement gives the material a rough surface with no repeating topology, and causes it to scatter light in random directions, which is what makes it extremely black.

The material is also very dark across the rest of the visible spectrum, with a reflectance ranging from 0.045% to 0.07% as the wavelength changes from 633 nanometres (red) to 457 nanometres (blue). Such properties could prove useful in devices to capture solar energy.

PALAEOPHYSIOLOGY

T. rex teen pregnancies

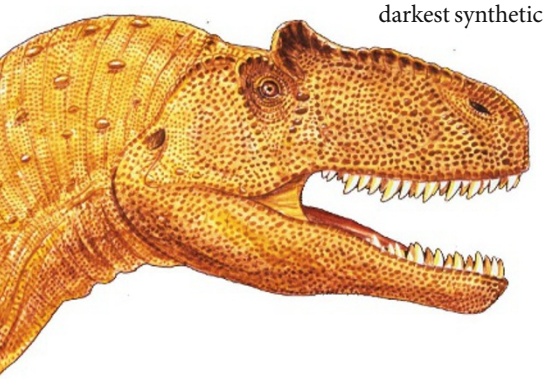
Proc. Natl. Acad. Sci. USA **105,** 582–587 (2008)

A new means of establishing sexual maturity in dinosaurs could finally settle the argument about whether they grew like big versions of modern lizards, or faster than such scaling would imply.

Andrew Lee, now at Ohio University in Athens, and Sarah Werning, of the University of California, Berkeley, have worked out the age by which two female dinosaurs had reached sexual maturity by looking at the specimens' medullary bones. Today, these short-lived tissues are found only in birds, where they provide calcium for developing egg shells, forming in the marrow cavities of females a few weeks before ovulation.

In 2005, another group reported medullary bones in a *Tyrannosaurus rex*, which was about 18 years old when it died. Lee and Werning's measurements of a *Tenontosaurus tilletti* (pictured right) and an *Allosaurus fragilis* (below) show that these species had reached maturity by 8 and 10 years of age, respectively. Had they grown like big lizards, these half-grown specimens would not have been fertile. The findings suggest that dinosaurs grew at rates more akin to today's birds and mammals than to reptiles.

B. KRZIC/NHMPL



JOURNAL CLUB

Hidde Ploegh
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An immunologist marvels at dendritic cells.

Dendritic cells ingest and process all manner of bacteria and viruses, and display the invaders' distinguishing structures so that other cells of the immune system 'know' what to 'look for'. No adaptive immune response can begin without them. For years I have been fascinated by the internal details of dendritic cells that enable them to handle this task.

One set of details concerns how these cells manage protein production and disposal, given that breaking down and presenting sections of foreign proteins are the cells' primary jobs. Last month, Hugues Lelouard and his colleagues at the University of the Mediterranean in Marseille, France, discovered that dendritic cells fine-tune the translation of messenger RNAs to proteins when they are activated by inflammatory stimuli (H. Lelouard *et al. J. Cell Biol.* **179,** 1427–1439; 2007).

The authors' stimuli of choice were lipopolysaccharides, signature molecules that indicate the presence of certain bacteria. Dendritic cells exposed to them showed a close correlation between the extent to which translation became more efficient and the increased formation of lumpy bodies similar to aggresomes, which is a prelude to the destruction of proteins. The authors then elucidated the biochemical steps that lead to enhanced translation of certain mRNAs when a dendritic cell becomes activated.

I consider it likely that the mRNAs in question are not randomly distributed throughout a dendritic cell's cytoplasm. If this is so, these cells may contain a 'translational hotspot' of requisite proteins and enzymes around each pathogen-containing vesicle, required for the orderly handling of the newly ingested microbe. The result might be the creation of an intracellular solid-state 'device' specifically for the processing and presentation of that microbe's antigens.

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