RESEARCH HIGHLIGHTS

Double fault

Geology **35,** 855–858 (2007)

Earthquakes in two separate fault systems in Southern California seem to be linked, with increased seismic activity in one zone being matched by a lull in the other.

James Dolan at the University of Southern California in Los Angeles and his colleagues say their data suggest that the release of strain in tectonic plates isn't entirely random, but is controlled by long-distance and long-term fault interactions. The researchers compared records of seismicity in a complex fault system under Los Angeles with records from a region to the northeast, the eastern California shear zone in the Mojave Desert (pictured).

The team is now drilling cores, checking faults and charting earth movement with global positioning systems to test the theory.

J. DOLAN

CLIMATE SCIENCE

Pouring over the past

Geophys. Res. Lett. **34,** L16707 (2007)

A 27-centimetre long stalagmite from a cave in central India has provided a 900-year record of rainfall from India's summer monsoon. The data span from 600 to 1500 ad, before instrumental records began.

The stalagmite, dated by analysis of uranium-series isotopes, suggests periods of substantially reduced monsoon rainfall that square with historical accounts of droughts and famines. Monsoon failures of this scale have not occurred during the 150-year instrumental period. The data pick out some of the same climate-related changes in the monsoon seen in records from marine sediments, stalagmites and pollen collected from elsewhere. Ashish Sinha of California State University, Dominguez Hills, in Carson and his colleagues suggest that differences between the records on shorter timescales are due to uncertainties in dating.

NANOTECHNOLOGY

Spare the rod

Nano. Lett. doi:10.1021/nl071615y (2007)

Rod-shaped nanoparticles can be sorted from a jumble of particles such as that pictured (right) with a technique borrowed from molecular biology, report researchers from the University of Mainz in Germany.

Carsten Sönnichsen and his colleagues found that gel electrophoresis, commonly used to separate DNA or proteins, also works on mixtures of silver nanoparticles coated with a charged polymer. On the whole, rod-shaped particles move more slowly through the gel than round or triangular particles.

Current synthesis techniques for silver nanoparticles typically produce all shapes at once. Filtering out the rods is desirable because they have applications in imaging and sensing. The researchers are now working to improve and scale up the technique.

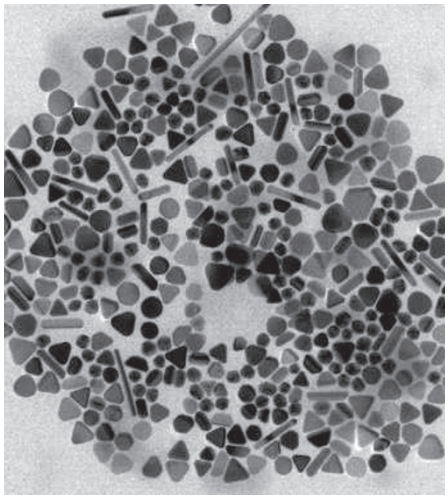
NEUROSCIENCE

One and the same

Science **317,** 1230–1233 (2007)

Researchers have shown that the learning and retrieval of a memory in mice have at least some neurons in common.

Mark Mayford and his colleagues at the Scripps Research Institute in La Jolla, California, created a transgenic mouse in which it is possible to tag and identify neurons that are active at different times. Mice engineered in this way were tested to identify neurons involved first in learning, and then later in retrieval, of a conditioned fear response. In the basolateral amygdala, a brain region important for emotional memory, some neurons were involved in both processes. Moreover, the number of reactivated neurons correlated with the strength of the contextual fear memory retrieval.



M. HANAUER/UNIV. MAINZ

ASTRONOMY

Brief encounters

Astrophys. J. **666,** 346–360 (2007)

A survey of more than two decades of radio-astronomy data has turned up a handful of mysterious objects, most of which appeared in only one of the once-weekly observations.

Geoffrey Bower and his colleagues at the University of California, Berkeley, reviewed 22 years' worth of data from the Very Large Array near Socorro, New Mexico, spotting ten transient objects. These had some features reminiscent of the afterglows of gamma-ray bursts, but not all the details matched. The group believes that some of the objects may have been remnants of a previously unknown type of stellar explosion, or a rare, very powerful type of eruption from a faint, low-mass star. Bower says that observations are now being planned to look for such events.

GENETICS

Tall story

Nature Genet. doi:10.1038/ng2121 (2007)

A genetic study involving more than 34,000 people has identified a single base change in a gene known as *HMGA2* that boosts overall body height. This is thought to be the first genetic variant decisively correlated with normal height variation — a trait potentially influenced by hundreds of genes.

The researchers, led by Timothy Frayling at the Peninsula Medical School in Exeter,

UK, report that people with two copies of the 'tall' variant are on average almost a centimetre taller than those with a double copy of the 'short' version. The precise function of *HMGA2* is not yet clear, although it is involved in unravelling the chromatin in which chromosomes are packaged, suggesting that it may influence cell growth and division.

CHEMISTRY

A simple solution

Science **317,** 1189–1192 (2007)

Our understanding of how molecules will react is usually gleaned from experiments carried out with organic solvents available in standard chemistry labs. For natural products that come from water-living organisms, it might help to think about things differently.

Timothy Jamison and Ivan Vilotijevic at Massachusetts Institute of Technology in Cambridge have synthesized the core piece of a famously hard-to-make marine molecule by working in neutral water. The molecule, which causes the toxicity associated with 'red tide' algal blooms, has a ladder-like arrangement of rings. It was thought that this structure might assemble through a cascade of reactions, but not until Jamison and Vilotijevic tried it in water did the molecule zip together with ease.

QUANTUM PHYSICS

Up in the air

New J. Phys. **9,** 254 (2007)

Although the Casimir force is generally regarded as attractive, theory predicts that this force, which acts between two closely spaced surfaces because of quantum fluctations, can be made repulsive. This effect could be useful in nanoengineering (see *Nature* **447,** 772–774; 2007). Ulf Leonhardt and Thomas Philbin of the University of St Andrews in Scotland suggest one way to turn the pull into a push.

They argue that a 'left-handed metamaterial' — comprising an array of electrical and magnetic components that bend light the 'wrong' way — placed between two mirrors may make the Casimir force repulsive. The researchers estimate that the repulsion should be strong enough, with metamaterials within experimental reach, to levitate a 0.5-micrometre thick aluminium foil in a vacuum.

IMMUNOLOGY

Itchy and scratchy

Nature Immunol. doi:10.1038/ni1503 (2007)

Mast cells, a type of proinflammatory immune cell, have been unjustly accused of exacerbating the blistering itch of poison ivy (pictured below) and sunburn, say researchers.

R. PLANCK/NHPA

Mast cells have been shown to increase short-term swelling in response to skin irritation. But Stephen Galli and his co-workers at Stanford University School of Medicine in California have found that instead of making the itch worse, mast cells reduce long-term inflammation by secreting a protein known as interleukin-10. Furthermore, chemical irritants elicited a more severe response in mice engineered either to lack mast cells, or to lack interleukin-10, than they did in normal mice. The results could spur development of novel anti-inflammatory therapies.

METHODS

Caught in the act

Nature Biotechnol. doi:10.1038/nbt1328 (2007)

A new proteomics technique can screen drugs for activity against hundreds of protein kinases at once. The technique has revealed two previously unidentified targets of imatinib, a cancer treatment that inhibits the BCR-ABL kinase and some other proteins.

Developed by Gerard Drewes and Bernhard Kuster at Cellzome in Heidelberg, Germany, and their colleagues, the approach relies on chemically coated beads that latch onto the hundreds of kinases, kinase-bound proteins and related purine-binding proteins found in cells. The kinases and other proteins can't attach to the beads if they are bound to a drug, so comparison of beads exposed to the contents of normal cells with those exposed to drug-treated cells shows which molecules the drug has blocked.

The bead-bound proteins are detected by mass spectrometry. This can also measure whether the drug has induced phosphorylation of the enzymes, a chemical modification that affects their activity.

JOURNAL CLUB

Drew Endy
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A biological engineer searches for simplicity.

Several years ago, a good colleague suggested that I read about a discussion held in 1864 on nuts and bolts (*J. Franklin Inst.* **77,** 344–351; 1864). The focus was a paper by one William Sellers that argued for the adoption of a uniform system of screw threads — 60° angles, squared off along the edges.

Machinists across the United States eventually started producing nuts and bolts according to Sellers' scheme. As a result, hardware stores now offer a wide selection of standardized parts that can be used in combination and behave as expected.

Inspired by this example and others, I have been studying how synthetic biological parts might be made as regular and easy to use as Sellers' nuts and bolts.

The starting complexity of nature has led some distinguished researchers to doubt such work is practical. But given that there has been little research on manufactured bio-simplicity, this seems premature.

And there are examples: a team at the California Institute of Technology in Pasadena recently developed a uniform system for engineering simple biological switches made from ribonucleic acids (M. N. Win and C. D. Smolke *Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.0703961104; 2007).

The 'nuts and bolts' of the switches are RNA sensor and actuator domains. The method for combining any sensor domain to an actuator domain through a third communication domain provides the 'uniform screw threads'. Because such switches are produced by a standard process, many switches could be quickly programmed to control diverse cellular functions in response to myriad molecular inputs, from small molecules, to peptides, to nucleic acids.

I suspect that further efforts to engineer biological simplicity will have similarly powerful results.

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