

QUANTUM COMPUTING

Noisy quantum calculations

Researchers have proposed a way to make use of noise in quantum computing.

Isolating systems from 'noisy' environmental interactions has been the focus of much research. Jens Eisert and his colleagues at the Free University of Berlin, however, propose an alternate framework in which information is encoded in a quantum system combined with its noisy environment.

To do this, the authors exploit an effect called the cutoff phenomenon, in which combined systems suddenly change states. This phenomenon defines points in time to launch calculations or read out results.

Phys. Rev. Lett. 110, 110501 (2013)

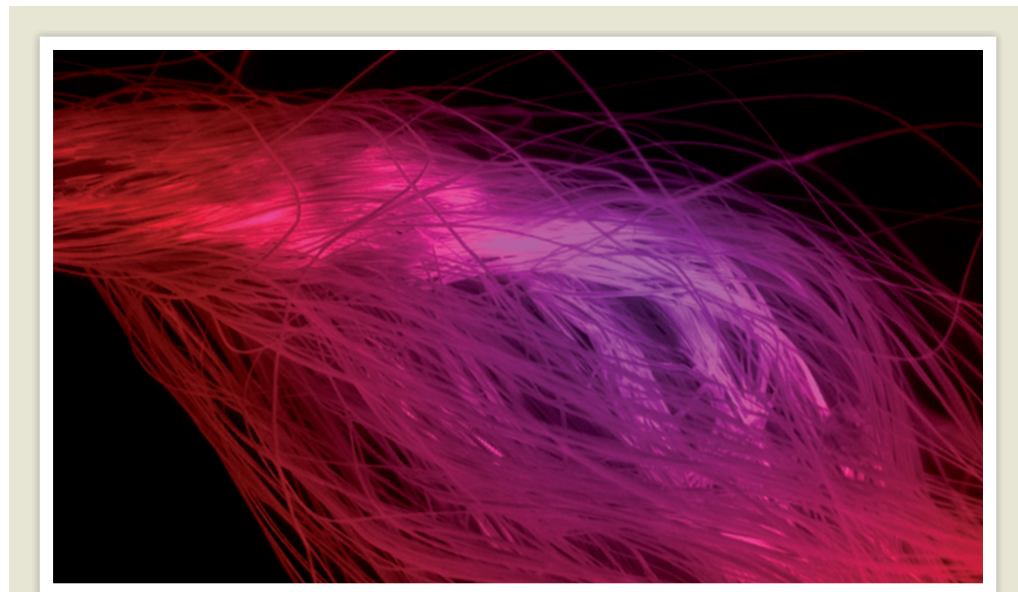
MEDICINE

Blood test for cancer DNA

The DNA that is shed into the bloodstream from dying cancer cells might one day be used to monitor the disease.

Carlos Caldas at the Cancer Research UK Cambridge Institute and his colleagues identified genetic markers to track disease in 30 women being treated for advanced breast cancer. They found that a technique to detect these markers in cancer-cell DNA in the blood was more sensitive than tests that look for circulating tumour cells or for a cancer antigen. The amount of tumour DNA also roughly correlated with the response to treatment.

The authors suggest that blood tests based on tumour DNA could be quicker and less-invasive than biopsies.



NANOMATERIALS

Fibres toughen when stretched

When most tough fibres are stretched to make them thinner, they become brittle. But a group led by Yuris Dzenis at the University of Nebraska–Lincoln has shown that this is not always the case.

The researchers made polyacrylonitrile fibres (pictured) using a technique called electrospinning. As their diameters narrowed to below 250 nanometres, the fibres became tougher and so were less prone to fracture, but

did not lose their strength. Nanofibres were up to 10-fold tougher and stronger than the best commercial fibres.

Dzenis suggests that the toughening is possible because the nanofibres are less crystalline than larger fibres. He thinks that the fibres could be used in load-bearing aerospace structures and bulletproof materials.

ACS Nano <http://dx.doi.org/10.1021/nn400028p> (2013)

N. Engl. J. Med. <http://dx.doi.org/10.1056/NEJMoa1213261> (2013)

For a longer story on this research, see go.nature.com/luwx3m

IMMUNOLOGY

Flu vaccines may improve with age

A subset of white blood cells may determine who is best protected by seasonal flu vaccines.

Hideki Ueno at Baylor Research Institute in Dallas, Texas, and Octavio Ramilo at the Nationwide Children's Hospital in Columbus,

Ohio, and their colleagues injected 49 adults and 19 children with flu vaccine. The researchers tracked cell types in individuals over time and discovered a particular class of immune cells that is activated on vaccination. These cells can boost production of existing antibodies that fight flu, but they do not induce production of new antibodies. This suggests that the current flu-vaccine strategy may be less effective in young children and against rare types of flu, such as H5N1. *Sci. Transl. Med.* 5, 176ra32 (2013)

MICROBIOLOGY

Life on the seabed, and below

The dark abyss of the Mariana Trench in the western Pacific Ocean hosts a surprisingly active bacterial community.

By using an automated deep-sea instrument that they designed, a team led by Ronnie Glud at the University of Southern Denmark in Odense measured rates of biological oxygen consumption in the almost 11-kilometre-deep ocean trench. The high rates they found there suggest that degradable organic matter

is being deposited at the bottom of the trench, allowing microbes to thrive in this secluded habitat.

A second team reports that life exists in an even more unlikely environment. While at the University of North Carolina at Chapel Hill, Mark Lever and his colleagues found hydrogen-loving microbes in the oceanic crust, deep beneath the seabed off the west coast of North America. An incubation experiment over several years showed that the organisms can derive energy from geochemical reactions between iron compounds and the sea water that permeates through cracks in the rocky crust. *Nature Geosci.* <http://dx.doi.org/10.1038/ngeo1773> (2013); *Science* 339, 1305–1308 (2013) For a longer story on this research, see go.nature.com/ppzjaz

CHEMISTRY

Protecting DNA in silica ‘amber’

High temperatures and harsh chemicals degrade DNA, but not if it is protected by a skin of silica.

Robert Grass and his colleagues from the Swiss Federal Institute of Technology in Zurich immobilized DNA on charged silica particles and grew a 10-nanometre silica layer on top. The encapsulated DNA was variously subjected to strong ultraviolet radiation, humid 120°C heat and attack by reactive chemicals. Each time, the molecule could be recovered by dissolving the silica with a weak acid. The DNA remained largely undamaged (much as fossilized DNA is protected in amber) and its sequence could be easily read. The researchers used a 195°C press to create plastic pills (pictured) containing the protected DNA, which

PHILLIP STOSSEL



they suggest could be added to consumer goods as high-security barcodes.

Angew. Chem. <http://dx.doi.org/10.1002/anie.201208135> (2013)

BIOENGINEERING

Mobile worm microscope

Smart phones may offer an affordable, portable way to diagnose intestinal worm infection, the most common infection in developing countries.

Isaac Bogoch at Toronto General Hospital in Canada and his group transformed an iPhone into a microscope by attaching an inexpensive lens to its camera. Almost 200 stool samples from children in Pemba Island, Tanzania, were mounted on slides and studied using the microscope. Experts identified more than 60% of worm-free slides, and nearly 70% of samples with eggs — of these, eggs from the large roundworm *Ascaris lumbricoides* had the highest rate of detection, at 81%.

Although similar portable microscopes have been made before, most have stayed in the laboratory. The authors say that this is the first field-based clinical test of such devices for intestinal worms, and they predict that higher-resolution imaging will boost the accuracy of smart-phone diagnoses. *Am. J. Trop. Med. Hyg.* <http://dx.doi.org/10.4269/ajtmh.12-0742> (2013)

GEOLOGY

Quakes shake the gold out

Earthquake after earthquake may build up economically important gold deposits by concentrating the precious metal along quartz-rich veins under the ground.

Dion Weatherley of the University of Queensland in Brisbane, Australia, and Richard Henley at the Australian National University in Canberra modelled jogs, or

COMMUNITY CHOICE

The most viewed papers in science

MEDICAL RESEARCH

Mice poor models for inflammation

HIGHLY READ
on www.pnas.org
in February

In a systematic evaluation of how well mice mimic human inflammatory responses, the popular disease model receives poor marks.

A large multi-institute group co-led by Ronald Tompkins of Harvard Medical School in Boston, Massachusetts, studied genome-wide gene expression in blood samples from 35 healthy people and 411 people with burns, severe blunt trauma or sepsis. They also used public databases to gather human data for other acute inflammatory stresses. Shifts in gene expression as a result of stress were highly similar across the different groups of patients, but correlated poorly with those in a mouse model. Such disparities could lead to misleading results in studies of disease or in the development of therapies, the authors say. The quality of a disease model should be assessed not just for the appearance of disease but also for its biomolecular fidelity, they suggest.

Proc. Natl Acad. Sci. 110, 3507–3512 (2013)

cracks, that cross geological faults. Ground motions can drastically increase the volume of such cracks, causing liquids trapped in them to depressurize rapidly and precipitate out their minerals, say the researchers.

This process, known as flash vaporization, could happen repeatedly in geologically active and gold-rich areas, such as Indonesia and South Africa.

Nature Geosci. <http://dx.doi.org/10.1038/ngeo1759> (2013)

For a longer story on this research, see go.nature.com/6jwoxn

ZOOLOGY

Frog feet share human hair origin

The toe pads that allow tree frogs to cling to slippery surfaces share their origin with human hair.

Toe pads are complex structures that are held in shape by a rigid network of proteins. Wim Vandebergh and his colleagues at the University of Brussels found 200 gene sequences expressed in the toe pads of the tree frog *Hyla cinerea* (pictured), but nowhere else in its toe.



ROLF NUSSBAUMER/NATUREPL.COM

The authors identified five keratins that seem to be the main structural components of toe pads; the genes that encode these five proteins have the same evolutionary origin as those for the keratins found in mammalian hair follicles.

The authors say that these proteins must have arisen in an early tetrapod ancestor before diverging to become hair in mammals and toe pads in frogs.

Biol. Lett. 9, 20130051 (2013)

NATURE.COM

For the latest research published by Nature visit:

www.nature.com/latestresearch