

## QUANTUM COMPUTING

### Qubits come close to perfection

Physicists have created quantum units of information that operate with some of the lowest levels of error ever seen.

David Lucas at the University of Oxford, UK, and his colleagues trapped ions of the rare isotope calcium-43 with electric fields and manipulated them with lasers and microwaves, forming 'quantum bits' or qubits. Their set-up was robust enough to outside interference that the qubits kept their fragile quantum states for 50 seconds and errors arose only once in every 1 million operations, 10 times better than previous demonstrations.

Because correcting codes can overcome these very low levels of error, the authors say that their qubits are accurate enough to be used in quantum computing.

However, linking up many of these qubits in a scalable system remains a challenge. *Phys. Rev. Lett.* 113, 220501 (2014)

## CANCER

### Old blood reveals cancer risk factors

DNA sequencing could help to identify people who are at risk of developing blood cancers months or even years before malignancy appears.

To search for early indicators of cancers such as acute myeloid leukaemia, Steven McCarroll at Harvard Medical School in Boston, Massachusetts, and his colleagues sequenced the DNA from stored white blood cells collected from 12,380 people. A team

led by Benjamin Ebert at Brigham and Women's Hospital, also in Boston, looked at similar data for another 17,182 people. Both groups then used medical records to find out which people had subsequently been diagnosed with cancer. Older people were more likely to have mutations in genes implicated in blood cancers. People carrying these mutations were up to 32 times more likely than non-carriers to be diagnosed with a blood cancer months

or years later.

The authors point out that DNA sequencing cannot yet predict blood cancers accurately enough for use in clinical care.

*N. Engl. J. Med.* <http://doi.org/xdp> (2014); <http://doi.org/xdq> (2014)

## MATERIALS

### How the silver Koi carp shines

Japanese koi carp are famous for their iridescent shimmer, but Lia Addadi

at the Weizmann Institute of Science in Rehovot, Israel, and her colleagues have discovered why some glimmer more brightly than others.

They used correlated optical and electron microscopy to compare scales and skin of a common variety of koi with those from a shinier type called Gin Rin. In the scales and skin of both types are cells called iridophores, which contain reflective stacks made up of layers of guanine crystals and



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## CONSERVATION BIOLOGY

### Bees lose their favourite flowers

Shrinking populations of bees' preferred plants could help to explain the worldwide decline in many wild bee species.

Jeroen Scheper of Wageningen University in the Netherlands and his colleagues carefully scraped pollen grains off the legs of museum specimens of 57 Dutch bee species to identify which plants the bees had fed on. The bees were collected before 1950, and thus before many wildflower populations began to

decline because of agricultural intensification. The study revealed that bees whose favourite plants have declined the most are now showing the steepest drop in population numbers. Populations of larger bees, which have greater food requirements, also showed big decreases.

The findings support calls to plant specific flowers for these threatened pollinators.

*Proc. Natl Acad. Sci. USA* <http://doi.org/xdx> (2014)

cytoplasm. The Gin Rin fish had a much greater density of iridophores, each containing more stacks of crystals than in the common type. The Gin Rin crystals were also oriented differently — almost parallel to the surface of their scales instead of at an angle of around 30°, as in the common variety.  
*J. Am. Chem. Soc.* <http://doi.org/xd8> (2014)

## GEOLOGY

## Europe feels fracking shakes

Hydraulic fracturing during natural-gas extraction caused two earthquakes in the United Kingdom that were felt by residents, by reactivating a geological fault that had lain dormant for many millions of years.

'Fracking' involves injecting a mixture of water, sand and chemical additives into the ground to fracture rock and loosen trapped natural gas. Earthquakes induced by the process in North America have been felt by communities, but this is the first such example in Europe.

A team led by Huw Clarke of fracking company Cuadrilla Resources in Lichfield, UK, reports that fracking in 2011 near Blackpool caused earthquakes on 1 April and 27 May of magnitudes 2.3 and 1.5, respectively. Fluid injected during the fracking

operation (**pictured**) caused movement in a fault that had been inactive for 260 million years.

*Geophys. Res. Lett.* <http://doi.org/xc9> (2014)

## CANCER IMMUNOLOGY

## Predicting cancer-therapy success

Tumour-cell genomes may hold clues to who will benefit from treatments that stimulate the immune system against melanoma.

A protein called CTLA-4 on the surface of cancer-fighting T cells can suppress these immune cells' attacks on the tumours. Drugs that block this protein can, in some patients, unleash these cells, but can have toxic side effects. Jedd Wolchok and Timothy Chan of the Memorial Sloan Kettering Cancer Center in New York and their colleagues sequenced genes in tumour cells from 64 patients with melanoma who were treated with CTLA-4 inhibitors.

Patients whose tumours had a higher number of cancer-associated mutations were more likely to benefit from the drugs, and a set of 101 tumour proteins created by these mutations were associated with a strong response to the drugs.

*N. Engl. J. Med.* <http://doi.org/xdx> (2014)

## STEM CELLS

## Matched stem cells still rejected

Transplants of stem cells with nuclear DNA identical to that of a patient could still trigger immune responses because of the presence of mismatched mitochondria.

Sonja Schrepfer at Stanford University in California and her colleagues transferred nuclei from a donor mouse's adult cells into mouse embryonic stem cells with genetically matched nuclear DNA but different mitochondrial DNA. When

## SOCIAL SELECTION

Popular articles on social media

## Unequal fates for maths superstars

A gift for numbers can take a person far in life, according to a report getting plenty of online attention. A survey of 1,004 men and 601 women who were identified as 13-year-old mathematics prodigies in the 1970s found above-average levels of accomplishment in fields including business and academia. "How do things turn out for math prodigies? Pretty well, it seems," tweeted Tyler Cowen, an economist at George Mason University in Fairfax, Virginia. Cowen told *Nature* that he shared the report on Twitter because he suspects that many of his followers have gifted children. "I was delivering good news," he says.

However, success was not evenly distributed. On average, the women in the survey earned about US\$80,000 a year. That is more than double the amount that US women with full-time jobs typically make in a year, but about \$60,000 less than the men in the survey. Zhana Vrangalova, a sexuality researcher at New York University in New York City, summed it up on Twitter by noting that the survey participants had accomplished "a lot more than the average Jo/Jane".

*Psychol. Sci.* <http://doi.org/xfb> (2014)



Based on data from altmetric.com. Altmetric is supported by Macmillan Science and Education, which owns Nature Publishing Group.

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the cells were transplanted back into the donor, they were attacked by the immune system. Isolated mismatched mitochondria also triggered an immune response.

*Cell Stem Cell* 16, 1–6 (2015)

## CANCER BIOLOGY

## Tumours set stage for their spread

An intricate interplay between cancer cells and white blood cells outside a lung tumour can help to drive metastasis, the spread of the disease to other parts of the body.

Nathan Reticker-Flynn and Sangeeta Bhatia at the Massachusetts Institute of Technology in Cambridge focused on a molecule called galectin-3, which they found is expressed on the surface of certain white blood cells during early cancer in mice. Lung tumours secrete signalling molecules that

mobilize these white cells — known to promote metastasis — out of the bone marrow and into the bloodstream.

Metastatic cells from the tumour display a cell-surface sugar that binds to galectin-3. As a result, these cells increasingly interact with the mobilized white blood cells in distant parts of the body, enhancing the cancer cells' ability to colonize and grow into new tumours.

*Cancer Discov.* <http://doi.org/xdx> (2014)

## CORRECTION

The Research Highlight 'Fish tags guide seal predators' (*Nature* 515, 469; 2014), gave the wrong year for the citation; it should have been 2015.

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