DNA sequencing

Different dyes for clear-cut colours

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Since its introduction almost 20 years ago, four-colour DNA sequencing has largely relied on the same, somewhat error-prone, method. Now Ernest K. Lewis *et al.* have built a prototype sequencing machine that could improve accuracy.

In conventional colour sequencing, the chemical bases that make up DNA are tagged with fluorescent dyes — a different colour for each of the four bases. A machine shines a laser onto the DNA molecules, and detects the wavelength of light emitted from each base to determine their sequence. But mistakes happen, partly because the spectra produced by the dyes overlap, and hence the glow from one dye can be mistaken for that from another.

For the new method, called pulsed multi-line excitation, the researchers developed a different set of four fluorescent dyes, each of which is excited by a separate wavelength. Their machine fires a series of four laser beams at the dye, but only the appropriate laser triggers a signal. The method could greatly improve the ease with which one base can be distinguished from another. **Helen Pearson**

CAST COLLABORATION

Particle physics

The elusive axion

Phys. Rev. Lett. **94,** 121301 (2005)

An effect known as charge–parity violation is linked to the fact that the Universe contains far more matter than antimatter, and it is well documented in processes involving the so-called weak nuclear force, one of the four fundamental forces of nature. But it seems to be suppressed by the strong force, and this can be explained by postulating a hitherto undiscovered particle, the axion. Axions interact hardly at all with radiation or other matter, making them hot candidates to be the 'cold dark matter' that is thought to pervade the Universe.

The CAST (CERN Axion Solar Telescope) collaboration has adopted an innovative approach to the search for axions. They are pointing a powerful test magnet (pictured), decommissioned from CERN's Large Hadron Collider, at the Sun. Axions might be produced in the solar plasma when photons are scattered in strong electromagnetic fields. CAST has put the scattering effect into reverse by producing X-ray photons from solar–axion interactions on Earth.

The magnet can be tilted at either end to an angle that allows the Sun to be observed at sunrise and sunset, both ends being fitted with X-ray detectors and an X-ray telescope recycled from the German space programme. The results, assuming a very small axion mass, show no signal above background, and constrain the axion–photon coupling strength by a factor of five compared with results from previous lab experiments. Future measurements should deliver still better sensitivity, and also test the axion hypothesis for higher masses. **Richard Webb**

Cancer

Remote control

Curr. Biol. **15,** 561–565 (2005)

***BRCA1* is notorious as the first gene to be linked with inherited susceptibility to breast and ovarian cancer. It has been thought of as a classic 'tumour suppressor', but Rajas Chodankar *et al.* suggest that it may have another, more subtle, effect.**

Granulosa cells in the ovary produce the sex hormones that regulate the ovulatory cycle — and the growth of ovarian tumours. Given that repeated ovulations (that is, fewer pregnancies or reduced oral contraceptive use) are known to increase the risk of non-hereditary ovarian cancer, the researchers wondered whether decreased levels of BRCA1 protein in granulosa cells are involved. Using mice, they inactivated the gene specifically in these cells. The animals developed tumours in the ovaries and uterine horns. But the tumour cells looked like epithelial cells and had normal copies of the gene, implying that they had not developed from granulosa cells.

Inactivating *BRCA1* seems, therefore, to be controlling some intermediary produced by the granulosa cells. It is this unidentified factor that appears to promote tumours in the ovary epithelium, so providing a lead for further investigation. **Helen Dell**

Neurobiology

Illuminating behaviour

Cell **121,** 141–152 (2005)

Through genetic engineering, researchers have developed a new technique for exciting neurons and influencing fruitfly behaviour. Whereas scientists typically excite these cells with electricity, the effect here was achieved with laser light.

Susana Q. Lima and Gero Miesenböck designed fruitflies to express particular ion channels in neurons that control escape mechanisms — such as jumping and wing beating — or in the dopamine-producing cells that influence movement. The next step involved injecting the flies with ATP (energy-storing molecules) held in chemical cages.

A 200-millisecond pulse of laser light — directed at the flies — removed the cage from the ATP molecules, allowing them to stimulate the channels and depolarize the neurons. When the authors targeted the neurons linked to escape mechanisms, the light set off jumping and wing flapping in the fruitflies. Similarly, targeting dopamine-producing cells altered the insects' walking behaviour. The authors speculate that this ability to direct animal behaviour by remote control will enable them to study how specific behaviours are related to specific neurons. **Roxanne Khamsi**

Spintronics

How electrons relax

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In the burgeoning field of spintronics, binary bits of data are stored in the spins of electrons, rather than in their charge, with a '1' equating to spin up and a '0' to spin down. But one problem facing the development of spintronic devices is that, although electron spin can be manipulated, it tends not to stay so — an induced spin decays as the electron interacts with the magnetic field of nearby nuclei.

P.-F. Braun and colleagues have now directly observed this 'spin relaxation' in quantum dots — clusters of atoms just nanometres across — made of the semiconductor materials indium arsenide and gallium arsenide. The authors found that the initial spin polarization of such dots decays with a half-life of just 0.5 nanoseconds — half a millionth of a millisecond — before remaining stable at about a third of its initial value for at least a further 10 nanoseconds.

However, they also report that this relaxation process can be suppressed by an externally applied static magnetic field of just 100 mT, which can be provided by small permanent magnets. Such a field increases the characteristic decay half-life to around 4 nanoseconds, and could prove useful in future practical devices, they suggest. **Mark Peplow**