RESEARCH HIGHLIGHTS

Selections from the scientific literature

CANCER THERAPEUTICS

Targeted drug fights melanoma

A drug that targets a specific mutant protein in skin cancer improved survival in a clinical trial of 675 patients with advanced melanoma.

The drug vemurafenib inhibits a mutated form of the cell-growth-promoting protein BRAF. Mutations in this protein are found in around half of all melanomas. Paul Chapman of the Memorial Sloan-Kettering Cancer Center in New York and his colleagues found that in their phase III trial of patients with metastatic melanoma and the BRAF mutation, almost half of those treated with vemurafenib responded to the drug. By contrast, the response rate in patients receiving an older chemotherapy called dacarbazine was only 5%.

Six months after treatment, 84% of those who received vemurafenib were still alive, compared with 64% of those who received dacarbazine.

***N. Engl. J. Med.* doi:10.1056/NEJMoa1103782 (2011)**

A. REKKAS/ALAMY

ANIMAL BEHAVIOUR

Fitter fish lead the pack

Schooling fish take up different positions in the group according to their aerobic abilities.

Shaun Killen at the University of Glasgow, UK, and his colleagues noted the positions of individual juvenile mullet (*Liza aurata*; **pictured**) of similar size as the fish schooled in a swim tunnel in the lab, and measured certain animals' metabolic rates and swimming abilities. When schools were swimming at high speed, fish less able to supply oxygen to their muscles ended up at the back, where they could reduce their workload. By contrast, fish with higher aerobic capacity that were better able to withstand drag forces took up positions at the front. Having fitter fish in the lead could allow schools to maximize their swimming speed.

***Proc. R. Soc. B* doi:10.1098/rspb.2011.1006 (2011)**

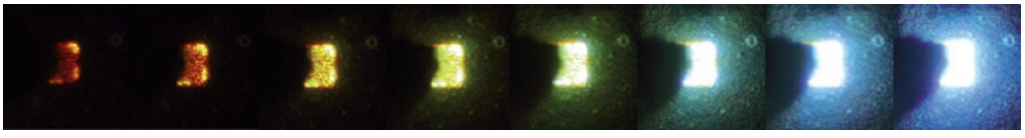
PHOTONICS

Rainbow from a single LED

Inorganic light-emitting diodes (LEDs) are bright, stable and efficient, but usually emit only one colour. Gyu-Chul Yi at Seoul National University and his team have created LEDs that can be tuned continuously from red to blue (**pictured**) for potential use in the display screens of mobile devices.

Their LED consists of nanorods of the semiconductor gallium nitride, each coated with layers of indium gallium nitride. These layers form 'quantum wells' that restrict the movement of electrons, altering the electrons' energy levels and, ultimately, determining the wavelength of the LED's emitted light. The thickness of the layers varies naturally as they are deposited on the rods' multi-faceted tips. By altering an applied voltage, the researchers force electric current to travel through layers of different thickness, thus changing the colour of light that the LED emits.

***Adv. Mater.* doi:10.1002/adma.201100806 (2011)**



WILEY-VCH

NEUROGENETICS

Extended hunt for autism genes

Boys are four times more likely than girls to have autism, and two studies hint at why: girls with the disorder tend to have many more genetic mutations than boys, suggesting that girls undergo greater genomic change before showing autistic behaviour.

Groups led by Michael Wigler at Cold Spring Harbor Laboratory in New York and Matthew State at Yale University in New Haven, Connecticut, conducted the most comprehensive search yet for spontaneous duplications or deletions of stretches of DNA that may be associated with autism spectrum disorders. In analysing the genomes of more than 1,000 people — some with autism, some unaffected family members — the teams found at least 130 sites in the genome where spontaneous duplications or deletions might

contribute to autism risk.

State's team found that duplication of a region on chromosome 7 is associated with autism. Autism is marked by antisocial behaviour, and deletion of the same region is linked to Williams–Beuren syndrome, a condition that involves hypersocial behaviour.

In a third study, Dennis Vitkup at Columbia University in New York and his colleagues, in collaboration with Wigler, analysed relationships between the mutated genes uncovered by Wigler's genetics study that were likely to be involved in brain function. Many clustered into a large network that regulates the creation and activity of connections between nerve cells.

Neuron 70, **863–885; 886–897; 898–907 (2011)**

For a longer story on this research, see go.nature.com/bscgf1

GEOCHEMISTRY

Mercury on the decline

A surprising drop in atmospheric mercury levels since the mid-1990s points to a substantial shift in the global biogeochemical cycle of the toxic element.

A team led by Franz Slemr of the Max Planck Institute for Chemistry in Mainz, Germany, compared data from monitoring stations in South Africa, Ireland and Antarctica, as well as measurements taken aboard ships in the Atlantic Ocean. They infer that, globally, mercury levels in the atmosphere have decreased by 20–38% since 1996.

Industrial mercury pollution has remained more or less constant over the past 15 years, leading the authors to suggest that decreasing re-emissions from soils and oceans of mercury deposited before the 1990s is the most likely cause of the downward trend. They add that climate change and ocean acidification may further shift the global mercury cycle.

Atmos. Chem. Phys. 11, **4779–4787 (2011)**

NEUROSCIENCE

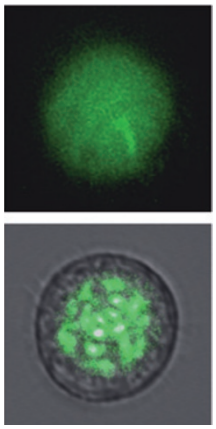
How nicotine curbs weight gain

Nicotine lessens the amount mice eat by activating specific neurons in the brain, perhaps explaining why people who stop smoking often gain weight.

Marina Picciotto at Yale University in New Haven, Connecticut, and her colleagues found that mice given nicotine daily for 30 days ate less and had lower body-fat levels than untreated mice. Nicotine increased the firing of brain neurons that produce a hormone precursor called pro-opiomelanocortin (POMC). When the POMC neurons fire, they release the hormone melanocortin. Mice in which the *Pomc* gene had been deleted ate the same amount whether or not they received nicotine. Those with a major melanocortin receptor gene silenced ate more when given nicotine than normal mice on nicotine.

The melanocortin hormone pathway regulates both energy use and food intake, so the authors think that nicotine has a two-pronged influence on body weight.

Science 332, **1330–1332 (2011)**



BIOPHYSICS

Fluorescent cells turned into lasers

A human cell has been engineered to form the light source of a tiny laser — creating the first laser to use biological material to generate light.

Malte Gather and Seok-Hyun Yun at Harvard Medical School in Boston, Massachusetts, engineered human cells to express an enhanced version of green fluorescent protein. They then sandwiched a suspension of the cells between two tiny, closely spaced mirrors to concentrate and align the light waves from the cells into a tight beam. By pulsing individual cells with blue light, the researchers excited the fluorescent proteins, causing them to emit light (two different lasing levels, **pictured**). The result was a bright directional beam of green laser light visible to the naked eye.

Nature Photonics **doi:10.1038/nphoton.2011.99 (2011)**

For a longer story on this research, see go.nature.com/iwdzj9

CHEMISTRY

Recipe for a good catalyst

Faced with the challenge of developing low-cost catalysts for some fuel cells and metal–air batteries, researchers have come up with a basic recipe that ensures high catalytic activity in a family of widely used materials.

Perovskite oxides catalyse the oxygen-reduction reaction, a core process in fuel cells and batteries. Yang Shao-Horn and Hubert Gasteiger at the Massachusetts Institute of Technology in Cambridge and their group studied 15 different perovskite oxide materials, which contain transition-metal ions. They found that the materials' catalytic activity in reducing molecular oxygen is strongly dependent on the level of occupancy of the transition metal's e_g electron orbital.

Because of various electron interactions between atoms of the oxide, this occupancy level can vary between 0 and 2. With one electron in this orbital, catalytic activity increased by four orders of magnitude compared with oxides that have 0 or 2 electrons in the orbital. An occupancy of less than 1 led to an interaction with the incoming oxygen that was too strong, whereas occupancy of greater than 1 made it difficult for the catalyst to interact with and adsorb the molecule.

Nature Chem. **doi:10.1038/nchem.1069 (2011)**

COMMUNITY CHOICE

The most viewed papers in science

METAGENOMICS

Movies of the body's bacteria

HIGHLY READ on genome biology.com 7 May–6 June

The rich microbial populations of the human body shift frequently in time — even on a daily basis — with no stable, core group of microbes present at high levels.

Rob Knight at the University of Colorado in Boulder and his colleagues obtained daily microbial samples from the faeces, mouth and palms of two volunteers, over 6 months for one subject and 15 months for the other. The authors sequenced a key genomic region of the bacteria to assess the composition of taxonomic groups. This revealed that the microbial communities are distinct from one body site to the next both in each individual and between individuals. However, only a small proportion of the observed groups persisted across all time points. The authors suggest that factors such as diet, medication and differences in immune-system activity may explain the temporal variations.

Genome Biol. 12, **R50 (2011)**