RESEARCH HIGHLIGHTS

MATERIALS SCIENCE

Skin-like sensors

Nature Mater. doi:10.1038/nmat2834; 10.1038/nmat2835 (2010)

Artificial skins have been developed that can detect the gentlest of touches of just a few kilopascals or less in pressure, the same as that felt by our fingers when typing, or picking up a pen.

Zhenan Bao at Stanford University, California, and her colleagues built a pressure sensor using the elastic polymer polydimethylsiloxane (PDMS). They engineered the material such that its capacitance — the ability to hold an electric charge — changed when pressure was applied to it. The researchers then attached this capacitor to a grid of organic transistors so that it could track pressure changes at specific positions. Their device could sense the presence of a fly and a butterfly (pictured).

Ali Javey at the University of California, Berkeley, and his team used a different approach. They laid out parallel arrays of semiconducting nanowires on a flexible pressure-sensitive rubber. Both 'skins' could eventually be used in prosthetics or touch-sensitive robotic devices.

For a longer story on this research, see go.nature.com/dmwi76

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MICROBIOLOGY

Bacteria for breakfast

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.1000079107 (2010)

Supermarket dairy shelves are filled with yogurt products containing live cultures of 'probiotic' bacteria — species that live in the human gut and are proposed to deliver health benefits when eaten at high levels. Three probiotic species seem to alter gene expression in the gut lining of volunteers consuming the cultures. The effect was similar to that of drugs for conditions including inflammation and high blood pressure.

Michiel Kleerebezem at NIZO Food Research in Ede, the Netherlands, and his co-workers analysed the gene-expression profiles of tissue taken from the small intestinal inner lining of seven healthy volunteers who had eaten a placebo and three probiotic cultures — *Lactobacillus acidophilus*, *L. casei* and *L. rhamnosus* — in a random order. The altered gene-expression profiles resembled those associated with the regulation of immune responses, cell growth, metabolism and even wound repair.

CANCER BIOLOGY

Ovarian cancer culprits

N. Engl. J. Med. doi:10.1056/NEJMoa1008433 (2010); *Science* doi:10.1126/science.1196333 (2010)

Genome sequencing has revealed two genes involved in a deadly form of ovarian cancer.

Ovarian clear-cell carcinoma is aggressive and difficult to treat. David Huntsman at the British Columbia Cancer Agency in Vancouver, Canada, and his colleagues sequenced protein-coding genes from 18 ovarian clear-cell tumours and found that six had mutations in a gene called *ARID1A*. The ARID1A protein regulates the coiling of DNA and hence gene expression, and has also been linked to tumour suppression.

Meanwhile, a team led by Kenneth Kinzler, Victor Velculescu and Nickolas Papadopoulos of the Johns Hopkins Kimmel Cancer Center in Baltimore, Maryland, sequenced protein-coding genes in eight tumours and uncovered mutations in *ARID1A* and another gene called *PPP2R1A*. The PPP2R1A protein helps to distribute chromosomes into dividing cells and controls cell growth. A follow-up experiment with 42 tumours showed that 57% had mutations in *ARID1A* and 7% had mutations in *PPP2R1A*.

ZOOLOGY

Fish fly like jets

J. Exp. Biol. **213,** 3269–3279 (2010)

Flying fish are well adapted for gliding through both water and air, staying airborne (pictured) for distances of up to 400 metres. To assess the aerodynamics of these creatures, Hyungmin Park and Haecheon Choi at Seoul National University stuffed five darkedged-wing flying fish (*Cypselurus hiraii*) that they had caught in the Sea of Japan. They placed the fish in a wind tunnel at different angles and with their fins in different positions, and measured the flow of air around them.

T. STACK/PHOTOLIBRARY

The analysis showed that the arrangement of the fins accelerates the flow towards the tail in the same way as the wings of a jet, providing extra lift and allowing the remarkable fish to fly for more than 30 seconds. Measurements of the lift-to-drag ratio revealed that the fish can fly furthest when close to, and parallel to, the surface of the water.

ECOLOGY

Biodiversity balance

Ecol. Lett. doi:10.1111/j.1461-0248.2010.01528.x (2010)

Organic farms can be friendlier to wildlife than conventional farms, but they have lower crop yields. They need more space to grow the same amount of food and so leave less room for wildlife reserves. What is the optimum land-use balance between organic farming, conventional farming and reserves?

Jenny Hodgson of the University of Leeds, UK, and her colleagues measured butterfly population densities in various British landscapes to track the effects of different types of farming on biodiversity. The team calculates that if organic yields are equal to or greater than 87% of conventional yields, it is worth switching to organic. If they are lower, it is better to farm conventionally and convert more land to reserves. But if the converted land exists only at the margins of fields, organic yields have to exceed just 35% of conventional yields to make organic farming a better strategy.

PSYCHOLOGY

Gaming the brain

Curr. Biol. doi:10.1016/j.cub.2010.07.040 (2010)

People who play a lot of action video games are known to perform better in a variety of sensory and perceptual tasks. Daphne

Bavelier at the University of Rochester, New York, and her colleagues suggest that this is because such games improve a key aspect of decision-making: the ability to infer quickly the probability that a given answer is correct on the basis of limited evidence.

The researchers asked 11 video-game players and 12 non-players to determine the overall direction of a group of randomly moving dots. In another experiment, the volunteers had to identify with which ear they heard a tone concealed in white noise. In both cases, the players gave accurate answers faster than the non-players. According to the authors, this enhanced 'probabilistic inference' explains why video games, unlike other activities that train for specific tasks, can improve performance in tasks not specifically related to game play.

Furthermore, 50 hours of playing action video games, such as 'shooting' games, improved decision-making in another group of non-players, but a non-action game did not.

ANIMAL BEHAVIOUR

Avian optical illusions

Curr. Biol. doi:10.1016/j.cub.2010.08.033 (2010)

Male bowerbirds create optical illusions with their bowers — grand exhibits made of sticks and decorated with stones and other objects to impress females — probably to boost their attractiveness.

The male great bowerbird (*Chlamydera nuchalis*) builds a twig-lined avenue, roughly 60 centimetres long and ending at a 'court'. The female looks down the avenue to the court, where the male squawks and hops to entice her. John Endler at Deakin University in Geelong, Australia, and his colleagues noticed that the objects lining the court floor were arranged by size — smallest at the front, largest at the back (pictured left) — creating an optical illusion known as forced perspective. The team says that the size gradient makes the male in the court look larger or more striking than he actually is.

When the researchers reversed the pattern (right), the male bowerbirds restored the size gradients within three days and had the optical illusion back to normal within two weeks.

For a longer story on this research, see go.nature.com/jSTy1w

PHYSIOLOGY

Fatty-acid effects

Cell **142,** 687–698 (2010)

The major components of fish oil, ω-3 fatty acids, are well known to have health benefits. Now researchers have discovered the molecular mechanism for their anti-inflammatory effects.

Jerrold Olefsky at the University of California, San Diego, and his colleagues show that the fatty acids bind to a receptor molecule called GPR120. In fat cells and macrophages — white blood cells involved in inflammation — this binding inhibited several biochemical activities known to trigger inflammation. In addition, it decreased insulin resistance, which is linked to inflammation, in fat cells and in mice fed a high-fat diet. The fat tissue in these mice also had fewer macrophages. The fatty acids had no effect in cells or mice that lacked GPR120.

NEUROBIOLOGY

Neuronal housekeeping

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.1004498107 (2010)

Neurodegenerative disorders such as Huntington's disease are characterized by the accumulation of misfolded, defective proteins in brain cells. Certain drugs can stimulate a process for clearing such proteins, called autophagy, in some cells, but not in neurons. Steven Finkbeiner and his colleagues at the University of California, San Francisco, have identified a small molecule, a phenoxazine known as 10-NCP, that induces autophagy in neurons isolated from rodents.

In neurons expressing the mutant huntingtin protein, 10-NCP improved survival. The drug also decreased levels of mutant protein in neurons isolated from a mouse model of Huntington's disease. Moreover, the researchers found that several structurally similar drugs, already approved by the US Food and Drug Administration, could trigger neuronal autophagy.

ELSEVIER

Correction

The image of the lacewing in 'Leaf-like history of lacewings' (*Nature* **467,** 134; 2010) was incorrectly described. The inset was not a similar-looking leaf, as stated, but a duplicate of one of the wings the authors had isolated for comparison.

JOURNAL CLUB

Georgy Koentges
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A genomic systems biologist muses on how shared DNA mistakes reveal shared cellular ancestry.

The way an organism or cancer develops often depends on how cells relate to each other. This is because ancestral cells make molecular decisions that affect the regulation of genes in their offspring. Revealing complex lineage relationships usually requires sophisticated methods of molecular embryology that are available for only a few 'model' species and not for humans. I recently stumbled upon a string of creative papers from two competing labs that prepare the ground for change.

When cells double their genomes, they make very rare mistakes that are passed on to their daughter cells, such that two closely related cells share more identical DNA mistakes than they each do with a third, less closely related cell. If one could quickly and accurately sequence the genomic DNA of single cells, phylogenetic algorithms could reconstruct the underlying lineage relationships by analysing the patterns of shared mistakes in the various cells.

Marshall Horwitz at the University of Washington in Seattle and his colleagues have accomplished this feat by cataloguing mutations in 300 cells from a single mouse (S. J. Salipante *et al. Evol. Dev.* **12,** 84–94; 2010). Ehud Shapiro at the Weizmann Institute of Science in Rehovot, Israel, and his co-workers had previously conceived this strategy but focused on different cell types (A. Wasserstrom *et al. PLoS ONE* **3,** e1939; 2008).

With these approaches, along with new, faster and cheaper high-throughput sequencing methods, we will one day be able to pick apart any group of cells from any interesting organism and establish full lineage trees. This would revolutionize not just comparative embryology and the study of evolution, but also medicine. Tumours could be dissected in this way and drugs designed against their specific lineage compositions, as part of truly personalized genomic therapies. Who would have predicted that human ingenuity could turn our common genomic rubble into such intellectual gems?

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