RESEARCH HIGHLIGHTS

Selections from the scientific literature

NEUROBIOLOGY

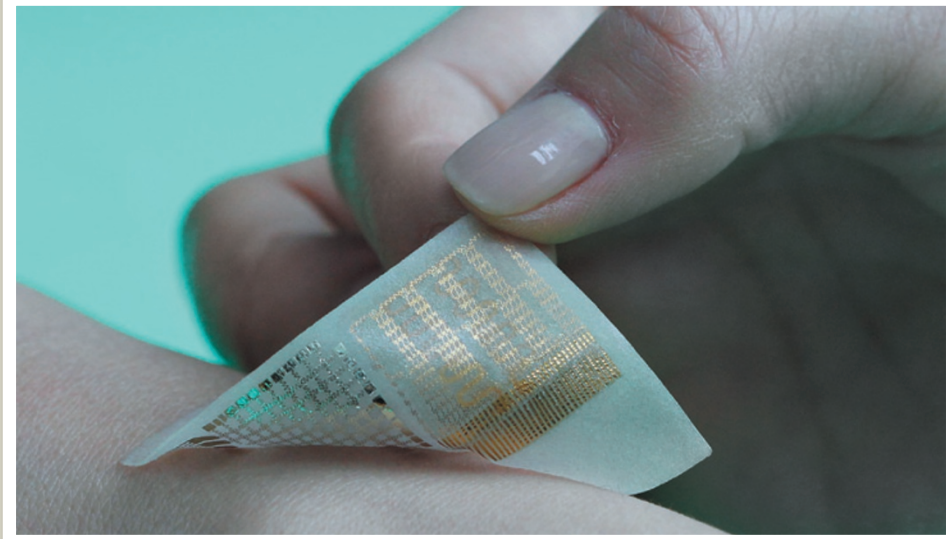
Brain map reveals behaviour links

An "atlas" of the fruit-fly brain is the largest yet to map regions that encode specific behaviours, such as walking backwards.

Carey Priebe of Johns Hopkins University in Baltimore, Maryland, and Marta Zlatic of the Howard Hughes Medical Institute's Janelia Farm Research Campus in Ashburn, Virginia, and their colleagues engineered fruit-fly larvae so that the insects' neurons fired when hit with a beam of light. The researchers stimulated more than 1,000 different neuronal pathways in nearly 38,000 *Drosophila* flies, and recorded how the flies responded.

They were able to determine 29 different behaviours, such as turning to avoid an obstacle, and mapped which neurons seemed to control each behaviour.

Science **http://doi.org/r4t (2014)**



DONGHEE SON/JONGHA LEE

ELECTRONICS

Stick-on skin sensor measures motion

A wearable device as thin as a temporary tattoo can measure, store and transmit data on muscle activity, and release embedded drugs into the wearer's skin.

Dae-Hyeong Kim at Seoul National University in South Korea and his colleagues built their device (pictured) by placing stretchable layers of nanomaterials onto an elastomeric polymer material designed to mimic the softness and flexibility of skin. The nanomaterials acted as strain and temperature sensors, memory modules, microheaters and drug carriers. The authors showed that when the device was applied to human skin, it remained in place and deformed with the skin. It measured simulated hand tremors, and delivered drugs through the skin when the tiny heaters generated enough heat.

The device used a wired connection for power supply and data transfer, but the team aims to develop a wireless version for use by patients with movement disorders.

Nature Nanotechnol. **http://dx.doi.org/10.1038/nnano.2014.38 (2014)**

PALAEONTOLOGY

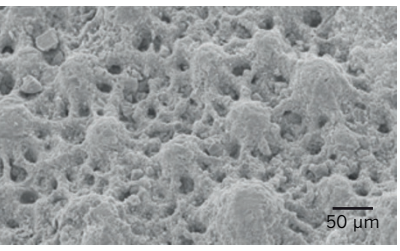
Ancient starfish spotted predators

Sea stars and some other echinoderms might have had complex visual systems for roughly the past 80 million years.

Some existing echinoderms, such as brittle stars, are covered in crystal calcite microlenses that are sensitive to light. To determine the evolutionary history of these structures, Przemysław Gorzelak at the Polish Academy of Sciences in Warsaw and his team analysed 75-million-year-old brittle-star and starfish fossils using a scanning electron microscope. Both kinds of fossil contained structures (**pictured**) that matched modern echinoderms' microlenses in size and shape.

After an explosion in the diversity of fish and crustacean predators began around 80 million years ago, echinoderms may have developed visual systems to avoid such predators, the researchers say.

Nature Commun. 5, **3576 (2014)**



PRZEMYSŁAW GORZELAK/ POLISH ACADEMY OF SCIENCES

NEUROSCIENCE

Why babies live hand to mouth

The reason that newborns put their hands into their mouths is probably because this action is hard-wired into the brain as a basic unit of movement.

Angela Sirigu at the French National Centre for Scientific Research in Bron and her colleagues used electrodes to stimulate nearly 150 sites in the precentral gyrus — the brain region that controls voluntary movement — in 26 people undergoing brain surgery. When the researchers stimulated ten specific sites in nine of the participants, including two three-year-olds, the volunteers each moved their closing hand towards their opening mouth.

The authors speculate that the hard-wiring of these movements in the brain means that they are an evolutionarily important behaviour that

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allows babies to put things in their mouth accurately, even at a time when they have generally poor motor control.
Proc. Natl Acad. Sci. USA **http://dx.doi.org/10.1073/pnas.1321909111 (2014)**

ANIMAL BEHAVIOUR

Whale dives into record books

A Cuvier's beaked whale has set a new record for the deepest known dive by a mammal, reaching 2,992 metres.

Gregory Schorr at the Cascadia Research Collective in Olympia, Washington, and his colleagues attached satellite tags to eight Cuvier's beaked whales (*Ziphius cavirostris*) and collected more than 3,700 hours of data on the whales' movements off the California coast. One individual was in a dive for 137.5 minutes, nearly 18 minutes longer than the previous deep-diving record-holder, the southern elephant seal (*Mirounga leonina*). Another whale beat the seal's record depth by more than 600 metres.

This behaviour could be atypical, and might be a result of heavy naval sonar use in part of the study region, the authors say.
PLoS ONE 9, **e92633 (2014)**

CANCER GENETICS

Cancer survives by silencing a gene

Breast cancer can become resistant to treatment by co-opting a gene-silencing mechanism, reports a team led by Steffi Oesterreich at the University of Pittsburgh in Pennsylvania.

The hormone oestrogen, which drives many breast cancers, dampens the activity of the tumour-fighting gene *HOXC10*, and drugs called aromatase inhibitors free the gene from this repression. But in a genome-wide screen of human breast-cancer cells, the team found that these drugs can also lead to a type of epigenetic modification called methylation — the addition of methyl groups to DNA without changing its sequence — across the genome. This ultimately silences *HOXC10*, rendering breast-cancer cells resistant to aromatase inhibitors.

Blocking the methylation activity associated with aromatase-inhibitor treatment might delay or prevent resistance to therapy, the authors say.
Sci. Transl. Med. 6, **229ra41 (2014)**

NEUROSCIENCE

A broken channel in Huntington's

In Huntington's disease, neurons become more excitable and die. Researchers have now found a faulty ion channel in astrocytes, another type of brain cell, that could be contributing to this.

Baljit Khakh and Michael Sofroniew at the University of California, Los Angeles, and their colleagues studied two mouse models of Huntington's disease, and show that channels that allow potassium ions to cross the cell membrane were dysfunctional in astrocytes containing the Huntington's disease proteins. This caused potassium levels outside the cells to rise, making the membranes of nearby neurons more excitable.

The authors reversed these defects by replacing the faulty channels with functional ones. In one of the mouse models, channel replacement allowed the animals to walk more normally and live longer than mice with defective channels.
Nature Neurosci. **http://dx.doi.org/10.1038/nn.3691 (2014)**

AGRICULTURE

Cattle tamed by moving and mixing

Cattle were domesticated in the Middle East before being brought to Africa by migrating humans some 10,000 years ago.

Researchers previously thought that African cattle were domesticated there. To better understand this history, Jared Decker and Jeremy Taylor at the University of Missouri in Columbia and their colleagues analysed the DNA of 134 breeds of domesticated cattle to establish the relationships between them. The authors found that cattle imported from the Middle East bred with wild species to produce the African animals seen today.

Mixing of native cattle with imported breeds occurred extensively worldwide. For example, American feral breeds are descended from cattle that were brought in from Spain and India.
PLoS Genet. 10, **e1004254 (2014)**

ECOLOGY

Crabs ready for climate change

Cold-blooded animals are especially at risk as the climate warms, but the remarkable temperature tolerance of the European green crab (*Carcinus maenas*; **pictured**) bodes well for the animal.

Carolyn Tepolt and George Somero at Stanford University's Hopkins Marine Station in Pacific Grove, California, studied the temperature tolerance of crabs by measuring the cardiac function of animals at seven sites in Europe and eastern North America with widely varying temperatures. They found that the crabs could withstand warmer waters before their cardiac function was compromised, compared to native crustaceans in many places. Crabs also thrived in colder habitats, and acclimatized quickly to temperature shifts.

Temperature tolerance has probably allowed this crab to spread rapidly along the coasts of North America, say the authors.
J. Exp. Biol. 217, **1129–1138 (2014)**

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COMMUNITY CHOICE

The most viewed papers in science

ECOLOGY

City birds and plants in decline

HIGHLY READ on *Proc. R. Soc. B* online in February

Most bird and plant species in cities are native to those areas, but their numbers are rapidly decreasing around the world.

Myla Aronson at Rutgers University in New Brunswick, New Jersey, and her colleagues compiled and analysed data for birds in 54 cities and for plants in 110 cities, mainly in North America and Europe — the largest collection of urban biodiversity data so far.

The authors found that cities support just 8% of bird species and 25% of plant species that are found in non-urban areas. Human-related factors, such as land use and city age, seem to have a greater effect on bird and plant populations than do natural factors such as climate and geography.

Urban planning that emphasizes native habitats could better support biodiversity, the authors say.
Proc. R. Soc. B 281, **20133330 (2014)**

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