

RESEARCH HIGHLIGHTS

NEUROSCIENCE

Relief from pain

Neuron 66, 149–160 (2010)

Healthy people and those with chronic back pain perceive similar levels of discomfort from a hot rod placed on their backs. But, subconsciously, their brains send different signals.

Vania Apkarian of Northwestern University in Chicago, Illinois, and his colleagues used functional magnetic resonance imaging to look at two brain areas: the cortex, where conscious thought occurs, and the nucleus accumbens, which monitors reward. The hot rod induced similar responses in the cortex. However, when the heat was removed, activity in the nucleus accumbens increased in the healthy volunteers — signalling rewarding relief — but decreased in those with chronic back pain, indicating disappointment.

When asked, members of the latter group reported a lessening of their chronic back pain when subjected to the acute pain.

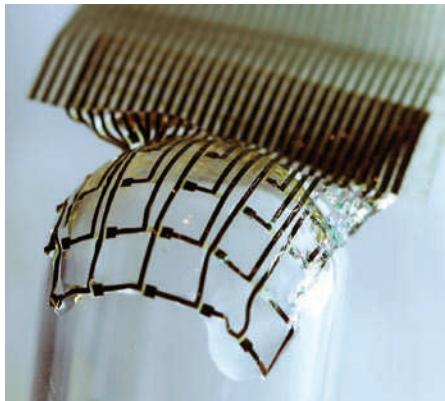
BIOMATERIALS

Electronics on the brain

Nature Mater. doi:10.1038/nmat2745 (2010)

Implanted electronic or medical devices can damage tissue or jostle themselves loose. The development of ultrathin electronics mounted on a flexible and dissolvable silk film could help to resolve this problem.

John Rogers of the University of Illinois at Urbana-Champaign, Brian Litt at the University of Pennsylvania in Philadelphia and their colleagues have fabricated thin electronics and transferred them to a layer of silk (pictured below). They placed their device on the surface of the exposed brain of an anaesthetized cat and show that, after application, the biocompatible silk dissolves, leaving the electronics layer tightly wrapped around the tissue. Its electrodes were able to detect brain activity.



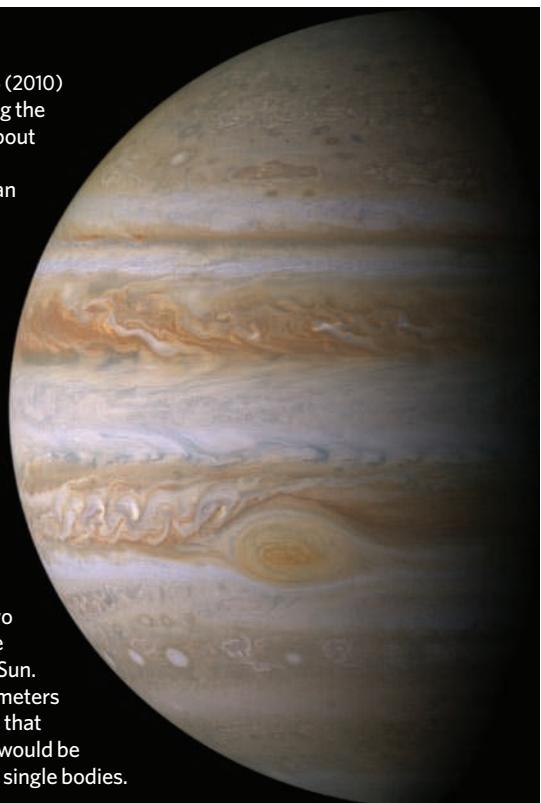
Moon grab

Icarus doi:10.1016/j.icarus.2010.03.026 (2010)

Of the more than 150 moons orbiting the Solar System's four giant planets, about two-thirds have distant, eccentric orbits. This suggests that, rather than coalescing from their respective planets' building materials, these moons were captured by their planets.

So far, however, modellers have struggled to recreate the conditions required for this capture, say Catherine Philpott at the University of Maryland in College Park and her colleagues. Proposing a new model, they show how a giant planet's strong gravitational tides can exaggerate small differences in the relative speeds of pairs of asteroids that stray too close. The slower of the two is left in the planet's grasp, while the faster one continues its orbit of the Sun.

Testing their model with the parameters of Jupiter (pictured), the team finds that 100-kilometre-wide binary objects would be captured about 10 times as often as single bodies.



NASA/JPL/SPACE SCIENCE INSTITUTE

CULTURAL EVOLUTION

High fidelity

Biol. Lett. doi:10.1098/rsbl.2010.0165 (2010)

In Darwin's finches, males learn to sing from their fathers. Song types can persist from one generation to the next, but for how long?

Eben Goodale and Jeffrey Podos at the University of Massachusetts, Amherst, compared song recordings from medium ground finches (*Geospiza fortis*) on Santa Cruz Island in the Galapagos made in 1961 and 1999. They found that, despite copy errors and other modifications, several song types persisted over almost four decades with remarkable fidelity. Certain parameters, such as trill rate, number of notes and song duration remained unchanged.

Male offspring that fail to reliably copy their father's song might be less successful at mating, the researchers suggest.

CELL BIOLOGY

Toxin tackle

Cell 141, 231–242 (2010)

The plant toxin ricin is a potential bioterror agent for which there is no treatment. Researchers in France used high-throughput screening to look for small molecules that

could protect cells against this compound *in vitro*. They found two, one of which markedly increased the survival rate of ricin-intoxicated mice.

Daniel Gillet at the Atomic Energy and Alternative Energies Commission in Gif-sur-Yvette, Ludger Johannes at the Curie Institute in Paris and their colleagues found that the small molecules blocked a key step in the trafficking of the toxin in the cell. This prevents it from reaching an organelle called the endoplasmic reticulum and moving on to inhibit protein biosynthesis.

They also found that the two molecules conferred similar beneficial effects on cells exposed to Shiga-like toxins, which are produced by certain disease-causing bacteria.

CHEMISTRY

Plumbing carbon rings

Science 328, 339–342 (2010)

Many organic compounds contain atoms arranged in aromatic or 'ring' structures, which often confer stability. Now Masaichi Saito at Saitama University in Japan and his colleagues have slipped lead into a ring of carbon atoms without disrupting its stable structure.

Aromatic compounds are stabilized