Now Michael Meaney of McGill University in Montreal, Canada, and his colleagues have tested brain samples from people who committed suicide, and found that those with a history of childhood abuse had a similar methylation pattern to the neglected rat pups. They also had fewer than average glucocorticoid receptors. These measures did not differ between people with no history of abuse who killed themselves and unabused people who died by other means.

MECHANICS

Good vibrations

Phys. Rev. Lett. **102,** 080601 (2009)

Harvesting energy from ambient vibrations, such as those created by walking or the shaking of moving vehicles, is one way to obtain low-cost and renewable power for small electronic devices. Most examples so far convert vibrations into electrical energy using 'linear' oscillators, which miss out much of the typically broad frequency spectrum of vibrations.

Nonlinear oscillators — for example, bistable ones with two stable oscillating states — can do a better job, according to Francesco Cottone at the University of Limerick in Ireland and his colleagues. Their proof of principle is an inverted pendulum comprising a piezoelectric beam, which produces electricity when it bends. This generates four to six times more power from ambient vibrations when it oscillates in a bistable rather than a linear manner.

PALAEOCLIMATOLOGY

Global cooling

Science **323,** 1187–1190 (2009)

Large parts of Antarctica became suddenly and substantially icy about 34 million years ago. Oxygen-isotope records suggest that a simultaneous accumulation in ice cover happened in the Northern Hemisphere, which is now challenged by Zhonghui Liu of Yale University and his colleagues.

They calculate sea-surface temperatures for the period using a pair of chemical proxies (tetraether and unsaturated alkenone) found in sediment cores retrieved from 11 locations around the world. According to their calculations, high-latitude cooling averaged 5 °C.

After plugging their numbers into an ocean-circulation model, the team calculated that ocean cooling could explain the discrepancy in oxygen-isotope records: a Northern Hemisphere glaciation would not have been required.

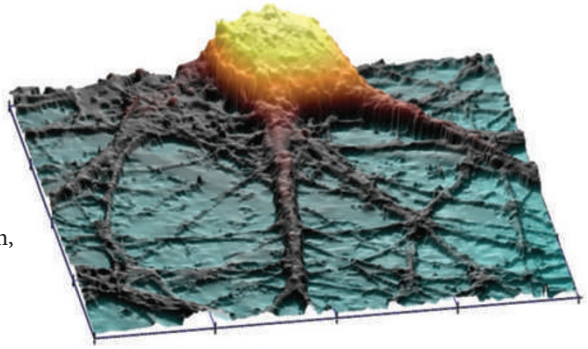
MICROSCOPY

Pogo-stick pictures

Nature Methods doi:10.1038/nmeth.1306 (2009)

There is as yet no way to produce images that capture the three-dimensional convolutions of a living cell's surface without running the risk of deforming the cell. But a team led by Yuri Korchev of Imperial College London, UK, thinks it has cracked the problem by modifying a technique used on relatively flat surfaces called scanning ion conductance microscopy.

The team's method builds up pictures by measuring changes in the ion flow through a fluid-filled nanopipette when its tip comes close to a cell. The team's innovation involves having the pipette 'hop'— that is, approach the sample from above any of its surface features — rather than scanning across the surface. Their image of a mouse cochlear hair cell is shown below.



P. NOVAK *ET AL.*

METAMATERIALS

Taming terahertz

Nature Photon. doi:10.1038/nphoton.2009.003 (2009)

Unlike X-rays, terahertz or 'submillimetre' radiation can penetrate organic samples without damaging them, and so holds promise for medical diagnostics. But there is a stumbling block on the path to such technologies: terahertz waves have proved difficult to manipulate.

Hou-Tong Chen at the Los Alamos National Laboratory in New Mexico and his colleagues have now developed a device that controls the phase of terahertz waves. This makes it possible for researchers to store and transmit information with terahertz radiation by varying the voltage across a 'metamaterial' — one made from tiny components that are similar in size to the wavelength of the terahertz waves.

The metamaterial modulator works as well as analogous devices for manipulating optical waves, but at much higher speeds.

JOURNAL CLUB

Paolo Tammaro
University of Manchester, UK

A physiologist notes the similarities between animal and plant electricity.

Almost all organisms run on electricity. As an undergraduate, I was intrigued by the fact that the long, single cells of the freshwater plant *Nitella* are nearly identical to those of single nerve fibres. These plant cells generate slow action potentials that are similar to those of human or animal nerves. But the electrical components that span plant and animal membranes — the ion channels and transporter proteins — are usually quite different, as are some of the ions they transport.

Earlier this year, however, two researchers in Italy found that a single mutation can turn an important transport protein from a component that is compatible with animal electrical systems into one that is appropriate for plants. They studied the protein CLC-5, which is abundant in the intracellular vesicles of kidney cells. There, it exchanges chloride ions for protons, and in so doing regulates the vesicles' acid content (G. Zifarelli and M. Pusch *EMBO J.* **28,** 175–182; 2009).

The researchers knew that CLC-5 resembled the plant transporter atCLCa, but they had no idea how closely. In plant vacuoles, which are formed by the fusion of several vesicles, atCLCa exchanges not chloride but nitrate ions for protons. The difference is vital: nitrate is necessary for plants to grow and is stored in the vacuoles of root and shoot cells, whereas chloride has a very different role. It is needed for photosynthesis and for the opening and closing of stomata, which matters mostly in the leaves.

Merely substituting one serine amino acid in CLC-5 with a proline changed the protein from a chloride transporter into a nitrate transporter. I find this fascinating because it provides an even more striking example of the similarities that animals and plants can share, even though their biologies are generally very different.

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