regulation. Buoys and ship-based sensors are normally used to measure the amount of water that sinks and how fast it does so, but generating such data from satellite readings would provide more complete coverage.

Marine Herrmann of the CNRS in Toulouse, France, and her colleagues have gone some way towards this by comparing satellite measurements of sea-surface elevation for the years 1994–2007 to a simulation of the Western Mediterranean Deep Water convection.

Sea level is always lower where convection takes place. Herrmann's study shows that it is sufficiently so off the southern coast of France (and by implication, many other sites around the world) for altimetry measurements to determine year-on-year convection changes.

NANOTECHNOLOGY

Etch a circuit sketch

Science **323,** 1026–1030 (2009)

The difficulty in designing nanoscale circuit boards lies in keeping electrons from leaving the conducting material through which they flow. With this in mind, Jeremy Levy of the University of Pittsburgh in Pennsylvania and his colleagues have devised 2-nanometre-wide circuits that confine electrons to the two dimensions of the chip's 'wiring' by trapping a gas of them at the interface of polar and nonpolar metal oxides.

Their circuits are made using a conducting atomic force microscope tip with positive voltage on the polar oxide, which changes the electronic properties of the oxide. Passing a tip with a negative voltage back over the circuits erases them. These processes can be repeated hundreds of times. The authors demonstrated the concept by building electronic components such as field-effect transistors.

MATERIALS SCIENCE

Better coats

Phys. Rev. Lett. **102,** 045003 (2009)

Sputtering, a common industrial method for coating surfaces, uses ions in a gas to knock metal atoms from a solid that then fly off to coat a target in a thin film. 'Self-sputtering' is a way to coat targets without the presence of a gas; at higher voltages some of the metal atoms are themselves ionized and return to their solid source, where they dislodge yet more metal atoms.

Now Joakim Andersson and André Anders of Lawrence Berkeley National Laboratory in California have created a sort of runaway self-sputtering. It uses pulses of extremely high voltage to make the ion current of the metal atoms exceed the applied electric current.

PALAEONTOLOGY

Flower power

J. Evol. Biol. **22,** 446–459 (2009)

Many palaeontologists have long thought that flowering plants and dinosaurs co-evolved because many species of both appeared during the Cretaceous period, 145 million to 65 million years ago. This now seems unlikely.

Richard Butler and his colleagues at London's Natural History Museum have mapped the species diversity of fossil finds encompassing 407 species of dinosaur (including those of diplodocus, pictured below) and more than 2,300 species of plant. They found no overall geographical correlation between the two data sets.

Instead, they learned that stegosaur diversity was negatively correlated with the diversity of flowering plants and positively correlated with that of non-flowering cycadophytes, which hints that the spiny-backed group ate cycadophytes.

N. PARKER/NATURAL HISTORY MUSEUM, LONDON

NEUROSCIENCE

Mouse mapping

PLoS Biol. **7,** e1000032 (2009)

When neuroscientists measure parts of nervous systems, they do so statistically, pooling data about the activity of many neurons at once. But researchers based in Cambridge, Massachusetts, have painstakingly mapped every neuron involved in innervating six mouse interscutularis muscles — muscles that allow mammals to wiggle their ears.

Jeff Lichtman of Harvard University and his colleagues used these six 'connectomes' to compare the innervation of paired tissues on the left and right sides of the same creatures. The wiring was strikingly different, underscoring the flexible nature of mammalian neural development. Many of the neurons were also 25% longer than required to form the connections that they did. That is odd because nerve cells are metabolically expensive.

JOURNAL CLUB

Kishan Dholakia
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An optical physicist sees beyond fluorescent labels.

Many a molecular biologist likes to watch molecules move around inside living cells, particularly in real time. The job is usually done by tethering a fluorescent tag to interesting biological molecules and following their movements by means of the tag's glow. But fluorescent tags are often bigger than the molecules they label, so frequently perturb their movements. Better to watch intracellular dramas without millstones around the actors' necks. But how?

A twist on 'Raman scattering' may hold the answer. Normally, when a laser is shone at a molecule, the molecule scatters most of the light at the same frequency at which it was emitted by the laser. A tiny amount — Raman scattered light — is scattered at different frequencies. These frequencies indicate the chemical bonds in the molecule, and can thus identify it as a fingerprint identifies a person. If only Raman signals were stronger, they would be suitable for real-time microscopy on a molecular scale.

A second laser provides the twist — and the necessary amplification. Sunney Xie of Harvard University and his colleagues have found that another laser can enhance the contrast of an image, improving the sensitivity over previous studies by four orders of magnitude (C. W. Freudiger *et al. Science* **322,** 1857–1861; 2008). For this to work, the two lasers must coincide on the sample, and the difference in their frequencies must exactly match that of a specific molecular vibration of a certain chemical bond in the sample. The background noise is eliminated and the signal is amplified.

This method is both versatile and powerful; the authors used it to observe the uptake of omega-3 fatty acids by human lung-cancer cells and the changing distribution of two drugs as they were absorbed by mouse skin. I think this could spur the development of tag-free molecular movie machines for all.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**