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Symmetry, snakes and snails



The snail-eating *Pareas iwasakii* homes in on its prey. (Courtesy M Hoso/Kyoto University.)

Physicists always find broken symmetries fascinating, and it seems that biologists do too. Masaki Hoso of Kyoto University and colleagues have found specialist snail-eating snakes with more teeth on the right side of the jaw than on the left. Why? Well, it is hard to pull a snail out of its shell, and it turns out that it helps the snakes to extract and eat snails – at least if the snail shells are right-handedly spiralled.

In their studies of the snail-eating specialist *Pareas iwasakii*, the team observed that the snakes could extract

snails from right-handed shells much more readily than from left-handed shells. As a side effect, where these snakes are found, snails with left-handed shells tend to do better – evidently a case of an initial small parity violation (even if accidental) that has been amplified by biology and evolution.

Further reading

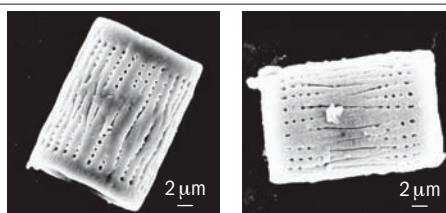
Masaki Hoso et al. 2007 *Biology Letters* **3** 169.

For movies of the snakes in action see <http://ecol.zool.kyoto-u.ac.jp/~hoso/E-top.html>.

Researchers replicate nature's nano-architecture

Nature makes an amazing range of tiny forms out of silica. However, more often than not it is silicon that is useful in a variety of applications, making the work of Zhihao Bao and colleagues at the Georgia Institute of Technology in Atlanta very interesting. They have developed a technique that can take the hard silica cell wall of a diatom, or other small silica structure, and react it with magnesium gas at a relatively low temperature to produce magnesium oxide and silicon. They then etch away the magnesium oxide to leave the original shape of the silica object, but now in more useful microporous silicon.

The process is particularly impressive as it takes place at temperatures less than



Before and after: secondary electron image of the original silica diatom shell (left) and the final silicon replica (right), showing the same structure with narrow channels.

around 850 °C, whereas the conversion of silica to silicon normally requires temperatures higher than 2000 °C. It could prove useful not only to make novel devices from biological silica but also from silica structures made by other processes. One use that the team has begun to investigate may be in microscale gas sensing.

Further reading

Zhihao Bao et al. 2007 *Nature* **446** 172.

Graphene shows room-temperature quantum Hall effect

Graphene – a material made from a single layer of carbon atoms – has attracted attention recently because of its many strange properties and the fact that its electrons act in many ways like massless Dirac fermions. The latest amazing finding is that graphene exhibits the quantum Hall effect at room temperature.

KS Novoselov of the University of Manchester and colleagues achieved the feat with an admittedly high magnetic field of 45T, but have managed to avoid the usual need to go close to or even below liquid helium temperatures. Their work is of particular interest for metrology since the quantum Hall effect can be used to provide a standard reference point for Planck's constant divided by the square of the electron charge.

Further reading

KS Novoselov et al. 2007 *Science* **315** 1379.

Silica nanorods set new record for thin-film refraction

Antireflection coatings play important roles in almost all fields of optics, and could dramatically boost the efficiency of solar cells. It has proven difficult, however, to get materials of very low indices of refraction to have a smooth match between the coating, whatever the type, and air.

Now J-Q Xi of Rensselaer Polytechnic in New York and colleagues have set a new record. Using electron-beam deposition they put two layers of angled silica nanorods onto three layers of angled titanium dioxide nanorods, on an aluminium nitride surface, and reached an index of refraction of just 1.05 – a world record for a thin film.

Further reading

J-Q Xi et al. 2007 *Nature Photonics* **1** 176.