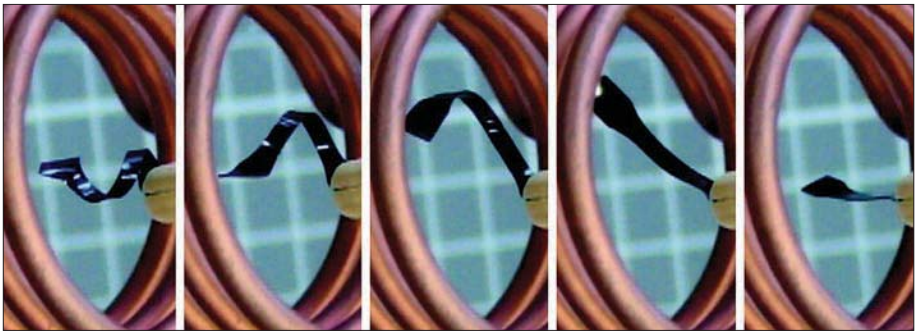
SCIENCEWATCH

Compiled by Steve Reucroft and John Swain, Northeastern University

Nanoparticles create shape-shifting polymer

A novel material that changes its shape in response to a suitable magnetic field is the brainchild of Andreas Lendlein and colleagues at the Institute of Polymer Research at the GKSS Research Centre Geesthacht in Teltow and the German Institute of Polymers in Darmstadt. The material is a variant on shape-memory polymers, which change shape in response to temperature. The idea is to use inductive heating from a time-varying magnetic field to warm up magnetic nanoparticles in a thermoplastic polymer, so as to trigger a change in shape without having to alter the ambient temperature or making direct contact with the material.

The researchers used nanoparticles of iron oxide in a silica matrix, which they distributed homogeneously in polyetherurethane. They can set the temperature for the shape change by varying the proportion of nanoparticles in the polymer and the strength of the magnetic field. The team is particularly excited by the potential for applications in medical technology, such as remotely controlled instruments and "smart" implants, for example for on-demand drug delivery triggered non-invasively by a magnetic field.



These photographs show the shape-memory effect in a polymer composite (Mohr et al. *2006).*

Further reading

R Mohr *et al.* 2006, *Proc. Nat. Acad. Sci.* **103** 3540.

Investigating parity violation in life…

The two most striking places in the universe where violation of parity is observed are in weak interactions, which are completely left-handed, and in biochemistry, where amino acids are left-handed and sugars are right-handed. While a precise link between the two phenomena has been elusive, new research has yielded a surprising clue in a spiral molecule called polyglutamic acid (PGA), which comes in left- and right-handed forms (L and R, respectively). Meir Shinitzky of the Weizmann Institute in Rehovot and colleagues have found that hydrochloric acid was dramatically more effective at unravelling the R form than the L.

Precisely what is going on is still unclear, but there is a suggestion that weak interactions might make L amino acids of L-PGA slightly more magnetic and hence more likely to interact with the weakly magnetic forms of water (ortho-H_2O) that make up about 75% of normal water. This would then perhaps provide some degree of protection from the acid. There is no magnetic analogue of ortho-H_2O in deuterium oxide (heavy water), and as the effect is not seen if PGA is dissolved in heavy water, this lends some support to this idea.

Further reading

Yosef Scolnik *et al.* 2006 *Physical Chemistry Chemical Physics* **8** 333.

…and putting DNA through the wringer

DNA is a strange molecule, and not only because it can carry genetic information. If you try to twist it, it becomes longer, which is the opposite to what happens when wringing out a wet cloth. In an aptly titled paper, "Wringing out DNA", Timothée Lionnet and colleagues of the Centre National de la Recherche Scientifique in Paris and Lyon found that a DNA molecule starts to extend when it is anchored at one end and twisted via a magnetic bead attached to the other. As the twisting takes place, base pairs are brought closer together and are forced to tilt, which leads to a net extension.

Further reading

Timothée Lionnet *et al.* 2006 http://xxx.lanl.gov/abs/q-bio.BM/0602008.

CFC uses down-time

In counterfactual computation (CFC), quantum computing can use a computer without running it. Onur Hosten of the University of Illinois and colleagues demonstrated this in the first CFC proof-of-principle. A photon couples with a computational element that is both on and off to get partial data about what would have happened had it been on. The team made an optical realization of CFC with an interferometer using an optical implementation of Lov Grover's algorithm for searching an unsorted database.

Further reading

Onur Hosten *et al.* 2006 *Nature* **439** 949.

Magnetic snails

Researchers have found a snail that grows magnetic iron-sulphide scales on its foot. Yohey Suzuki of the Japan Agency for Marine-Earth Science & Technology in Yokosuka and colleagues found the snail in a deep-sea hydrothermal field. It uses the scales against sulphides and to protect itself from predators.

Further reading

Yohey Suzuki *et al.* 2006 *Earth and Planetary Science Letters* **242** 39.

In May 2006, Outokumpu Copper Products will become Luvata

* ***Outokumpu Copper Products constituent companies include:***

Outokumpu American Brass
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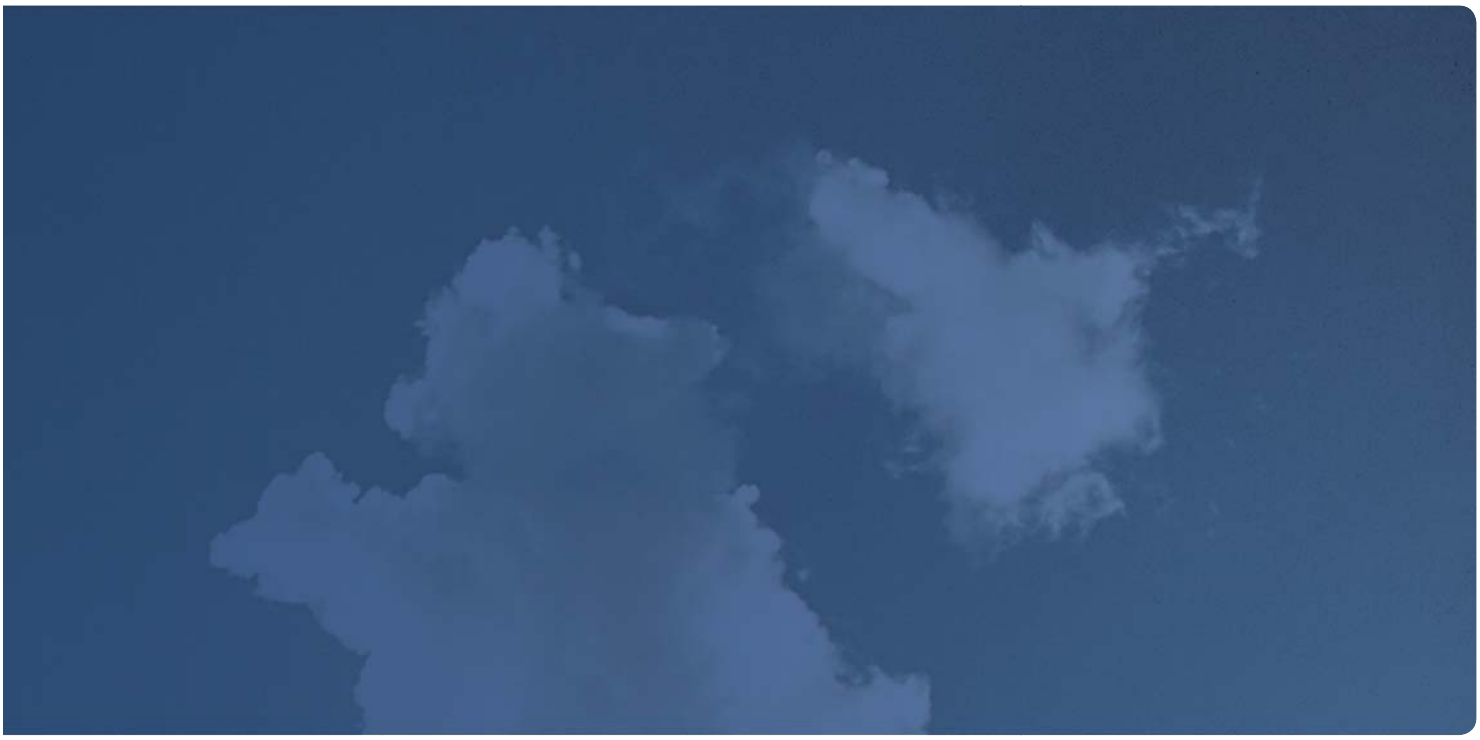

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For many decades, Outokumpu Copper Products and its constituent companies* have set the standard in the fabricated copper products industry.

Successful partnerships with our customers have brought continued growth and diversification. Following our separation from the Outokumpu Group in 2005, the need arose for a new name to better reflect our independence, our future direction, and the products and services we offer.

Luvata is a Finnish word that means 'to promise'. We chose it because it reflects the strength of our ongoing commitment to our customers.

As we come closer to May 15, the date of our name change, we will post further information on our website.

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