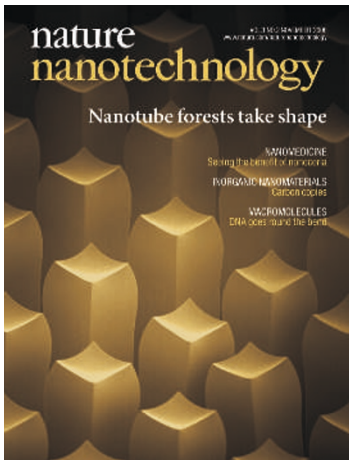

COVER STORY

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Double-walled nanotubes benefit from the structural integrity of an extra layer of carbon, but they can also possess some of the useful properties of single-walled nanotubes, such as a low turn-on voltage when used in field-emission devices. To optimize the synthesis of this relatively unexplored type of nanotube, Kenji Hata and co-workers have analysed more than 1,400 samples produced under different growth conditions, and constructed phase diagrams that relate the number of walls to the diameter of the nanotubes. They then focus on the range of diameters that yields the most double-walled nanotubes, determining how the diameter depends on the thickness of the iron film that acts as a catalyst. This strategy results in 85% size selectivity and 99.95% carbon purity. Moreover, during the growth process the double-walled nanotubes self-organize into vertically aligned 'forests', reaching more than 2 mm in height. **[Article p131; News & Views p94]**

METAL OBSTACLE OVERCOME

The ability to grow multiwalled carbon nanotubes directly onto metallic surfaces would be advantageous for various applications. Until recently, however, nanotube growth techniques in which the catalyst is delivered in the vapour phase have not worked for metals. Now Saikat Talapatra and colleagues have shown that it is possible to overcome this limitation by using chemical vapour deposition to deliver the catalyst, and a nickel-based alloy called Inconel as the growth surface. Using this technique, the team produced nanotubes that have good mechanical and electronic contacts with the surface, and went on to make double-layer capacitors and field-emitter devices. **[Letter p112]**

IMPROVE YOUR FOCUS

The patterning of surfaces is central to many applications of nanotechnology, with a large number of these techniques relying on photoresists that expose selected parts of the surface to treatments such as doping. Mansoo Choi and co-workers have now demonstrated an approach called electrodynamic focusing that is capable of producing patterns with feature sizes considerably smaller than those in the photoresist. Moreover, it works on both conducting and non-conducting surfaces. The technique relies on a combination of charged aerosol nanoparticles and an applied electric field to produce nanoscopic electrostatic lenses that focus the nanoparticles onto the exposed areas of the surface. **[Letter p117]**

TAKE IT AND LEAVE IT

The ultimate limit in surface patterning involves the delivery of single atoms and molecules to precise locations, where they remain fixed. Now, Anne-Sophie Duwez and colleagues have shown how an atomic force microscope (AFM) can do this with single polymer molecules. The team start by grafting the polymer molecules, which contain reactive groups, onto an AFM tip. The molecules are then brought into contact with a chemically modified silicon surface, which they bond to. When the AFM is pulled away from the surface, the weakest bond in the chain — the one between the polymer and the AFM tip — breaks, completing the delivery of a single molecule to the surface. **[Letter p122]**

BEND IT LIKE DNA

The way DNA folds is important for many cellular processes, so it is essential to understand its elastic properties. Previous theoretical models could predict the results of experiments on single DNA molecules, showing that they more or less obeyed Hooke's law. Now, Philip Nelson and colleagues have used high-resolution atomic force microscopy to investigate the curvature of DNA molecules on shorter (5–10 nm) length scales. Their results suggest that DNA is a lot more flexible than previously thought, and have led to a new general model that could be applied to other semiflexible molecules. **[Article p137; News & Views p100]**

SIGHT FOR SORE EYES

Cerium is routinely used in automobile exhaust systems and for polishing glass and jewellery, but it could also be used to treat eye disorders and other diseases according to new research. James McGinnis and co-workers injected rat eyes with cerium oxide nanoparticles and found they can protect the retina against exposure to damaging levels of illumination. If injected after exposure, they can assist recovery. The nanoparticles neutralize the effects of reactive oxygen intermediates (ROIs), although the mechanism underlying this process remains unclear. The results indicate that nanoceria particles may be effective in inhibiting ROI-induced cell death, which is thought to be involved in a variety of blinding diseases, including macular degeneration, and diabetes. **[Article p142; News & Views p92]**

A GOLDEN GLOW

The ability to modulate the spectral properties of semiconductor nanocrystals could prove useful in various optical-based technologies. Metal-enhanced fluorescence, for instance, increases luminescence as a result of coupling between the nanocrystal and electronic excitations, known as surface plasmons, in the metal. Piero Pompa and co-workers have investigated how arrays of gold nanostructures can be used to enhance the optical characteristics of CdSe/ZnS nanocrystals. Electron-beam lithography was used to create regular patterns of gold triangles or cylinders on a silicon dioxide substrate, and a polymer dispersion of nanocrystals was spin-coated on top. Thirtyfold intensity enhancements, with a high degree of spatial control, were observed. **[Letter p126]**

Enhanced fluorescence from nanocrystals

p126