Cover story

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The mechanical properties of polymers can be enhanced by reinforcing them with nanoparticulate fillers, but the improvements often fall far short of the values predicted by theory. There are a number of reasons for this discrepancy, including practical limits on the amount of nanoparticles that can be incorporated into the polymer matrix and difficulties in dispersing them evenly because of their tendency to stick together. Now, Christoph Weder and colleagues have developed a new method for making nanocomposite materials that allows otherwise immiscible components to be combined and also permits high filler loadings. In the new approach, rather than adding the nanoparticles to the polymer, a network of nanofibres (see cover) serves as a template that can be filled with a polymer. Weder and colleagues demonstrate the potential of the technique with a range of different polymers and nanofibres. **[Letter p765]**

NANOPLATES ON THE MENU

Semiconducting nanoplates are the latest addition to the growing family of free-standing nanostructures that can be fabricated by researchers. Martin Aagesen and co-workers have grown free-standing nanoplates of indium arsenide with molecular beam epitaxy and examined their structural and transport properties. The carrier density of the nanoplates can be reduced to zero by applying a voltage, creating a new type of suspended quantum well. The electronic and optical properties of such systems also make them potentially attractive for photovoltaic and sensing applications. **[Letter p761]**

TAKING THE SHINE OFF SILICON

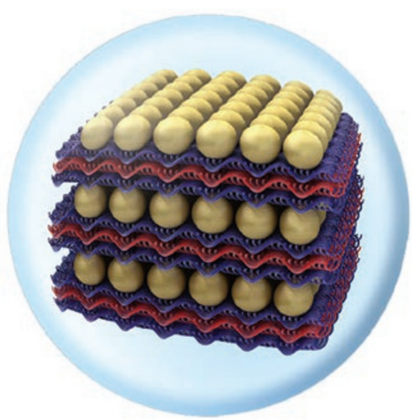
Scientists and engineers often take inspiration from examples in the natural world, such as the anti-reflection surfaces found in the eyes of moths. In another example of such biomimetic research, Surojit Chattopadhyay and colleagues have shown that a simple aperiodic array of silicon nanotips on the surface of a 6-inch silicon wafer can suppress the reflection of light over a wide range of wavelengths, including the ultraviolet, visible, infrared and terahertz regions of the spectrum, and for a wide range of angles of incidence. The anti-reflection properties are due to changes in the refractive index caused by variations in the height of the silicon, and can be simulated with models that have been used to explain the low reflection from moth eyes. The improved surfaces could have applications in renewable energy and electro-optical devices for the military. **[Letter p770]**

IN THROUGH THE OUT PORE

Solid-state nanopores are emerging as a useful tool for the study of single molecules. However, their use in applications such as DNA sequencing and the exploration of protein folding requires better control over the interaction between the molecule and the pore. In many experiments the molecule of interest translocates through the nanopore just once. Now Marc Gershow and Jene Golevchenko have shown that electric fields can be used to recapture double-stranded DNA molecules after they have translocated. This means they can make the same molecule pass back and forth through the nanopore many times, which greatly improves the accuracy of the measurements. The new approach will allow the chemical transformations and internal dynamics of the molecules to be probed on submillisecond time and submicrometre length scales. **[Letter p775; News & Views p741]**

THANKS FOR THE MEMORY

Developments in flash-memory technology will require greater control over the charge-trap layer in these devices. Metallic and semiconductor nanoparticles are already used as charge-trap elements, but Jinhan Cho and co-workers now describe a versatile approach for making devices in which gold nanoparticles in polyelectrolyte/nanoparticle multilayer films trap the charge. A layer-by-layer assembly approach was used to make the devices, and the effect of increasing the number of polyelectrolyte and gold nanoparticle layers on memory performance was investigated. They found a maximum memory window (the difference between the voltages required to 'program' and 'erase' the device) of about 1.8 V in devices that contained three polyelectrolyte/nanoparticle layers. **[Article p790]**



In a flash — golden memories.

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BEWARE SOFT CELLS

Changes in the stiffness of cells influence the way in which they spread. *In vitro* measurements have previously shown that cultured cancer cells are elastically softer than normal ones. Now James Gimzewski and colleagues have shown that cancer cells taken from the patients with suspected lung, breast and pancreas cancer are more than 70% softer than benign cells. The different types of cancer cells also showed a common stiffness. Moreover, normal cells that looked like cancerous cells could be distinguished with the techique. This mechanical approach complements current cancer detection methods and may be clinically applicable in the future. **[Letter p780; News & Views p748]**

SMALL PRINT

The increases in computing power made possible by making ever smaller transistors have come at a cost — the expense of 'fabs' that manufacture semiconductor devices has soared. However, there is also a need for low-cost approaches to fabricating inexpensive devices for less demanding applications. Printing has emerged as such an approach, but it is difficult to scale to smaller feature sizes, which results in slow circuit speeds and high operating voltages. Henning Sirringhaus and co-workers have now demonstrated a self-aligned approach to printing that can improve the performance of organic transistor circuits by reducing feature sizes while remaining compatible with low-cost, large-area, flexible electronics manufacturing. The use of a 30–50 nm polymer layer as the gate dielectric allows operating voltages to be kept below 5 V. **[Article p784]**