COVER STORY

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The self-assembly of small molecular building blocks into large ordered structures is a simple and efficient way to create new functional materials. Such a bottom-up approach relies solely on the delicate interplay of attractive and repulsive forces between individual molecules and the assemblies they form. Ehud Gazit and Meital Reches have shown that small protein fragments — known as dipeptides — can organize into nanotubes, which, in turn, form vertically aligned arrays on glass substrates. The effects of both molecular size and electronic charge on this hierarchical assembly process are investigated. Furthermore, by attaching magnetic nanoparticles to these tubes and applying an external field, it is also possible to align them horizontally. **[Letter p195; News & Views p169]**

ALLOY, THERE!

Bronze, steel and other alloys have properties that are very different from those of their constituent elements. But when an alloy is reduced to a chain of atoms, does the conventional understanding of an alloy survive? Jefferson Bettini and colleagues explore this question for alloys of gold and silver. With electron microscopy and computer simulations they 'film' how the atoms rearrange themselves as a nanowire is thinned to become a chain of atoms. Gold and silver have different thermal diffusivities and surface energies, and early simulations suggest that it may be possible to design core–shell nanostructures by taking advantage of the self-organization that happens during the thinning process. **[Letter p182; News & Views p164]**

BETTER THAN GOLD

Gold catalyst nanoparticles are widely used for synthesizing silicon nanowires. However, gold impurities can trap charges and introduce kinks and defects in the nanowires. Aluminium is an attractive alternative because it is a natural dopant for silicon and is also compatible with CMOS processing, but the natural oxide that forms on the surface of the aluminium has always been an obstacle. However, by using chemical vapour deposition under ultra-high vacuum, Yewu Wang and co-workers have now demonstrated that it is possible to epitaxially grow silicon nanowires from aluminium catalyst nanoparticles. Moreover, they suggest that the aluminium remains a solid during the growth process, permitting low-temperature nanowire fabrication. **[Letter p186]**

BASE METALS

The secrets of life are coded into the sequence of bases (A, C, G and T) that line up along the backbone of a DNA molecule. When two strands come together to a form a double helix, the bases recognize each other and pair up in a wholly predictable manner (A with T, and C with G). Now, Mitsuhiko Shionoya and colleagues have made DNA strands containing artificial bases that pair up when they are 'bridged' by metal ions. By using bases that only bind to specific metals, it is possible to line up mercury and copper ions along the core of the double helix in a sequence that is programmed by the order of the bases on the backbone. **[Letter p190]**

KEEP IT CLEAN

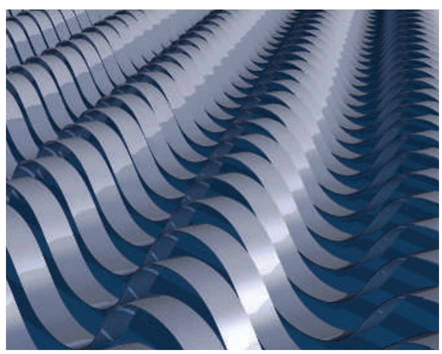
Combining semiconductors and superconductors in one device could have many advantages for applications and fundamental research, but it is difficult to guarantee good electrical contact between these often dissimilar materials. Jie Xiang and co-workers have now overcome these problems to insert a one-dimensional semiconductor junction into a superconducting aluminium circuit. The junction and the contacts are exceptionally 'clean', which allows the authors to observe multiple Andreev reflections as electrons tunnel from the semiconductor into the superconductor. The results indicate that the electrons and holes in the device can pass through the junction as many as 25 times without scattering. **[Article p208; News & Views p167]**

CANTILEVERS ARE GOOD FOR YOU

Existing methods for detecting biomarkers in medical samples tend to be costly, labour intensive and time consuming. Moreover, the various amplification and labelling processes involved can influence the signal in unexpected ways. An alternative approach involves the use of nanomechanical cantilevers that can be functionalized with single strands of DNA that are complementary to the sequence of DNA bases that need to be detected. When the two strands of DNA bind together, the cantilever bends due to the change in surface stress. Martin Hegner and colleagues show that arrays containing eight cantilevers can detect DNA with picomolar sensitivity within minutes, which could lead to the development of personalized devices for drug testing. **[Article p214]**

MAKING A WAVE

Electronic paper, roll-up displays and various types of sensors and detectors rely on the availability of electronic materials that can be stretched, compressed and bent. Previous research on flexible electronic devices has mainly focused on small organic molecules and polymers because traditional inorganic semiconductors lack the necessary flexibility. John Rogers and co-workers now show that devices containing silicon or gallium arsenide nanoribbons can overcome this problem. The team stretched a flexible substrate and created a pattern of adhesion sites before depositing the nanoribbons. When the substrate was allowed to relax, the nanoribbons buckled into wave-like structures that remained fixed to the surface at the adhesion sites. The team has made a fully stretchable and compressible photodetector using this approach. **[Article p201; News & Views p163]**



Semiconductors go for flexibility

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