RESEARCH HIGHLIGHTS

MATERIAL SCIENCE

Speedy silk imprinting

Adv. Mater. doi:10.1002/adma.200903166 (2010)
Silk proteins called fibroins have potential uses in a variety of devices thanks to their favourable optical and mechanical properties. Now Fiorenzo Omenetto at Tufts University in Medford, Massachusetts, and his colleagues have stamped patterns into these proteins using a rapid nanometre-scale imprinting process.

Silk fibroin usually takes many hours to cast into patterns, but the nanoimprinting technique, which presses the material into a mould at low pressure and room temperature, takes just seconds to minutes.

Tests of a patterned film of the silk protein in an optofluidic sensing device showed that the protein's stability enabled repeated use of the device, even after several months of storage.

BIOMATERIALS

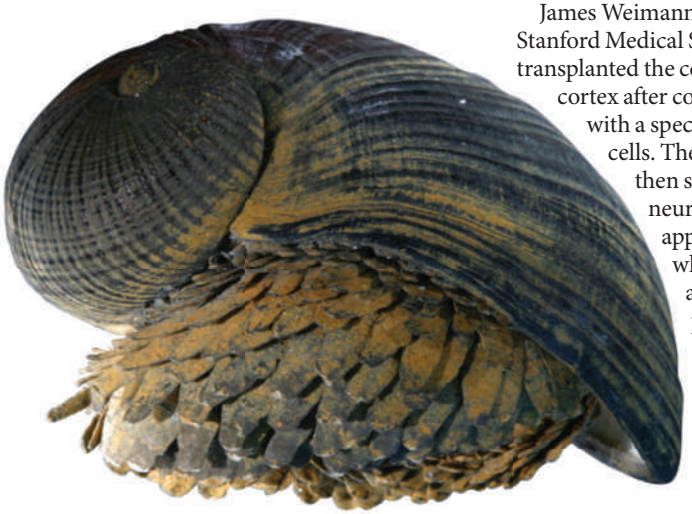
Super snail shells

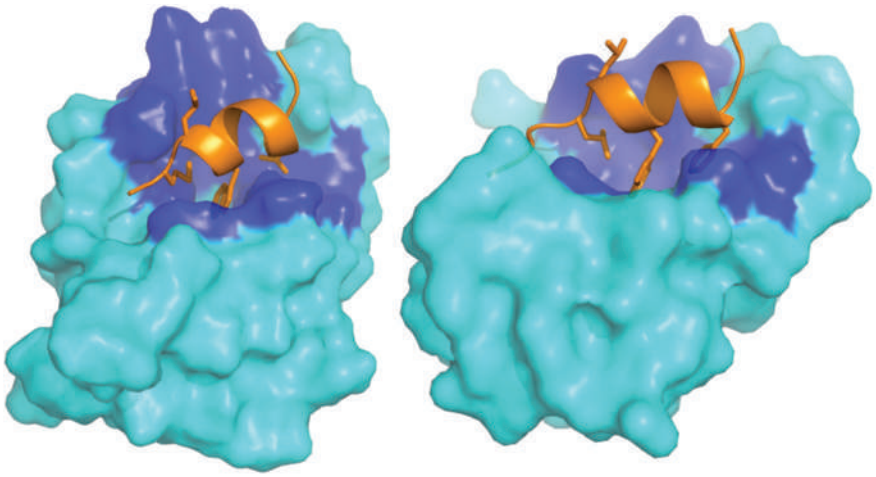
Proc. Natl Acad. Sci. USA **107,** 987–992 (2010)
The mechanical properties of an unusual, trilayered armour from a deep-sea snail have been revealed by Christine Ortiz of the Massachusetts Institute of Technology in Cambridge and her colleagues.

Using computational and nanometre-scale experimental techniques, they determined the mechanisms used by this mollusc (pictured below), from the Kairei Indian hydrothermal vent field, to dissipate energy and prevent fracture of its shell during predatory attacks.

A rigid iron-based outer layer provides a first line of defence against microfractures, whereas a more flexible organic middle layer assists in dissipating energy and arresting cracks. An inner rigid calcified layer provides structural support and resists bending.

A. WARÉN, SWEDISH MUSEUM OF NATURAL HISTORY, STOCKHOLM





C. VERMA/A. MADHUMALAR

Protein's billion-year history

Cell Cycle Epub ahead of print (2010)
Despite having a small genome and only four cell types, the simple creature *Trichoplax adhaerens* holds clues about the evolutionary origin of p53, the most commonly mutated human tumour-suppressor gene.

David Lane and his colleagues at Singapore's Agency for Science, Technology and Research found sequences in the *Trichoplax* genome that are similar to those of human p53 and Mdm2. The latter tightly regulates p53 in humans and other vertebrates.

Key binding sites between the p53 and Mdm2 proteins in this amoeba-like creature (Mdm2 protein pictured, above left, in cyan, p53 fragment in orange) also seem to be conserved in humans (right). The authors suggest that these two proteins and their interaction have existed for more than a billion years and emerged much earlier in evolutionary history than previously thought.

REGENERATIVE BIOLOGY

New nerve cells connect

J. Neurosci. **30,** 894–904 (2010)
Transplanting nerve-cell precursors derived from embryonic stem cells into the brain may be a promising repair strategy, but getting the cells to connect with the right parts of the brain has proved challenging.

James Weimann and his colleagues at Stanford Medical School in California transplanted the cells into the mouse cerebral cortex after conditioning them *in vitro* with a specific set of bone-marrow cells. The transplanted cells then specialized into cortical neurons that projected far into appropriate brain regions while avoiding inappropriate areas. For example, cells placed in the motor cortex extended to the spinal tract by the same route as native motor cortex neurons.

The authors conclude that cells derived from embryonic stem cells can integrate into the correct brain circuits, a key step towards stem-cell-based neural therapies.

VASCULAR BIOLOGY

Hearty hormones

J. Exp. Med. doi:10.1084/jem.20091924 (2010)
Male sex hormones may help men but not women to recover from cardiovascular problems.

Daniel Sieveking and Martin Ng of the University of Sydney in Australia and their group exposed the cells that line human blood vessels to dihydrotestosterone (DHT), a potent natural hormone that is synthesized from and acts like testosterone. DHT caused the cells from males, but not females, to form vessel-like structures — an indicator of tissue repair.

Neutered mice had a tougher time growing blood vessels in an implanted tissue-like gel than normal mice, with males more affected than females. This effect was reversed in the males by DHT administration, but not in females. Moreover, after the authors removed a major artery in males to restrict blood supply to the hindlimbs, the castrated mice