Genomics

The silkworm show

Science **306,** 1937–1940 (2004)
http://silkworm.genomics.org.cn

The silkworm (*Bombyx mori*) is the latest model organism to have its genome sequence pieced together. The silkworm, second only to the fruitfly *Drosophila* in its importance to insect geneticists, has an estimated 18,510 genes contained within its 28 chromosomes, compared with some 13,379 genes for the fruitfly.

The draft sequence was compiled by a consortium of Chinese researchers, and was no mean feat. Silkworms, which belong to the order Lepidoptera, have a genome sequence totalling almost 430 million base pairs. This is 1.5 times the size of the mosquito sequence and some 3.6 times that of *Drosophila*; both of these are members of the Diptera, which diverged from the Lepidoptera around 300 million years ago.

Of most interest are the genes that govern silk production, a process that has been exploited by mankind for more than 5,000 years. The researchers discovered 1,874 genes that function in the silk glands, only 45 of which were known before in *B. mori*. Many of them seem to encode hormones that regulate the activity of the silk-producing genes themselves. The authors also found 107 genes that seem to have counterparts in that other master spinner, the spider. **Michael Hopkin**

Chemistry

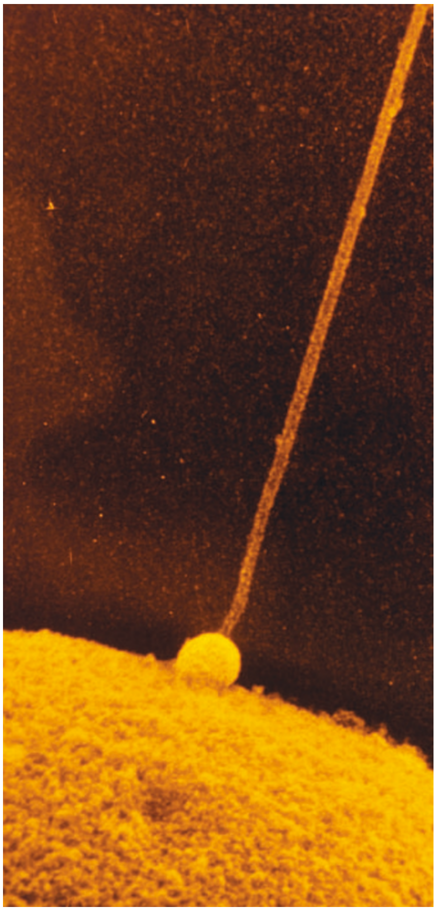
Radium singled out

J. Am. Chem. Soc. doi:10.1021/ja0455650 (2004)

Removing radioactive radium from industrial waste-water is tricky — for each radium ion present there may be millions of other metal ions that interfere with the cleaning process.

Fijs W. B. van Leeuwen and colleagues now show that an extraction chemical that builds itself *in situ* can pick radium out of the crowd. The chemical is an isoguanine derivative, which self-assembles into layered complexes and uses the radium ions as a template.

The complexes trap radium over a much wider pH range than has been possible with conventional extraction methods, and have a higher selectivity. For example, in a mixture containing a million times more magnesium than radium, van Leeuwen *et al.* could still remove all of the radium. Barium, which is close in size to radium, is an even tougher proposition. But the isoguanine complex still extracted almost all the radium in a mixture, even when the radium was outnumbered by 10,000 to one. **Mark Peplow**



Developmental biology

Peroxide producer

Dev. Cell **7,** 801–814 (2004)

The fertilized egg must keep a troop of invading sperm at bay. To do this, it undergoes a series of chemical reactions that hardens the outside of the cell into a protective shield. In many animals this is achieved by using hydrogen peroxide. For decades, scientists have searched for clues to how the peroxide is produced and what prevents it from damaging the fertilized egg. An investigation of sea urchins by Julian L. Wong *et al.* now sheds light on this reproductive riddle.

The authors scanned the sea urchin's DNA for genes encoding enzymes that could catalyse these types of peroxide reactions. An enzyme that they dubbed Udx1, for 'urchin dual oxidase 1', caught their attention. They showed that Udx1 is activated after fertilization and starts to generate hydrogen peroxide. This peroxide, in turn, is used to crosslink proteins to create a tough layer surrounding the egg.

So what makes Udx1 a 'dual' enzyme? Although it can convert oxygen into peroxide, it can also, using different domains of the enzyme, cleave this toxic compound into harmless water molecules, protecting the embryo. **Roxanne Khamsi**

Photovoltaics

Solar cell, heal thyself

Appl. Phys. Lett. **85,** 5218–5230 (2004)

If money is no object, photovoltaic cells can be impressively efficient at turning sunlight into electricity. A multi-decker cell made from indium gallium phosphide, indium gallium arsenide and germanium can attain efficiencies of more than 29%, well above the 16% efficiencies typical of commercial silicon cells. The cost is far greater too — but if the cell is powering instrumentation on a space satellite it's a small price to pay. Such a cell can perform even better if a layer of AlInGaP is added, which captures the high-energy photons in the solar spectrum.

There's another reason why silicon solar cells don't do well in space, however: they are degraded by the harsh radiation they encounter. InGaP and InP have been shown to be relatively resistant to such radiation, and now Aurangzeb Khan *et al.* show that AlInGaP shares this important property, making such high-efficiency, multilayered solar cells feasible for space applications.

The main defects produced in AlInGaP by an electron beam, which mimics the radiation environment of space, are so-called hole traps, which can act as sites for wasteful recombination of light-induced electrons and holes in the semiconductor. But these defects disappear in an annealing process, making the material more or less self-healing. **Philip Ball**

Molecular biology

Sun protection factor

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People who suffer from a genetic disease known as xeroderma pigmentosum have a 1,000-fold increased risk of developing cancer in sun-exposed areas, particularly the skin. This is because their cells lack a functional copy of a crucial enzyme that is involved in repairing DNA damage induced by ultraviolet light. The lifespan of those with this condition is reduced by 30–40 years.

Although a cure in humans remains elusive, Maria Carolina N. Marchetto and her colleagues have just seen success in treating mice engineered to bear this genetic defect. The authors injected a modified adenovirus carrying the human *XPA* gene, one of the genes known to be affected in xeroderma pigmentosum, into the skin of such mice. They found that the injection increased the expression of the XPA protein — and helped to protect the mice against skin tumours after exposure to UVB light. **Roxanne Khamsi**

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