

## Photosynthesis exhibits quantum coherence

Common wisdom has it that quantum effects should not be relevant for biology because the systems involved are too warm and noisy for coherence to be maintained. Now Elisabetta Collini of the University of Toronto in Canada and colleagues have used two-dimensional photon-echo spectroscopy to study the light-harvesting protein “antennae” that make up part of the photosynthetic apparatus of some species of algae.

These antennae contain eight pigment molecules, two of which can be optically excited into a superposition of energy states that couple coherently to the other

pigment molecules. This allows the system to rapidly compute how best to direct the energy flow across the protein. The coherent energy transfer requires that coherence be maintained for 400 fs – which may not sound much but is far longer than would be naively expected for such a complex molecule at room temperature.

In a sense, it turns out that nature has already implemented room-temperature quantum computing in plants.

### Further reading

Elisabetta Collini *et al.* 2010 *Nature* **463** 644.

## Dinosaur feathers show their colours

Research over recent years has made it increasingly clear that dinosaur fossils contain significant amounts of relatively well preserved organic material, in addition to the more obvious mineralized bone. Michael Benton of the University of Bristol and colleagues have now managed to determine some of the colours of the feathers of dinosaur *Sinosauropteryx*, using 125-million-year-old fossils from the Jehol formation in the Liaoning province in China.

The team identified two types of colour-bearing organelles – eumelanosomes and phaeomelanosomes – which strongly suggest that the striped tail of the metre-long beast originally had reddish-brown stripes alternating with lighter stripes. These lighter ones might, with less certainty, have been



*Fossil of Sinosauropteryx showing tufts of simple filaments along the back of the head, the back and the tail. The darker bands on the tail were reddish in colour. (Courtesy the Nanjing Institute.)*

white. The role that this pigmentation played in the life of these dinosaurs is still not known.

### Further reading

F Zhang *et al.* 2010 *Nature* **463** 1075.

## New route to radiation damage

Researchers have identified a new mechanism that could play a significant role in how radiation damages living tissue. Two groups – T Jahnke of the University of Frankfurt and colleagues and Melanie Mucke

of the Max-Planck Institute for Plasma Physics and colleagues – have observed a new source of low-energy, biologically damaging electrons arising from intermolecular Coulomb decay.

This three-step process starts when an inner-valence electron is knocked loose from a pair of hydrogen-bonded water molecules. When a higher-energy electron drops down to fill the vacated space, the energy released knocks another electron out of the other water

## Spider webs collect water vapour

Most people think of spider webs as passive things but Yongmei Zheng of the Beijing University of Aeronautics and Astronautics and colleagues have shown that the webs of the *Uloborus walckenaerius* spider respond dynamically to water for efficient collection.

Exposure to water vapour makes the hydrophilic web fibres restructure into spindle-knots separated by elongated joints. Water collects everywhere, but that which collects on the joints moves toward the knots, driven by a surface-energy gradient between water on the smooth joints and rougher knots. The roughness arises from the different arrangements of nanofibrils – something that the researchers reproduced in artificial fibres. The work could have important applications in collecting water and controlling chemical reactions using similar flows.

### Further reading

Yongmei Zheng *et al.* 2010 *Nature* **463** 640.

## Faster transistors

Graphene – a substance made of a monatomic layer of carbon atoms – is about as thin as any material can be and now it has been made into fast transistors. Yu-Ming Lin and colleagues at the IBM TJ Watson Research Center in the US used wafer-scale synthesis and fabrication techniques to make field-effect transistors that work at up to 100 GHz. This is the highest cut-off frequency for any graphene device and is twice the speed of current silicon transistors.

### Further reading

Y-M Lin *et al.* 2010 *Science* **237** 662.

molecule. The two water molecules, now both positively charged, fly apart. Despite the complexity of the process, it appears to be responsible for a significant number of low-energy electrons, which can be damaging to DNA despite having energies below 20 eV.

### Further reading

T Jahnke *et al.* 2010 *Nature Physics* **6** 139.  
M Mucke *et al.* 2010 *Nature Physics* **6** 143.