RESEARCH HIGHLIGHTS

A watery carbon bank

Ecosystems **11,** 643–653 (2008)

Dead wood can persist for more than a hundred times longer in rivers and floodplains than on land, sequestering carbon for centuries and even millennia, according to Richard Guyette of the University of Missouri in Columbia and his colleagues.

Although their terrestrial neighbours degrade within decades, the submerged oaks that Guyette's team studied held their carbon for an average of almost 2,000 years. The team found oak wood up to 14,000 years old in northern Missouri streambeds and floodplains.

The samples are among the oldest non-petrified oak trees known in North America. The aged wood retains its rings, and is a potential source of palaeoclimatic data.

R. GUYETTE

NEUROSCIENCE

Rewiring the brain

J. Neurosci. **28,** 6592–6606 (2008)

The brain can recover so well from a stroke that initially paralysed limbs can be moved again. Scientists have discovered how this happens at the level of individual neurons.

Timothy Murphy and Ian Winship of the University of British Columbia in Vancouver induced stroke in adult mice and used an *in vivo* imaging technique called two-photon microscopy to monitor the activity of individual neurons close to the site of damage.

In the first month — when paralysis is usually at its worst — they found that some neurons ditched their speciality for one particular limb and began processing information from multiple limbs. During the following month, as the affected brain region reorganized itself more permanently, those neurons re-specialized to a new single limb.

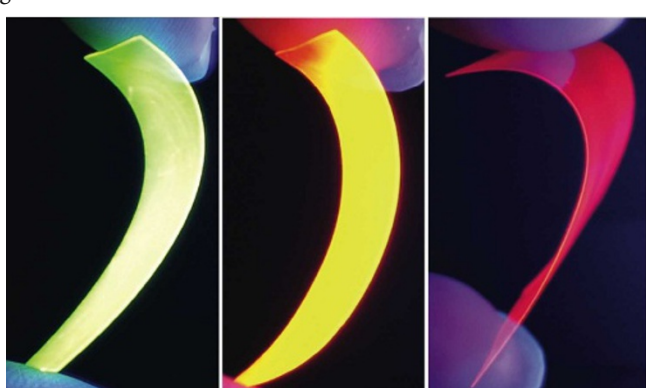
MATERIALS

Colourful clay

Adv. Mater. doi:10.1002/adma.200702544 (2008)

Nanocrystals made of semiconducting materials glow different colours depending on their size. Researchers are interested in using them in electronic devices, but first need to figure out how to attach them to more conventional silicon components.

Takeo Ebina and his colleagues at the National Institute of Advanced Industrial Science and Technology in Sendai, Japan, have come up with a technique for doing so. The researchers dissolved nanocrystals made of cadmium selenide and zinc sulphide in water and mixed it into a clay–polymer mixture. They then poured the clay into moulds and dried it, creating a thin, flexible film filled with evenly spaced crystals. The team was able to make films glow various colours under ultraviolet light (pictured below) and hope the technique will allow nanocrystals to be integrated into optoelectronic devices.



H. TETSUKA

REMOTE SENSING

Rainforest shrinkage

Proc. Natl Acad. Sci. USA **105,** 9439–9444 (2008)

Despite growing international concern about the future of the world's rainforests, the rate of tropical forest clearance has not slowed.

A team used a combination of low- and high-resolution satellite data sets to quantify forest clearing in the humid tropics. Using a probability-based approach blending satellite data retrieved from NASA's Terra and Landsat missions, Ruth DeFries of the University of Maryland in College Park and her colleagues estimate that more than 27 million hectares of rainforest area — roughly 2.4% of the global rainforest cover — were cleared from 2000 to 2005.

The results suggest that tropical forest loss continues at rates roughly similar with those observed in the 1990s.

PLANT BIOLOGY

An egg-spedient defence

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0707809105 (2008)

Some plants are known to attract parasitic wasps to eat the eggs laid on them by insects. However, the exact mechanisms of this complex defensive behaviour are not clear.

Nina Fatouros at Wageningen University in the Netherlands and her colleagues have determined that in one case the mechanism is triggered by a specific compound in male insect ejaculate. The ejaculate of male large cabbage white butterflies (*Pieris brassicae*) contains anti-aphrodisiac benzyl cyanide to reduce female re-mating. This compound is then present on or around their eggs.

Application of benzyl cyanide induced chemical changes in the leaves of Brussels sprout plants, Fatouros's team found. As a result, the parasitoid wasp *Trichogramma brassicae* spent more time on treated leaves than on controls. So, for *P. brassicae* males, the anti-aphrodisiac trick has some cost.

ATMOSPHERIC CHEMISTRY

Forgotten gas

Geophys. Res. Lett. **35,** L12810 doi:10.1029/2008GL034542 (2008)

Nitrogen trifluoride (NF_3) has been identified before as a greenhouse gas, but the threat it poses has barely been quantified. Michael Prather and Juno Hsu of the University of California, Irvine, have produced a new estimate of the atmospheric lifetime of NF_3 —

550 years. This is about 25% shorter than the previous value, but, they write, "still far beyond any societal time frames".

The market for NF_3 has exploded recently, because its initial use in rocket fuel has expanded to include applications in the semiconductor industry. NF_3 is already potentially a bigger contributor to climate warming than the carbon dioxide emissions of some large coal-fired power plants, and global production in 2008 is predicted to be more than 3,500 tonnes — a number that could double by 2010. Yet NF_3 is not included in the greenhouse gases covered by the Kyoto Protocol.

ECOLOGY

Competing keeps bees busy

J. Ecol. doi:10.1111/j.1365-2745.2008.01405.x (2008)

Bumblebees are pollinator generalists, flying to more flower species than most other insects, but a new study suggests that this behaviour depends on competition.

Colin Fontaine and his colleagues at the École Normale Supérieure in Paris recorded the foraging behaviour of individual common bumblebees (*Bombus terrestris*) in an experimental garden where five flowering plant species were available. The researchers varied the number of bees present during the experiment and found that when few bees were present, they visited fewer species of plant.

Pollinator numbers are known to be falling in many regions owing to human disturbance. Worryingly, the resulting reduced competition could lead bumblebees to eschew some plant species.

GEOLOGY

Glacial speeds

Science **321,** 111–113 (2008)

The movement of ice sheets increases markedly when meltwater gets involved, according to researchers from Utrecht University in the Netherlands.

Just days after increased meltwater is produced, ice velocity can increase by a factor of four, say Roderik van de Wal and his colleagues. They used 17 years' worth of data from Global Positioning System units drilled into the western edge of Greenland's ice sheet to determine both ice velocity and disappearance rates. Despite detecting larger than previously observed meltwater-induced bursts in velocity, the team found that, in the long term, ice velocities have actually decreased slightly.

They suggest that ice sheets continually adjust to the amount of meltwater, keeping overall velocities more or less constant.

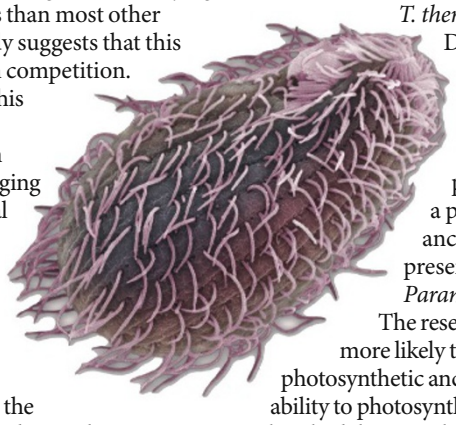
EVOLUTION

Photosynthetic ancestors

Curr. Biol. doi:10.1016/j.cub.2008.05.042 (2008)

Genomic analysis of the hairy single-celled ciliate *Tetrahymena thermophila* (pictured below) suggests that ciliates may once have been photosynthetic. This finding supports the controversial 'chromalveolate hypothesis', which proposes a common photosynthetic ancestor for two groups of single-celled eukaryotes: the chromists and the alveolates.

Searching through the tens of thousands of proteins predicted from the genome of *T. thermophila*, an alveolate, Debashish Bhattacharya and his colleagues at the University of Iowa in Iowa City identified 16 proteins potentially derived from a photosynthetic algal ancestor. All 16 were also present in another ciliate, *Paramecium tetraurelia*. The researchers argue that it is more likely that the ciliates had a photosynthetic ancestor but later lost the ability to photosynthesize than that they absorbed the genes by horizontal gene transfer.



A. BELL/VISUALS UNLIMITED/GETTY

MOLECULAR NEUROSCIENCE

Pores for thought

Nature Neurosci. doi:10.1038/nn.2151 (2008)

Ion channels activated by ATP — the main source of energy for cells — are abundant throughout the body, and are involved in fundamental processes such as pain and inflammation. But little is known about their molecular structure.

Shai Silberberg and her colleagues at the National Institute of Neurological Disorders and Stroke in Bethesda, Maryland, now report some unusual properties of the channels. They found that the bulk of the pore of the ATP-activated channel — and the gate controlling ion flux through the pore — comprises just three transmembrane protein stretches, one from each of the channel's identical protein subunits.

The pores of families of ion channels activated by other neurotransmitters such as acetylcholine are generally much more complex.

JOURNAL CLUB

Oliver Rando
University of Massachusetts, Worcester

A biologist despairs over the difficulty of demonstrating heritability of chromatin states.

Chromatin, the packaged bundles of protein and DNA that make up eukaryotic genomes, is widely believed to be a carrier of 'epigenetic' inheritance — that is, heritable information not encoded by DNA. In multicellular organisms, the chromatin of mother and daughter cells is generally of similar shape, exposing similar regions of DNA for expression. And chromatin regulators often seem to be required for epigenetic states to be inherited. But there is a problem. It is possible that some other information carrier is inherited, and then directs chromatin regulators to re-establish a functional state.

One purported example of chromatin inheritance comes from yeast, which seem to 'remember' prior growth conditions. Galactose-naive yeast induce genes for Gal enzymes slowly; those whose recent ancestors experienced galactose induce them much faster. Because this 'memory' requires certain chromatin regulators, it has been suggested that it provided evidence for a heritable chromatin state.

Zacharioudakis *et al.* investigate this idea using heterokaryons, fused pairs of yeast cells that have mixed cytoplasmic contents but maintain separate nuclei. By inducing memory in one yeast and seeing speedy *GAL1* expression in the other, they show that memory of galactose is transferable through cytoplasm (I. Zacharioudakis *et al. Curr. Biol.* **17,** 2041–2046; 2007). Thus, the chromatin state around the *GAL1* gene cannot be the heritable factor, and the authors further identify the probable inheritance factor as a soluble enzyme.

These results demonstrate the difficulty of proving that any example of epigenetic inheritance is due to inheritance of chromatin state per se. One wonders whether any chromatin state will ever be proved to be heritable, given the difficulty of proving the absence of another information carrier.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**