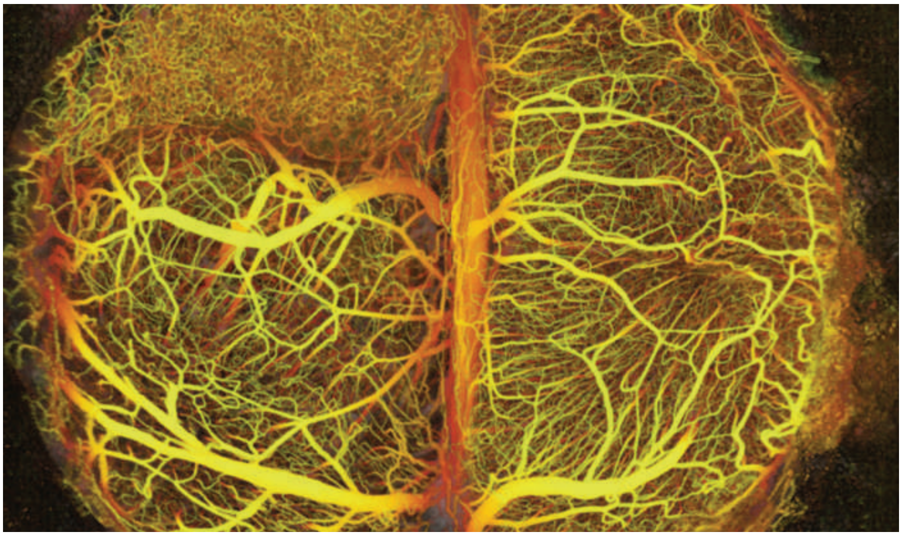
RESEARCH HIGHLIGHTS

Now you see it

Nature Med. doi:10.1038/nm.1971 (2009)
A technique for imaging tissues in three dimensions can be used to visualize the tumour microenvironment in greater detail than previous methods. Brett Bouma, Rakesh Jain and their colleagues at Harvard Medical School and Massachusetts General Hospital in Boston imaged various tumour types using a system called optical frequency domain imaging. It involves scanning a laser beam with shifting wavelengths over a tissue sample, measuring the properties of the reflected light across depths, and processing the signals to reveal three-dimensional perspectives. The image shows the system of blood vessels in a mouse brain with a tumour at a depth of 2 millimetres.



TECHNOLOGY

Lightning-fast memory

Phys. Rev. Lett. **103,** 117201 (2009)
The speed at which information can be recorded on a magnetic disc is limited by the time it takes to 'flip' the magnetic bits on the surface. Like a spinning top, these bits have momentum, and it takes them time to reverse their magnetism from one orientation to another using traditional means.

Now Kadir Vahaplar of Radboud University Nijmegen in the Netherlands, and his colleagues have found a faster way to flip the bits. The team used a powerful pulse of laser light to temporarily destroy and reorient the bits. A second pulse allowed them to read back the data. The entire process took just 30 picoseconds — ten times faster than today's technology.

GENETICS

Yeast joins the club at last

Science doi:10.1126/science.1176945 (2009)
It seemed a stubborn exception. One of the most useful research tools, gene silencing by RNA interference (RNAi), can't be used in a laboratory workhorse organism, the yeast *Saccharomyces cerevisiae*. Indeed, it was thought that the ability to do RNAi had been lost from all budding yeast species at some point in evolution.

But David Bartel of the Massachusetts Institute of Technology in Cambridge and his colleagues took a closer look at some related yeast species. They found all the necessary components of the RNAi pathway, including a previously unknown version of the Dicer protein, which is essential to the process.

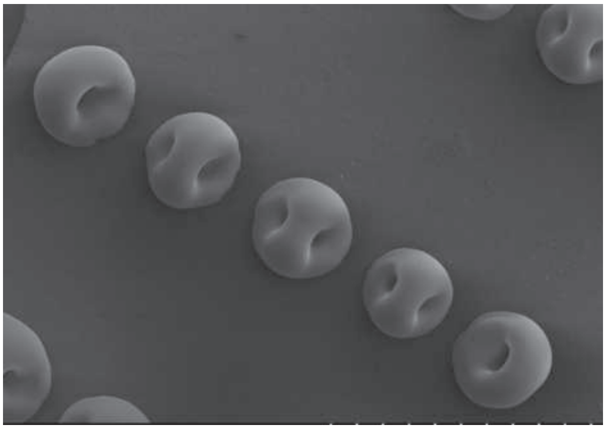
By putting the components into *S. cerevisiae*, they were able to kick-start the pathway, potentially opening up new research directions for both the organism and the nature of gene silencing.

CHEMISTRY

Aluminium arches

Langmuir doi:10.1021/la902918m (2009)
How can the miniature arched structures pictured below be created? When droplets of dissolved or suspended matter dry on a surface, material often spreads to the edges of the droplet forming a 'coffee ring' stain. These rings can pile up into ridges that form cups or hollow domes.

Julian Evans and Lifeng Chen at University College London placed droplets containing an aluminium powder onto circular platforms about 1 millimetre apart. Powder ridges on adjacent edges of the platforms grew slowly owing to high local humidity, and ridges on the far edges grew faster in the lower relative humidity. The drops eventually bumped into one another and connected, forming arches.



AM. CHEM. SOC.

ACOUSTIC SCIENCE

A sonic one-way street

Phys. Rev. Lett. **103,** 104301 (2009)
Diodes act as one-way filters for electric current, protecting delicate devices from sudden reversals in flow. Sound waves can also travel easily in both directions along a given path, like electricity does, so acoustic devices could block wrong-way reflections. Alas, acoustic diodes do not yet exist.

Jian-chun Cheng of Nanjing University in China and his colleagues have now described a possible way to build one consisting of a sandwich of acoustic layers. Key to the structure would be a layer of nonlinear material that, by changing the frequency spectrum of incoming sound waves, could act as a filter. The researchers suggest that acoustic diodes could be useful in improving ultrasound devices such as those used to break up kidney stones.

ATMOSPHERIC SCIENCE

Alien sprites

J. Geophys. Res. **114,** E09002 (2009)
Sprites — ghostly flashes of light that occur above some thunderstorms on Earth — may also illuminate other planets' atmospheres.

Calculations suggest that sprites could occur on both Venus and

Jupiter, if thunderstorms on those planets build up the right amount of charge to trigger the flashes, say Yoav Yair of the Open University of Israel in Ra'anana and his colleagues. Neither Mars nor Saturn's moon Titan are likely to have sprites, though both have the right conditions for lightning.

Japan's Planet-C mission to Venus, due for launch next year, might be able to confirm the existence of the hypothetical sprites.

BIOLOGY

Turning tail

Biol. Lett. doi:10.1098/rsbl.2009.0577 (2009)

When threatened, geckos such as *Coleonyx brevis* (pictured) can jettison their tails in the hope that predators will be too distracted by the writhing appendage to notice the meal that is scurrying away.

D. HEUCLIN/NHPA

Although many have observed the gecko's great escape, the behaviour of the newly autonomous decoys they leave behind is less well known.

Timothy Higham from Clemson University in South Carolina and Anthony Russell at the University of Calgary in Alberta, Canada, used high-speed video cameras and implanted electrodes to study the tail of the leopard gecko (*Eublepharis macularius*) immediately after shedding. In addition to rhythmic swinging movements, which were probably controlled by motor circuits in the spinal cord, the tail also performed complex acrobatics such as flips and lunges.

MICROBIOLOGY

Sussing *Shewanella*

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0902000106 (2009)

For bacteria, which have notoriously twisted family trees, defining species boundaries requires close knowledge of both genetic and expressed characteristics.

A team led by Kostas Konstantinidis of the Georgia Institute of Technology in Atlanta and James Tiedje at Michigan State University in East Lansing investigated ten strains of bacteria from the genus *Shewanella*, a group with varied, often ecologically important, metabolic abilities. Genome and protein-expression data were already available for the strains.

By comparing these data sets, the team was able to link genetic factors to ecological role in more detail than before. Also, despite identical culture conditions, protein expression varied more than genome sequence in some cases, so gene regulation could be important for describing species.

MATERIALS SCIENCE

Hard-headed theories

Phys. Rev. B **80,** 060103 (2009)

Physicists recently discovered that materials known as transition-metal diborides rival the hardness of diamonds in one direction but are relatively soft in another. Such materials have the potential to revolutionize industrial processes — if scientists can work out what makes them so tough in certain orientations.

Theorists had thought that the strength came from strong vertical bonds within the crystal, similar to the ridges in a sheet of corrugated cardboard. But Antonín Šimůnek of the Academy of Sciences of the Czech Republic in Prague thinks it might be just the opposite. He proposes a model in which strong horizontal bonds between surface atoms act as a tough shell that can resist denting by a sharp tip. The theory could lead to development of new super-hard materials.

NEUROBIOLOGY

Teamwork rewarded

Biol. Lett. doi:10.1098/rsbl.2009.0670 (2009)

Coordinated social activity, such as dancing or team sports, stimulates the brain to release high levels of mood-elevating endorphins that are believed to have a role in social bonding. But how can this be distinguished from the normal release of endorphins during exercise?

Emma Cohen of the University of Oxford, UK, and her colleagues looked at rowers training alone or with teammates on stationary rowing machines. Because measuring endorphins directly would require a spinal tap, the researchers instead used pain tolerance to gauge endorphin release after workouts. They found that rowers had greater increases in pain threshold after operating as a crew than when going solo.

JOURNAL CLUB

Rusty Feagin
Texas A&M University, College Station, Texas

A coastal ecologist sees the hidden effects of hurricanes.

As part of my job, I often drive around looking at the impacts of hurricanes in coastal areas. The one thing that stands out from such trips is that the devastation always looks the same, regardless of where I am — the boats perched on the streets, the newly house-less stilts near the beach, the furniture on a lawn covered in mould.

I realized though, after reading a recent article by Hongcheng Zeng of Tulane University in New Orleans, Louisiana and his colleagues (H. Zeng *et al. Proc. Natl Acad. Sci. USA* **106,** 7888-7892; 2009), that I need to be concerned with the damage that I cannot see — the bleeding of carbon from the landscape, and the loss of future carbon stores.

Using field, satellite and modelled data, Zeng and his colleagues detail how damaging winds over the past 150 years have greatly reduced forest biomass through tree mortality, subsequent wood decay and carbon release. They estimate that between 1980 and 1990, 9–18% of the amount of carbon stored yearly by US forests was lost due to destruction caused by tropical cyclones. The carbon dioxide loss is cumulative because once a tree is lost, it cannot sequester CO_2 in the future. Thus, an extreme event such as Hurricane Katrina in 2005 or the Indian Ocean tsunami in 2004 could radically reduce carbon sequestration in the areas affected for several decades.

These findings force me to consider more than just the visible effects of hurricanes; I realize that tree loss is in effect altering the global carbon cycle. This paper also makes me wonder about the cumulative impact of cyclones on CO_2 in other ecosystems, such as grasslands that have been damaged by salt-water inundation, or even possible forest growth due to storm-induced rainfall inland.

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