RESEARCH HIGHLIGHTS

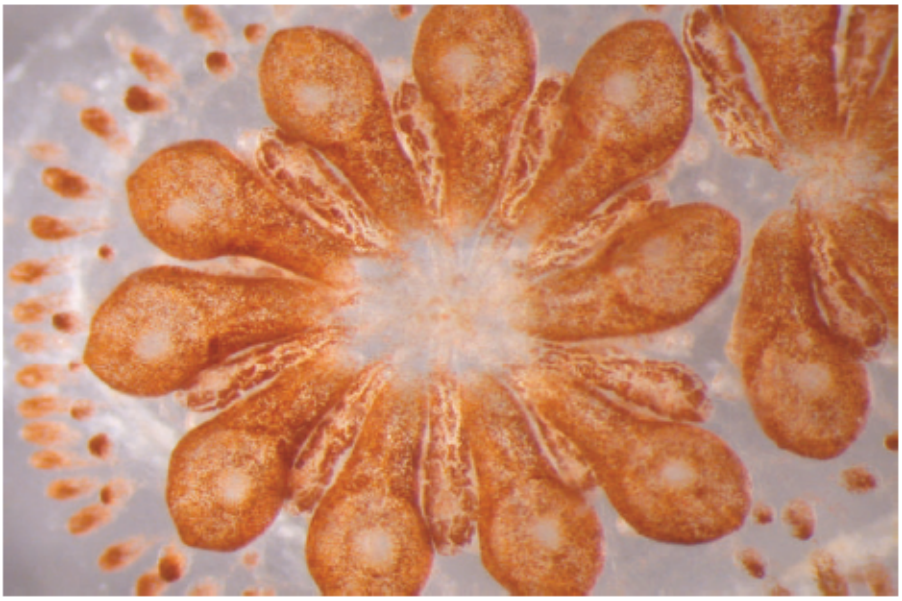
The ultimate parasite

Cell **123,** 1351-1360 (2005)

A cramped colony of sea squirts can use a single stem cell to take over the reproductive function of a neighbouring colony, researchers at Stanford University in California have found.

When two colonies of genetically dissimilar sea squirts (*Botryllus schlosseri*, pictured) come into contact, they repel each other. But compatible colonies fuse, with their vascular networks joining to form a single circulatory system.

Diana Laird and her colleagues discovered that, in fused systems, blood-borne stem cells from one colony can give rise in the other to gametes, the units of sexual reproduction, or polyps, for asexual reproduction. The results suggest that genetically 'fit' invading stem cells can outcompete native stem cells — showing how evolutionary pressures can come to bear on stem cells.



D. LAIRD

ARCHAEOLOGY

Written history

Science doi:10.1126/science.1121745 (2006)

The earliest-known example of writing from the Mayan civilization, which flourished in Central America from 1,000 years BC, has emerged from the ruins of a temple at San Bartolo in Guatemala.

A fragment of wall painted with a column of ten hieroglyphs (illustrated, right) was recovered from deep within a pyramid-shaped structure at the site. Radiocarbon dating of burnt wood found in portions of the structure built earlier, later and at the same time as the section where the writing was found put its age between 200 and 300 years BC, report William Saturno of the University of New Hampshire in Durham and his colleagues. The find suggests that the Maya evolved writing systems around the same time as other Meso-American civilizations.

SCIENCE

MARINE ECOLOGY

Fishing prohibited

Science **311,** 98-101 (2006)

Counter-intuitively, no-fishing zones designed to save large Caribbean fish such as the Nassau grouper (*Epinephelus striatus*) also benefit threatened corals, reveals a survey of the waters of the Bahamas archipelago.

Peter Mumby of the University of Exeter, UK, and his international team had been worried that more grouper would mean fewer of their prey — parrotfishes (Scaridae) — which graze on algae that otherwise smothers the coral. Fortunately, though, the fishing-free area also saved large species of parrotfish from the net. These big fish can escape the grouper and are naturally the busiest grazers. The scuba-diving scientists found twice as much grazing and four times less algae inside the reserves. It's a happy ending for the coral, says Mumby.

NANOMATERIALS

A rather odd film

Phys. Rev. Lett. **95,** 266101 (2005)

In electronic devices shrunk to the nanoscale, changing the thickness of a metallic film by just one atom can have profound effects. Some of these effects can be fine-tuned, as illustrated by Tai-Chang Chiang and his colleagues from the University of Illinois at Urbana-Champaign in a neat set of experiments.

They studied how the electronic energy levels, and hence the overall stability, of a lead film on a silicon substrate varied with its thickness. Films made from an even number of atomic layers were normally more stable than films with an odd-numbered thickness. But the authors found that introducing a single layer of indium atoms between the lead and silicon reversed the trend, so that odd-numbered layers were the more stable.

CANCER BIOLOGY

Bad influence

J. Clin. Invest. **116,** 261-270 (2006)

A chaperone protein that normally 'nannies' other proteins in times of stress could also contribute to breast cancer, say researchers in the United States. Vincent Cryns of Northwestern University in Chicago and his team studied a protein known as αB-crystallin, which stops damaged proteins from clumping together and helps others to refold correctly. It was present at high levels in cells from an aggressive type of breast cancer — the basal-like subtype.

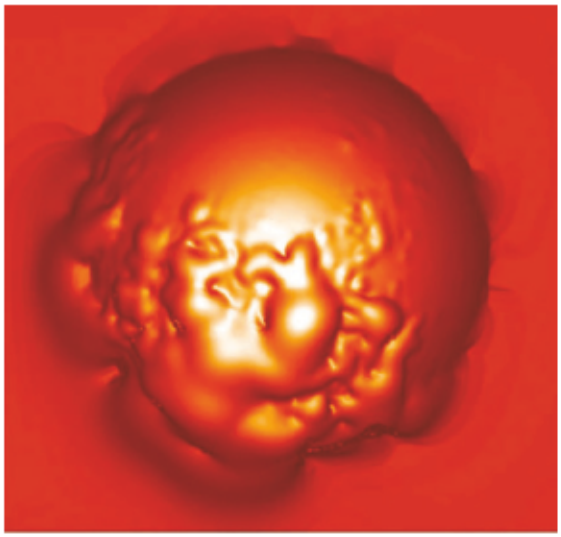
The team thinks that the protein switches on a signalling system that involves the enzyme MAPK kinase. They showed that adding extra αB-crystallin to human breast cells made them develop abnormalities typical of the cancer, and that blocking the identified signalling pathway prevented these changes.

NEUROSCIENCE

Seeing is believing

Neuron **49,** 81-94 (2006)

Bipolar cells in the retina, which enhance the contrast of visual input, have curious properties. In one subpopulation, for example, the neurotransmitter GABA has opposite effects on the membrane charge at the cell's two ends. It depolarizes the input end while hyperpolarizing the end that



D. BRAIN/SSL

stretches towards the retina's output layer.

Thomas Euler and Thomas Kuner of the Max Planck Institute for Medical Research in Heidelberg, Germany, and their colleagues confirm the long-standing hypothesis that the opposing responses are enabled by a gradient in the concentration of chloride ions running down the cell's length. To show this, they engineered mice to express Clomeleon, a chloride-sensitive fluorescent protein.

MOLECULAR BIOLOGY

Copyeditor stops press

Nature Struct. Mol. Biol. doi:10.1038/nsmb1041 (2005)

A class of enzyme thought to be no more than the cell's back-room copyediting desk in fact has a key role in controlling gene activity, say researchers.

The enzymes, called ADARs, edit RNA by altering specific RNA bases. This editing changes the function of several mammalian genes, but mysteriously, its main target is the large number of RNAs that do not code for proteins. Now Kazuko Nishikura of the Wistar Institute in Philadelphia and her colleagues have an explanation.

They studied non-coding RNAs called microRNAs that switch off, or silence, target genes. They found that ADARs alter the processing of particular microRNAs and suppress their expression. This shows that RNA editing and RNA interference interact.

SMART MATERIALS

Paint that listens

J. Acoust. Soc. Am. **119,** 251–261 (2006)

It looks like paint, and can be sprayed like paint. But it's actually a microphone.

The mixture of ceramic nanoparticles, polymer resin and light-emitting dye, concocted by James Gregory of Purdue University in West Lafayette, Indiana, and his co-workers, generates an image of a sound wave bouncing off a thin, porous film of the mixture applied to a surface. The brightness of the dye emission depends on the partial pressure of oxygen in the surrounding air, and so is a measure of air pressure.

Pressure-sensitive paints have been developed over the past several years for aeronautical studies, but have only recently been proposed as acoustic sensors. Gregory and his team show that their paint is sensitive enough to map the changing shape of a sound field over an area of about 22 × 17 centimetres.

ASTRONOMY

The constant question

Phys. Rev. Lett. **95,** 261301 (2005)

Astronomers are suggesting a way to tighten the noose around claims that a fundamental constant of physics has changed over the lifetime of the Universe.

Nissim Kanekar of the National Radio Astronomy Observatory in Socorro, New Mexico, and his colleagues present an independent test of controversial data suggesting the fine-structure constant, α, has changed over the past 8.5 billion years. The team analysed absorption and emission lines from hydroxyl and hydrogen atoms in radio observations. They conclude that the fractional change in α over the past 6.5 billion years was less than 6.7×10^{-6}.

Although this new limit does not rule out the change in α claimed from observations of quasars, the data used are less prone to systematic errors. A precise test of the original study's conclusions will be possible with the improved sensitivity of the next generation of radio telescopes.

PLANETARY SCIENCE

Martian lights

Geophys. Res. Lett. doi:10.1029/2005GL024782 (2006)

Aurorae regularly flicker on and off at Mars, a study suggests.

After the recent report of the first known martian aurora (*Nature* 435, 790–794; 2005), David Brain of the University of California, Berkeley, and his colleagues delved into past data from the Mars Global Surveyor satellite. In six years' worth of data, they uncovered some 13,000 energetic electron-collision events linked to hundreds of auroral flashes.

The aurorae occur when electrons accelerate along magnetic field lines that connect the solar wind to localized magnetic fields in the martian crust (pictured above). Many of the most energetic aurorae took place during solar storms, suggesting that electrons are most readily accelerated during those times.

JOURNAL CLUB

Kurt Cuffey
University of California, Berkeley, USA

A method for dating the carving of landscapes by ice or water captivates a glaciologist.

As an undergraduate, I authored a manuscript on the shapes of glacial valleys, and successfully had it rejected by two minor journals.

The silver lining of that cloud was the ensuing dialogue with wise geologists, who introduced me to glacial geomorphology manuscripts founded in geophysics and rich with conceptual insight (B. Hallet *J. Glaciol.* **23,** 39–50; 1979; J. Oerlemans *Z. Gletsch. Glazial.* **20,** 107–126; 1984).

With my passion for the aesthetics of glacially sculpted terrain, it was thrilling to see great science applied to the subject. Yet equally striking was the weakness of the discipline's empirical side — a problem that persists.

Dramatic, characteristic landforms prove that glaciation has profoundly altered landscapes. But how to quantify the magnitude and timing of the alteration?

David Shuster of the California Institute of Technology in Pasadena and his colleagues recently proposed a remarkable new source of information (D. Shuster *et al. Science* **310,** 1668–1670; 2005).

Erosion of a land surface cools the underlying rocks, in turn restricting the mobility of helium produced *in situ* by radioactive decay. Shuster *et al.* say they can reconstruct detailed cooling histories from the spatial distribution of helium-isotope ratios within single mineral grains.

They apply their technique to samples from the walls of a glacial valley in British Columbia, Canada. It reveals that the rocks underwent rapid cooling 1.8 million years ago, suggesting the valley was deeply and rapidly scoured at that time.

If the method withstands scrutiny, studies of active processes, such as my own investigations of how glaciers erode the cores of mountain belts, will finally be complemented by precise dating of landform evolution.