RESEARCH HIGHLIGHTS

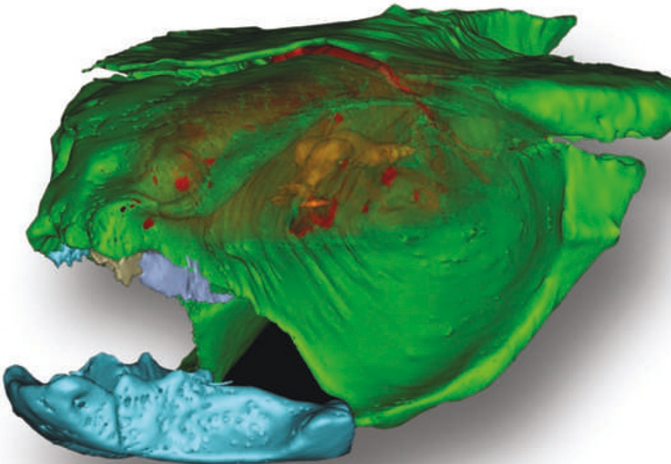
Brain box

Proc. Natl Acad. Sci. USA doi: 10.1073/pnas.0807047106 (2009)

A remarkably well-preserved brain has been discovered in a 300-million-year-old fossil of a fish from Kansas.

Philippe Janvier of the National Museum of Natural History in Paris and his colleagues used X-rays from the European Synchrotron Radiation Facility in Grenoble, France, to peer inside the skulls of iniopterygians, extinct relations of modern sharks and ratfish.

In one skull (pictured), they imaged a dense calcium phosphate structure. Its shape and relationship to nerve locations suggest that it is a brain, mineralized by phosphate-fixing microbes before the soft tissue could decay. The researchers hope that other vertebrates fossilized in similar conditions might yield further preserved organs, potentially throwing light on brain evolution.



PROC. NATL ACAD. SCI. USA/P. JANVIER/CNRS

CHEMICAL BIOLOGY

Sweet disguise

Nature Chem. Biol. doi:10.1038/nchembio.151 (2009)

An analysis of the sugars that cloak HIV-1 indicates that the virus leaves cells by usurping a native pathway used to spit out bits of cell membrane. This may help to camouflage it from the immune system.

When HIV-1 exits a cell, it picks up a coat of proteins decorated with sugars. Lara Mahal of the University of Texas at Austin and her colleagues found that the sugar profile of HIV-1 particles in cell culture matched that of microvesicles — cell membrane fragments thought to modulate immune responses — that are shed by infected cells.

The results raise concern that therapies aiming to block the interaction between HIV sugars and host cells could also interfere with microvesicle function. However, the researchers add that the same process may not be hijacked in all infected cells; they looked only at immune cells called T cells.

PROTEOMICS

Worm versus fly

PLoS Biol. **7,** e1000048 (2009)

The nematode worm *Caenorhabditis elegans* and the fruitfly *Drosophila melanogaster* (pictured, right) produce similar relative amounts of analogous proteins, even though levels of the messenger RNAs that code for these proteins vary widely between the species.

Michael Hengartner at the University of Zurich in Switzerland and his colleagues used mass spectrometry to analyse almost 11,000 *C. elegans* proteins (roughly half of the worm's predicted gene products). Of these, they selected nearly 2,700 for which mRNA data were available and compared their abundances with those of related proteins in the fruitfly. Protein ratios in the two model organisms correlated highly despite the two species' 600 million years of separate evolution, illustrating that regulating protein abundance is more important than maintaining gene-expression levels.

CHEMISTRY

Sprouting tubes

Nature Chem. doi:10.1038/nchem.113 (2009)

Tiny tubes grow spontaneously when small crystals of an inorganic solid are dunked in a solution of an organic ion. The effect could be exploited to build networks of miniature pipes that direct and control fluids.

Leroy Cronin and his colleagues at the University of Glasgow, UK, filmed tubes sprouting at up to 13 micrometres a second; some reached lengths of several centimetres.

The tubes grew from polyoxometalate (POM) crystals in solutions of phenanthridinium-based ions. The dissolving crystals first mingle with the ions to form a membrane, which subsequently bursts, squirting out POM that forms tube walls on contact with more organic ions.

The tubes can be bent with an electric field or the judicious use of obstacles. Their diameters can be customized by altering the concentration of organic ions.

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MARINE ECOLOGY

Deadly dusting

Proc. Natl Acad. Sci. USA doi.10.1073/pnas.0811486106 (2009)

Atmospheric aerosols, which supply ocean phytoplankton with nutrients such as nitrates and iron, can have toxic effects too.

Adina Paytan at the University of California, Santa Cruz, and her colleagues found that some species of phytoplankton in Red Sea surface waters suffered when exposed to aerosol samples collected from the Sahara Desert in Africa, whereas they thrived on European aerosols. Copper may be to blame: it was present at much higher levels in African aerosols and can be toxic to phytoplankton.

Although desert dust supplies about two-thirds of atmospheric copper, human industrial emissions of the element are increasing rapidly. The researchers suggest that copper deposition could alter marine ecosystems by damaging phytoplankton in high-aerosol areas such as those downwind of industrial regions of south and east Asia.

OPTICS

Beyond the invisibility cloak

Phys. Rev. Lett. **102,** 093901 (2009)

Invisibility shields that cause objects within them to vanish are now well-known. But Yun Lai and his colleagues of the Hong Kong University of Science and