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Nature - Nanotechnology-Live Wire

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RESEARCH HIGHLIGHTS

EVOLUTION

Fickle enzymes

Science **310,** 499–501 (2005)

It is surprisingly easy for enzymes to switch their preference for the molecule they work with, according to US researchers. Their study shows that a small number of mutations can dramatically alter a protein's function. This allows the protein to evolve new abilities quickly, without taking intermediate forms that harm the organism's fitness.

Antony Dean and his team at the University of Minnesota, St Paul, studied an enzyme called isopropylmalate dehydrogenase, or IMDH. IMDH needs the help of another molecule, called NAD, to function. Working in bacteria, Dean's team altered amino acids in IMDH and found that just five swaps were needed to make IMDH switch to a different helper molecule known as NADP.

MOLECULAR BIOLOGY

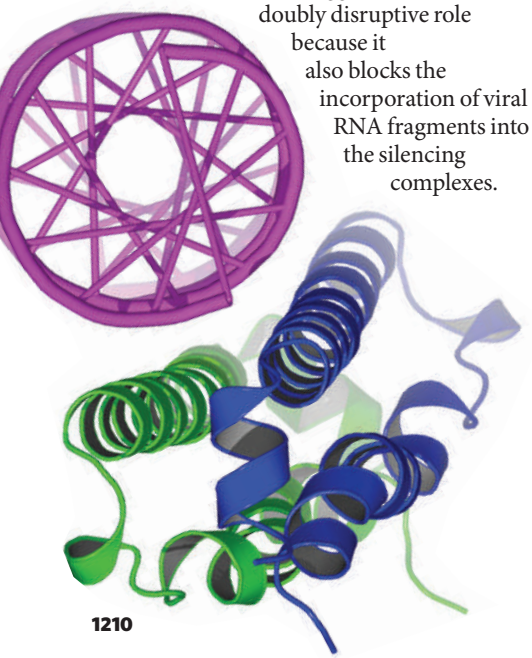
Double defence

Nature Struct. Mol. Biol. doi:10.1038/nsmb1005 (2005)

The structure of a protein (pictured below) produced by the insect- and plant-infecting Flock House virus sheds light on how some viruses might counter their hosts' defences.

Two B2 proteins (blue and green) form a four-helix bundle that binds to the virus's double-stranded RNA (pink). This protects the viral RNA against cleavage — the host cell needs to cleave viral RNA to build RNA silencing complexes in response to infection.

The researchers, led by James Williamson of the Scripps Research Institute in La Jolla, California, suggest that B2 has a doubly disruptive role because it also blocks the incorporation of viral RNA fragments into the silencing complexes.

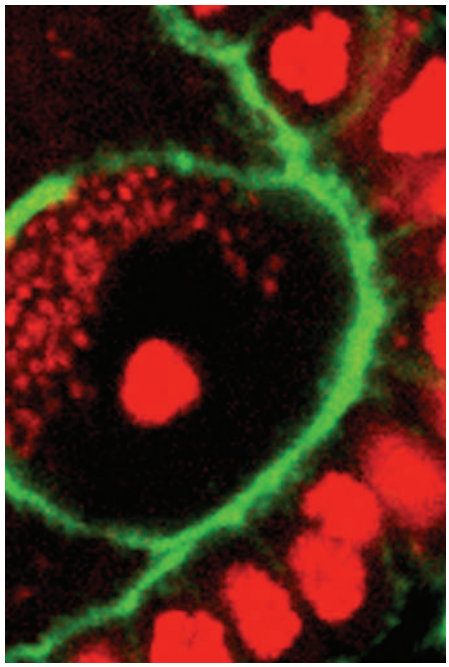


From mother with love

PLoS Pathogens **1,** e14 (2005)

Wolbachia — a parasitic bacterium that lives inside the cells of many insect species — is transmitted by females to their offspring. William Sullivan from the University of California, Santa Cruz, and his colleagues have looked in unprecedented detail at this process.

The parasite resides in the cytoplasm, a component of eggs but not of sperm. The researchers showed that, in the fruitfly *Drosophila, Wolbachia* infects immature egg cells and multiplies rapidly during the egg's development. They also found that the bacteria cluster at the top of the egg (pictured; *Wolbachia* and host DNA shown in red). Both the localization and rapid multiplication depend on *Wolbachia* commandeering its host's transport system, consisting of the cell's network of microtubules and associated motor proteins.



P. M. FRYDMAN & W. SULLIVAN

NANOTECHNOLOGY

Live wire

Angew. Chem. Int. Edn **44,** 2–7 (2005)

In an exciting union of microbe and machine, living bacteria have been incorporated into an electronic circuit to produce a humidity sensor.

Vikas Berry and Ravi Saraf from the University of Nebraska, Lincoln, placed *Bacillus cereus* bacteria on a silicon chip inlaid with gold electrodes, then applied a wash containing gold particles measuring just 30 nanometres across. This covered the microbes with a bristle-like gilt that conducts electricity.

The size of the electrical current depends on the separation of the particles, so a rise in moisture levels that causes the bacteria to swell is detected as a drop in current. Tests indicate that the device is much more sensitive than a conventional humidity gauge.

CANCER

Two roles in tumours

Nature Cell Biol. doi: 10.1038/ncb1314 (2005)

It's easy to tire of learning about players in the p53 pathway, but this research reveals an interesting case. It explains how the transcription factor KLF4 can suppress tumour growth in some situations, yet act as a tumour promoter in others.

Daniel Peeper and his colleagues report that KLF4 regulates, in opposing directions, two genes central to growth control. It suppresses *p53*, whose gene product suppresses tumours, and it induces *p21CIP1*, a gene controlling normal cell proliferation.

The researchers, from the Netherlands Cancer Institute in Amsterdam, demonstrate that KLF4 becomes a growth promoter when p21CIP1 is dysfunctional — as occurs in most cancers. In these genetic circumstances, KLF4's suppression of *p53* goes unchecked.

ASTRONOMY

X-ray vision

Astrophys. J. **632,** L99–L102 (2005)

The discovery of X-rays coming from a 35-year-old supernova, 1970G, has helped astronomers to extract data on the object from older, lower resolution observations.

Compiling these data gives a unique record that traces the object's X-ray emissions from when the star exploded through its transition to a supernova remnant. The X-rays probably emanate from material heated up by a shock wave closing in on the remnant's centre. The X-rays were discovered using a powerful space telescope — the Chandra X-Ray Observatory — and were analysed by Stefan Immler and Kip Kuntz of the NASA Goddard Space Flight Center in Greenbelt, Maryland.

NATURE STRUCT. MOL. BIOL.

NEUROSCIENCE

Thumbs up

J. Neurosci. **25,** 9339–9346 (2005)

Just observing an action can lead to the formation of a corresponding motor memory, according to a study led by Joseph