RESEARCH HIGHLIGHTS

GENETICS

Gene guards

Genes Dev. doi:10.1101/gad.1893210 (2010)
Transposons, or 'jumping genes', move around genomes and can disrupt normal gene function. As a result, many organisms add methyl groups to their transposons to silence them. But how does a cell determine where a transposon ends and a protein-coding gene begins?

Eric Selker at the University of Oregon in Eugene and his team tackled this question in the fungus *Neurospora crassa*. When they disrupted a gene called *dmm1*, methylation spread beyond transposon borders and into neighbouring genes. The resulting mutants grew more slowly.

The DMM1 protein interacts with another protein, DMM2, and *dmm2* mutants also had excess methylation. The results suggest that DMM1 and DMM2 act together in a complex that protects genes residing near transposons.

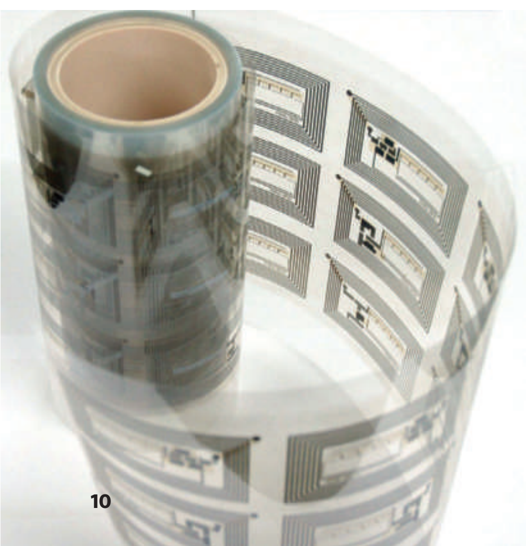
NANOTECHNOLOGY

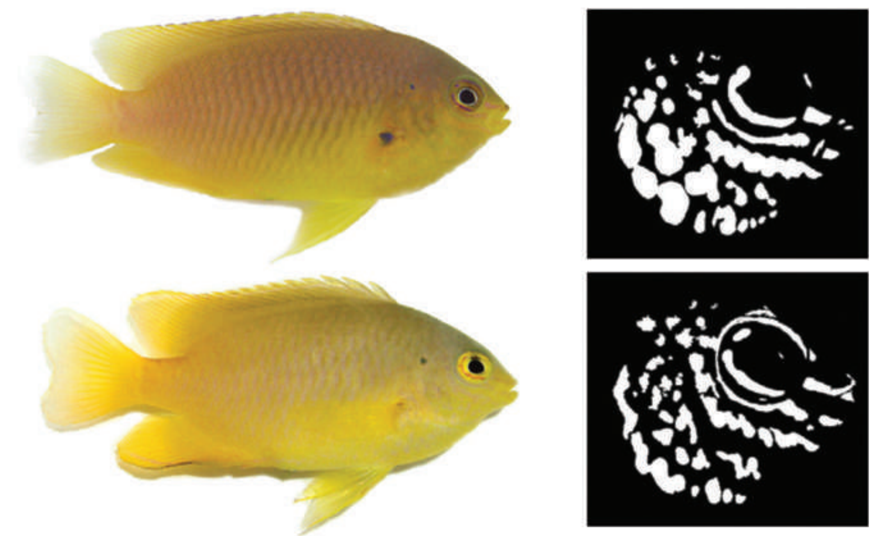
Light DNA machine

Angew. Chem. Int. Edn doi:10.1002/anie.200907082 (2010)
DNA structures can be created to manipulate other molecules, but controlling their activity has been a challenge. Xingguo Liang, Hiroyuki Asanuma and their colleagues at Nagoya University in Japan have now constructed one such single-molecule DNA 'nanomachine' that cleaves RNA and is controlled by light. This avoids the need to add small DNA or other 'fuel' molecules that would accumulate and interfere with the reactions.

The 'DNAzyme' is hairpin-shaped, with two parallel arms connected by a loop at one end, and both arms bind to the RNA. When illuminated with ultraviolet light, the hairpin opens, cleaving the RNA. It could be used to regulate gene expression, the authors suggest.

M. JUNG





U. SIEBECK/ELSEVIER

Secret code

Curr. Biol. doi:10.1016/j.cub.2009.12.047 (2010)
Some fish are thought to communicate using covert signals: ultraviolet (UV) coloration that is invisible to their predators. The idea is supported by the finding that Ambon damselfish (*Pomacentrus amboinensis*, pictured, top) can differentiate between their own species and the near-identical lemon damselfish (*P. moluccensis*, pictured, bottom) using tiny differences in UV facial patterning.

Ulrike Siebeck at the University of Queensland in Brisbane, Australia, and her colleagues found that, in general, territorial *P. amboinensis* attacked members of their own species more than they did *P. moluccensis*, but that this correlation broke down when the potential rivals were presented to one another in UV-opaque tubes.

The authors went on to show that trained fish could differentiate between species using images of facial patterns (pictured, right) that reflected either UV or visible light.

ELECTRONICS

Caught on film

IEEE Trans. Electron Dev. **57,** 571–580 (2010)
Radio-frequency identification (RFID) tags are microchips with tiny radio antennas that could replace barcodes on consumer goods if they become cheap enough to mass-produce. Gyoujin Cho of South Korea's Sunchon National University and his colleagues have developed a low-cost process that prints RFID tags onto rolls of plastic film (pictured left).

The film passes through three types of printer, which lay down the electrodes, antenna and other necessary electronic components. The key advance is the ability to print a tag that is powerful enough to be quickly activated and read by a standard RFID reader. The team estimates its per-unit production cost to be about US$0.03.

BIOLOGY

Stayin' alive

Am. Nat. doi:10.1086/650725 (2010)
Sexual reproduction weeds out harmful genetic mutations. How, then, have the asexual soil fungi Glomeromycota managed to survive for 400 million years?

The answer may lie in the way that Glomeromycota reproduce, by releasing spores packed with hundreds of nuclei. By contrast, typical eukaryotic cells, including the spores of many other asexual fungi, contain only one nucleus. Teresa Pawlowska of Cornell University in Ithaca, New York, and Jean-Luc Jany, now at the European University of Brittany, Rennes, France, used three-dimensional imaging to watch *Glomus etunicatum* reproduce on carrot roots.

They found that a stream of nuclei pour into the spores from the fungus's thread-like vegetative branches. They also observed that some nuclei are eliminated and thus never passed on to spores, suggesting a method the fungus uses to screen out mutated nuclei.

ASTROPHYSICS

Old stars call out

Astrophys. J. **711,** 517–531 (2010)
Mysterious radio signals could be coming from a large but quiet population in the Milky Way: old, slow-spinning neutron stars.

As many as one billion ancient neutron stars — the remnants of exploded stars — are thought to be scattered around the Galaxy, but only a tiny fraction can be easily detected. Eran Ofek at the California Institute of Technology in Pasadena and his colleagues follow up on the recent discovery of weak radiowave emissions, lasting hours to days, of unknown origin.

The researchers present infrared observations that rule out other objects — such as supernovae, quasars and pulsars — as sources. Old neutron stars offer insight into the Milky Way's history and, the authors suggest, would be easier to track down if they did prove to be the radio emitters.

CHEMICAL BIOLOGY

With added sugar

Nature Chem. Biol. doi:10.1038/nchembio.314 (2010)

Researchers and drug developers often use bacteria to churn out proteins in vast numbers, but the microbes are not equipped to create glycoproteins — proteins with sugar chains attached — of the kind that are useful to mammalian cells. Markus Aebi of the Swiss Federal Institute of Technology in Zurich, Lai-Xi Wang at the University of Maryland in Baltimore and their colleagues have modified the bacterium *Escherichia coli* to produce mammalian-style glycoproteins.

The microbes carry a set of genes from another bacterium, *Campylobacter jejuni*, that enable the *E. coli* to link sugar chains to the nitrogen atoms of certain amino acids in proteins. The authors engineered this pathway to generate the same protein–sugar linkage that mammalian cells do. After extracting the proteins, they added enzymes and synthesized sugars to trim and remodel the attached sugar chain, creating the desired glycoprotein.

APPLIED PHYSICS

Sound lasers hum along

Phys. Rev. Lett. **104,** 083901 (2010)

Since the advent of lasers, researchers have strived to build an acoustic equivalent — devices that can amplify and emit sound waves at a single frequency.

Kerry Vahala and his group at the California Institute of Technology in Pasadena fired a light laser at two micrometre-scale silica drums. The light raced around the rim of the drums, causing the drum heads to vibrate. Once the system crossed a threshold, one head beat with a pure, amplified tone — an effect that the researchers verified by looking at how the laser flickered as it exited the drums.

Such devices may prove useful in electronics and ultrasound applications.

For a longer story on this research, see go.nature.com/UbvNSB

WILDLIFE BIOLOGY

Lizard back burden

Herpetologica **65,** 363–372 (2009)

Studies have reported deleterious effects of radio transmitters attached by researchers to various animals in the wild. Charles Knapp of the San Diego Zoo in California and Juan Abarca of the National University in Heredia, Costa Rica, reveal that the arbitrary weight limit used for transmitters on lizards — of 5–10% of body mass — may be too high.

They attached transmitters of between 2.5% and 15% of body mass to green iguana hatchlings (*Iguana iguana*; pictured below) in Costa Rica. Although these did not impede the animals' running speed, transmitters weighing 10% and 15% of the iguanas' body mass did lower climbing speeds. The animals with the 10%-of-mass transmitters also gained less weight over a month. The authors suggest limiting monitoring equipment for these creatures to 7.5% of body mass.

C. KNAPP

NEUROSCIENCE

Use it or lose it

Nature Neurosci. doi:10.1038/nn.2498 (2010)

The making of new memories can interfere with old memories of similar events. However, elevated activity in the brain's hippocampus during new memory formation is associated with the retention of older, related memories, according to work by Brice Kuhl, Anthony Wagner and their team at Stanford University in California.

During the study, volunteers learned to associate pairs of objects while their brain activity was monitored with functional magnetic resonance imaging (fMRI). The volunteers then learned to associate a new selection of pairs, some of which featured an object contained in the original pairs. After they left the fMRI scanner, the volunteers did a memory test. Those who remembered the original pairs had exhibited more activity in their hippocampus when forming the new memories than those who did not.

JOURNAL CLUB

Robert Lucas
University of Manchester, UK

A neuroscientist explores the network of cells in the retina.

The brightness of ambient illumination varies by as much as nine orders of magnitude from night to day. Many models of the visual system regard this variation as merely an inconvenience. However, these changes in illumination reset circadian clocks and influence mood, sleep and even migraine headaches. So how does the eye measure illumination over such a wide range?

Melanopsin-expressing retinal ganglion cells (mRGCs), a recently discovered subtype of the retina's output cells — those that convey signals from the eye to the brain — are dedicated to this task. mRGCs have their own photopigment, melanopsin, so can respond to light directly. Nonetheless, they also receive input from the other light-absorbing cells in the retina — the rods and cones. Two papers show that the cells linking rods and cones to mRGCs are unusual.

A rule of retinal wiring is that those RGC dendrites or projections that receive 'ON' signals — which indicate an increase in illumination — occupy one retinal layer, whereas those receiving 'OFF' signals are in another. Using mice, two independent groups show that mRGCs buck this trend by receiving ON signals in the OFF layer: David Berson and his team at Brown University in Providence, Rhode Island, and Stephen Mills and his colleagues at the University of Texas at Houston (O. N. Dumitrescu *et al. J. Comp. Neurol.* **517,** 226–244; 2009; H. Hoshi *et al. J. Neurosci.* **29,** 8875–8883; 2009).

These data indicate that the retinal networks that carry rod and cone signals to mRGCs follow their own rules. As artificial lights increasingly replace the Sun as our main source of photons, we are faced with the question of what makes a 'good' light for our physiology. The answer depends on which photoreceptors we want to stimulate and so requires a deeper understanding of these networks.

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