RESEARCH HIGHLIGHTS

Feel the heat

PLoS ONE doi:10.1371/journal.pone.0000281 (2007)

Crocodiles rely on temperature-sensing ion channels in their cells to decide whether to warm up in the sun or take a cooling swim, say Frank Seebacher and Shauna Murray of the University of Sydney, Australia.

The researchers found that *Crocodylus porosus* (pictured) has two genes, *TRPV1* and *TRPM8*, that are closely related to genes found in warm-blooded animals. The genes encode ion-channel proteins that act as heat and cold sensors. Inactivating the sensors impairs the reptile's ability to thermoregulate: crocodiles whose sensors were chemically blocked stopped shuttling between sunbathing and swimming, and their body temperatures settled down to that of the water.

D. ZUPANC/NHPA

CELL BIOLOGY

Make or break

Cell **128,** 915–929 (2007)

Researchers have uncovered a molecular link between the construction and clear-up of scaffolding inside a migrating cell.

The skeleton of a migrating cell must constantly re-form, with actin filaments being assembled at the leading edge and broken down at the rear. James Bear of the University of North Carolina, Chapel Hill, and his colleagues suggest that a protein called coronin 1B coordinates these processes.

They found that coronin 1B inhibits actin-filament formation by interacting with a protein complex known as Arp2/3, and that it also regulates the activity of the protein cofilin, required for filament turnover. Furthermore, depleting coronin 1B in rat cells reduced their motility.

MATERIALS SCIENCE

Love–hate relationship

Macromolecules doi:10.1021/ma062965u (2007)

Here's a riddle: how can a 'hydrogel' that holds more than its dry weight in water have a hydrophobic, or water-repellent, surface?

Kazutoshi Haraguchi of the Kawamura Institute of Chemical Research in Sakura, Japan, and his colleagues observed this for a hydrogel made from a network of the polymer poly(*N*-isopropylacrylamide) and particles of clay.

Water dropped onto a hydrogel would usually spread out and be absorbed. But water splashed onto the surface of this team's material sat in round droplets — making contact angles of up to 150°. The researchers suspect that the polymer's water-repellent side-chains have wriggled to the surface, poking out to form an impenetrable layer.

CHEMISTRY

The buckycatcher

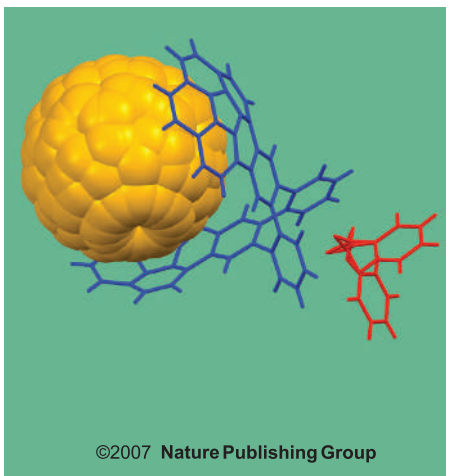
J. Am. Chem. Soc. doi:10.1021/ja070616p (2007)

Molecular tongs designed to clasp carbon C_{60} molecules — or buckyballs — make their debut in a paper from Andrzej Sygula of Mississippi State University and his team.

The tongs have two gently curved, bowl-shaped heads that wrap snugly around C_{60}'s spherical shell, cradling it in the same way a baseball glove holds a ball (pictured below).

The bowls are molecules known as corannulenes, which contain aromatic rings of carbon atoms. They bind C_{60} through interactions between the two structures' π molecular orbitals.

Attached to a surface, these tongs could be just the thing for extracting C_{60} molecules from solution, or for positioning them at precise locations.



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DEVELOPMENTAL BIOLOGY

Secure checkpoint

Curr. Biol. doi:10.1016/j.cub.2007.02.027 (2007)

Fruitflies use a belt-and-braces approach to stop genetic parasites wrecking the chromosomes in their developing eggs, report Trudi Schüpbach and her team at Princeton University, New Jersey.

The team found that mutations in genes involved in the 'rasiRNA' pathway — a kind of RNA interference — led to a marked increase in the activity of mobile DNA elements called transposons. This suggests that the rasiRNA pathway normally shuts down transposons, whose activity destabilizes chromosomes.

The transposon activity then prompted a protein known as Chk2, which responds to DNA damage, to either halt cell division in the developing eggs, or, if that failed, block the translation of a protein essential for egg development. This 'checkpoint' monitors the RNA-interference system and kicks in if it fails, the team suggests.

INORGANIC CHEMISTRY

Radical element

Angew. Chem. Int. Edn doi:10.1002/anie.200700059 (2007)

Chemists have achieved a delicate balancing act: creating a molecular 'radical' containing a phosphorus atom with an unpaired electron that will react with other species, but which is stable enough to be stored in a bottle. Such a radical might be used to initiate polymerization reactions, or to probe reaction intermediates.

Phosphorus radicals are typically difficult to stabilize. Here, the phosphorus

is sandwiched at the radical's core between two chemical groups that contain vanadium atoms. This stabilizes the structure, report Christopher Cummins at the Massachusetts Institute of Technology in Cambridge and his team, because the phosphorus shares its lone electron with the two metal atoms. They hope that the same strategy will stabilize radicals centred on other elements, and that varying the metal will tune the radical's reactivity.

MALARIA

Which mozzies win out?

Proc. Natl Acad. Sci. USA **104,** 5580–5583 (2007)

Genetic resistance to the malaria parasite gives mosquitoes feeding on infected blood a fitness advantage, researchers have found. Release of mosquitoes that are resistant to infection with malaria is one control strategy being considered to curb the disease.

Marcelo Jacobs-Lorena of the Johns Hopkins University in Baltimore, Maryland, and his colleagues put 250 transgenic and 250 wild-type mosquitoes of opposite sexes into a cage, where they fed on mice infected with the *Plasmodium berghei* parasite. The transgene, which blocks infection through the mosquitoes' gut, was found in around 70% of the mosquito population after 10 or so breeding cycles. Mosquitoes in the wild only occasionally become infected with the parasite, but this study gives hope that the transgene could persist in the population.

ASTRONOMY

Seeing things

Astrophys. J. **657,** 669–680 (2007)

Infrared light thought to have been emitted by the Universe's first stars isn't seen in a new survey of the skies.

Researchers had previously found a 'near-infrared background excess' in some

NASA/ESA/R. THOMPSON

satellite images that they couldn't account for with known sources. They argued that it was light from early galaxies, stretched by the expansion of the Universe to appear at infrared wavelengths.

Rodger Thompson of the University of Arizona, Tucson, and his colleagues analysed sharper and more sensitive images from the Hubble telescope (pictured above). They say the claimed excess was due to inaccurate estimates of emission from zodiacal dust. What's more, they could attribute spatial variations in the background to previously undetected nearby galaxies.

NANOTECHNOLOGY

Spheres inside cells

Environ. Sci. Technol. doi:10.1021/es062541f (2007)

Concerns about nanoparticle toxicity have prompted researchers to look closely at how C_{60} molecules interact with cells.

Alexandra Porter at the University of Cambridge, UK, and her colleagues imaged C_{60} that had infiltrated human macrophages — cells that have a role in clearing debris from the lungs. The researchers showed that a technique known as energy-filtered transmission electron microscopy can pick out the carbon spheres. They could see individual molecules and tell apart aggregates that were crystalline or disordered.

C_{60} appeared in the cells' cytoplasm and nuclei. The molecules were concentrated just inside the cell wall, suggesting that they had infiltrated the cell through its membrane.

GENETICS

Mutations linked to autism

Nature Genet. **39,** 319–328 (2007)
Science doi:10.1126/science.1138659 (2007)

Two studies point to genetic changes that may contribute to the spectrum of autism disorders.

The Autism Genome Project Consortium scanned the genomes of more than 1,000 affected families for single-nucleotide variations in DNA inherited alongside the disorder. They also searched for inherited versions of mutations known as copy-number variants — deletions or duplications of chunks of the genome. Their findings implicate two major regions of DNA, one of which is linked to neuronal proteins called neurexins.

Independently, Jonathan Sebat and Michael Wigler at Cold Spring Harbor Laboratory, New York, and their colleagues compared the role of copy-number variants in sporadic and inherited cases of autism. They found that such mutations appear spontaneously in 10% of patients with sporadic autism, but in only 2% of patients from families with more than one affected member. This suggests that the two classes of autism differ in the primary genetic mechanism involved.

Correction

The Research Highlight 'An added dimension' (*Nature* **446,** 234; 2007) incorrectly referred to *Schizosaccharomyces pombe* as budding yeast. It is fission yeast.

JOURNAL CLUB

James Bauer
College of William and Mary, Gloucester Point, Virginia, USA

A marine scientist marvels at connections between the cold war and slimy mudflat worms.

Having grown up on the coast of New England, my childhood involved a good deal of digging around in the intertidal mud, unearthing things that most people of good sense do their best to avoid — things such as slimy, slithering worms, which often bite or smell bad, or both.

Older but no wiser, I was delighted to come across a recent paper (E. Teuten *et al. Mar. Ecol. Prog. Ser.* **324,** 167–172; 2006) that has cleverly extracted a surprising scientific result from studies of such mudflat worms.

As well as reminding me of my dubious childhood pastime, the work recalls the period in which I grew up, during the cold war, when much of the world lived in fear of the nuclear weapons then being tested. This work takes advantage of one legacy of those tests.

The bomb tests sent into the atmosphere lots of the isotope carbon-14, normally present only at low levels. This bomb carbon-14 subsequently made its way into the oceans, where it became incorporated into plankton. The plankton in turn sank and became part of the coastal mud, providing a home and a food source for marine sedimentary animals.

Mudflat worms are generally believed to ingest wholesale the nondescript sediment in which they live, yet the worms examined in this study contained more bomb carbon-14 than the sediment surrounding them.

Thus, it seems that the worms assimilate from the amorphous goop, material that has been deposited since the cold war and so is younger than the average age of the sediment. Presumably, they do so because the newer material is more nutritious, but how they extract it is unknown.

Makes me want to get back out by the sea with my bucket.

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