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Research Highlights

Nature **451**, 110-111 (10 January 2008) | doi:10.1038/451110a; Published online 9 January 2008

Neurobiology: Sleep stimulation

***Nature Med.* doi:10.1038/nm1693 (2007)**

Drugs that target the neurotransmitter adenosine could one day replace or enhance brain implants to calm the tremors that are symptomatic of Parkinson's disease.

Deep brain stimulation is a technique that uses electrodes to deliver electrical impulses to specific regions far inside the brain. Lane Bekar and Maiken Nedergaard of the University of Rochester in New York and their colleagues have found that adenosine, which is associated with sleepiness, is crucial to the technique's beneficial effects.

The researchers used a drug to induce symptoms of Parkinson's disease in mice, then showed that the tremors could be dampened by treating the animals with adenosine. They also found that dosing the mice with a compound that blocks adenosine receptors exacerbated the tremors.

Nanotechnology: Memory sticks

***Nature Nanotech.* doi: 10.1038/nnano.2007.417 (2008)**

Carbon nanotubes have often been tipped as contenders in the race to replace silicon computing with something faster and smaller. Gehan Amaratunga at the University of Cambridge, UK, and his colleagues have now produced a memory device that works by bending one nanotube towards another.

They developed a tiny capacitor in which one carbon nanotube can store electric charge. A second nanotube generates 'on' and 'off' states when a voltage is applied by bending enough to touch the first nanotube, charging the first nanotube up.

Although they have put information onto the device, the authors have not yet tried to read it back. But because their system works similarly to computer memory in widespread use today, they propose that conventional circuits linked to the device might be able to read the data.

Evolution: Chemical arms-race

***Science* 319, 88–90 (2008)**

D. NASH

Caterpillars of the Alcon blue butterfly (*Maculinea alcon*; pictured with *Myrmica rubra*) trick ants into caring for them by mimicking the surface chemistry of ant larvae. Researchers have found that the bluff locks Alcon blues and the ants they parasitize into localized evolutionary arms races.

David Nash at the University of Copenhagen in Denmark and his co-workers discovered that the more caterpillars 'taste' like their potential hosts, the quicker they fool ants into 'adopting' them. The team studied several ant colonies of either *Myrmica ruginodis* or *Myrmica rubra*. The chemical signatures of the first species' larvae were similar across its populations, because of regular gene flow between them, so colonies in the Alcon blues' range were more or less equally susceptible to the free-riding caterpillars.

But there was more variation among the colonies of the second type of ant that share habitat with the Alcon blue than in those that did not. This species rarely exchanges genetic information between colonies, and this finding suggests that the parasitized ants are under pressure to evolve against the butterfly, which responds by countering the ants' evolutionary innovations.

Materials science: Forbidden zone

***Phys. Rev. Lett.* 99, 235503 (2007)**

Why do some solids grow with 'forbidden' fivefold and twelvefold symmetries, which cannot be produced by any regular stacking of atoms, when rearranging their atoms into perfect crystals would be thermodynamically more stable?

Aaron Keys and Sharon Glotzer of the University of Michigan, Ann Arbor, have performed computer simulations to explain how these 'quasicrystals' form.

Like crystals, quasicrystals expand from a tiny nucleus of solid that forms spontaneously in a supercooled liquid. Keys and Glotzer report that a quasicrystal nucleus grows by incorporating ready-formed clusters of atoms with icosahedral shapes, which have five- and twelvefold symmetries and cannot themselves grow indefinitely. This creates packing mismatches. Reorganizing the atoms in the enlarging nucleus to correct for the mismatches is a slow process, and quasicrystal growth outpaces it, preventing the formation of a regularly ordered crystal.

Chemical biology: Platinum result

***Nature Chem. Biol.* doi:10.1038/nchembio.2007.58 (2007)**

Common chemotherapy drugs based on platinum, such as cisplatin and oxaliplatin, target different combinations of DNA sequences when that DNA is bound to structures called nucleosomes compared with when it is not, according to Curt Davey and his colleagues at Nanyang Technological University in Singapore.

Nucleosomes comprise bundles of proteins and DNA, and package DNA into chromosomes. Although scientists knew where these drugs act on nucleosome-free DNA, they understood little about how the drugs work in living cells.

The additional details, elucidated with X-ray crystallography, may make the process of screening potential anticancer medicines with fewer side effects than cisplatin and oxaliplatin more efficient. The findings could also help in the design of more specific compounds — if drugs could home in on nucleosomes in certain positions, they could better target relevant genes.

Fluid dynamics: What goes around

***Phys. Rev. Lett.* 99, 234302 (2007)**

Large-scale ocean flows are often mapped using buoys that broadcast signals to satellites. Yoann Gasteuil and his colleagues at the École Normale Supérieure in Lyon, France, have developed a miniature instrument that freely follows smaller-scale currents.

Their wireless sensor, which measures just over 2 centimetres in diameter, can record the temperature and velocity of its surrounding medium and transmit that information via radio waves. The sensor's density is matched to that of the fluid, so it neither sinks nor floats and is carried along by convection flows.

So far Gasteuil and his team have recorded the size and speed of rising hot plumes and cool sinking ones in a desktop water tank, and have taken measurements of heat transport, which varies considerably between circulation cycles.

Zoology: Face space

***Brain Behav. Evol.* doi:10.1159/000108607 (2008)**

E. A. TIBBETTS & J. DALE

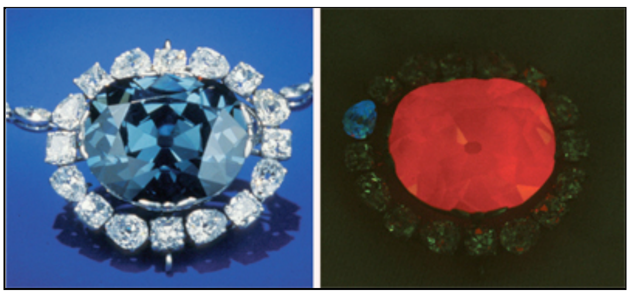
Certain types of paper wasp are the only insects known to be able to recognize individuals of their own species by the pattern of markings on their faces. A study comparing brain size and structure in wasps with and without this ability might aid zoologists trying to understand the evolution of facial processing in the brain.

Wulfila Gronenberg at the University of Arizona, Tucson, and his co-workers looked at the neural structures of four species of paper wasp, two of which can recognize the faces of wasps of their own species.

The face-recognizing wasps had neither bigger brains nor larger primary visual centres than the others. So telling contrasting facial markings apart may be no more taxing for these insects (such as *Polistes dominulus*, pictured) than discriminating between different foods or predators, the researchers suggest. If this is the case, it may distinguish the wasps from other creatures capable of facial recognition, and could provide clues to how finely tuned facial processing evolved from primitive brains in 'higher' organisms.

Forensics: The red in the blue

***Geology* 36, 83–86 (2008)**



J. HATLEBERG/SMITHSONIAN INST.

The Hope Diamond (pictured), the largest known deep blue diamond in the world, glimmers red for several minutes after exposure to ultraviolet light.

Contrary to expectation, almost all natural blue diamonds phosphoresce red as well as blue or green light, and the colour and duration of their glow creates a fingerprint unique to every gem. The phosphorescence patterns arise from defects in the diamonds' chemical structures, which affect how radiation — in this case ultraviolet light — bumps electrons into higher energy states and how that energy is released as photons.

Sally Eaton-Magaña at the Naval Research Laboratory in Washington DC and her team arrived at this conclusion after measuring the phosphorescence of the Hope and 66 other natural blue diamonds. No man-made or treated diamonds phosphoresced red in the experiment. The researchers propose that spectrometers could be used to authenticate stolen blue diamonds and tell natural gems from synthetic ones.

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