

clumpiness of dark matter has changed since the Big Bang suggest that the Milky Way should have hundreds, if not thousands, of neighbouring nuggets of dark matter thick enough for faint dwarf galaxies to form in them. But only 20 or so of these galaxies have been spotted.

By assessing the limits of the Sloan Digital Sky Survey, Tollerud and his co-workers have found that the number of known dwarf galaxies is consistent with the number of nearby dark-matter clumps predicted by models.

NANOTECHNOLOGY

Super speakers

Nano. Lett. doi:10.1021/nl802750z (2008)

Imagine a loudspeaker that is bendy, transparent and stretches to twice its length without breaking or changing the intensity of the sound it amplifies. This is what Kaili Jiang and Shoushan Fan of Tsinghua University in Beijing, China, and their colleagues have made. By attaching one of their prototype films to the screen of an iPod they have used it to play sound from the device.

The invention exploits the thermoacoustic effect, which was first realized in the nineteenth century with the platinum thermophone. The effect describes what happens when a material is heated and cooled, thus expanding and contracting the air around it, which creates sound waves. The film on the researchers' iPod generates sound 260 times more efficiently than this historical gadget because the sheets of parallel carbon nanotubes of which it is composed heat up and transfer heat to air faster.

CHEMISTRY

Snip it with zinc

J. Am. Chem. Soc. doi:10.1021/ja801794t (2008)

The covalent bonds that string DNA's nucleotide subunits together are tough, so breaking them requires high temperatures or a catalyst. Now Fabrizio Mancin and Paolo Scrimin at the University of Padova in Italy and their colleagues describe how to make a DNA-cleaving catalyst that works 100 times faster than one of the most efficient synthetic alternatives.

Their method relies on self-assembling sulphur-containing ligands. These are spread across a surface of gold nanoparticles and attach many zinc-based catalysts to each nanoparticle. Because this generates many catalytic sites close together, the substance can cut both strands of DNA at the same point, which enzymes find easy but artificial catalysts have not previously managed.

MICROBIOLOGY

The one and only

Science 322, 1110–1112 (2008)

All previously discovered cyanobacteria can use water as an oxygen donor in photosynthesis, producing molecular oxygen as a by-product. But Jonathan Zehr at the University of California, Santa Cruz, and his colleagues have found one that can't.

The new cyanobacterium, known as UCYN-A, has not been cultured, although significant parts of its DNA have been sequenced. It lacks photosystem II, which is necessary for water splitting, but retains photosystem I, in common with light-fuelled but non-oxygen-producing green sulphur bacteria. UCYN-A does not fix carbon dioxide into carbohydrates, but it does fix nitrogen.



A. DAVISON

ZOOLOGY

Sex with a twist

Biol. Lett. doi:10.1098/rsbl.2008/0528 (2008)

The direction in which a snail's shell twists affects much more than the animal's appearance. Angus Davison and his colleagues at the University of Nottingham, UK, have shown that the 'handedness' of great pond snail shells corresponds to the handedness of their courtship.

When hermaphrodites of the species *Lymnaea stagnalis* mate with each other, one takes a 'male role' by climbing onto the other and circling (pictured above) before copulation. All 46 dextral males studied by Davison's team circled anticlockwise during courtship; all but one of 48 sinistral snails circled clockwise.

The researchers say that sinistral snails tend to have mirror-image brains, so the handedness of their behaviour is probably a direct consequence of the handedness of their brains. This probably also dictates the direction of twist in their shells.

JOURNAL CLUB

Jagadeesh Bayry
INSERM, Paris

An immunologist applauds a protein that prunes intolerant white blood cells.

Spreading tolerance is a worthy cause. In the body, newly made white blood cells are rendered tolerant to the many thousands of native proteins. But, like any complex process, this one is not foolproof, and when it goes wrong intolerant white cells cause autoimmune disease.

One way that the tolerance-spreading system can fail is by not having enough 'field agents' to pick off intolerant dissenters. Regulatory T lymphocytes (T_{reg}), a type of white blood cell, are these field agents. They find and suppress other white cells that react to healthy parts of the body. Although it is known that people with low T_{reg} levels tend to have autoimmune diseases, how the cells function has been unclear. Recently, however, researchers in Japan shed light on this mystery.

Kajsa Wing, now at the Karolinska Institute in Stockholm, and her colleagues focused on the protein CTLA-4, which is preferentially expressed by T_{reg} cells and forms part of a rheumatoid arthritis drug called Abatacept. They bred mice without CTLA-4 on the surface of their T_{reg} cells. The animals appeared healthy until maturity, then quickly developed autoimmunity. So CTLA-4 is needed for the field-agent system to operate, and merely expressing it in smaller quantities on other sorts of white blood cell isn't enough. Wing *et al.* then discovered that CTLA-4 on T_{reg} cells interacts with and diminishes two proteins, CD80 and CD86, on the surface of dendritic cells, which show other white cells what to hunt (K. Wing *et al. Science* 322, 271–275; 2008).

All of this confirms that CTLA-4 should provide a means of treating autoimmune diseases. Blocking CTLA-4 should improve the capacity of dendritic cells to present dangerous native cells to the immune system. Clinical trials for cancer treatments that do just that are already under way. Now we have a clearer idea how they work.

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