may be more sociable, sometimes coming together into 'vortex molecules'. Q-Han Park of Korea University in Seoul and his collaborators modelled what would happen in a BEC composed of both atomic and molecular rubidium. They show that the interactions of the different rubidium species cause vortices in the BEC to form into triplets that look similar to carbon dioxide molecules.

The researchers are now building an experiment to test their calculations. They hope the system will improve the understanding of vortices in other materials, including superconductors.

ARCHAEOLOGY

Excremental advance

Science doi:10.1126/science.1154116 (2008)

The Clovis culture of about 13,200 years ago is the first unmistakeable sign of human presence in the Americas, but there have been tantalizing hints of an older presence. Now, Eske Willerslev of the University of Copenhagen and a large team of his colleagues have found human faeces in an Oregon cave that they carbon date to about 14,300 years ago.

Human mitochondrial DNA from some of the fossil faeces, which were removed from the lowest layer of the Paisley Caves, carries a signature associated with two founding Native American groups. These mysterious pre-Clovis people support findings of non-Clovis cultural artefacts in Chile from about 14,500 years ago.

CANCER BIOLOGY

Long-distance instructions

Cell **133,** 66–77 (2008)

The microenvironment of a breast tumour cell can influence it in a way that leaves it particularly well suited to spread to the lungs.

This may be a general phenomenon, according to Joan Massagué of the Memorial Sloan-Kettering Cancer Center in New York, explaining the mysterious tendency of cancer cells to metastasize to a 'preferred' organ.

He and his colleagues found that in one major type of human breast tumour, cells would invade lungs much more readily than bones if they had responded to the signalling molecule TGFβ in the tumour microenvironment before escaping into the bloodstream.

TGFβ, they found, switches on production of a second signalling molecule in the tumour cell itself. This molecule, ANGPTL4, disrupts the tight connections between cells in the tiny blood vessels that infiltrate lungs — allowing the tumour cells to enter and settle there.

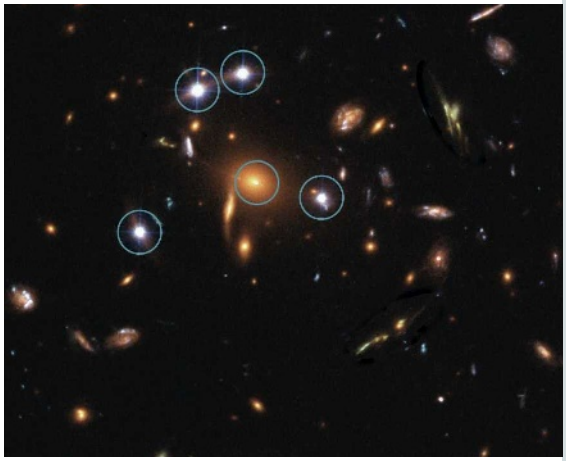
ASTROPHYSICS

Quasar, delayed

Astrophys. J. **676,** 761–766 (2008)

Astronomers have measured the longest time delay yet seen due to gravitational lensing. Earth receives light from quasar SDSS J1004+4112 along five different paths (pictured below), thanks to the space-warping effects of intervening galaxies. Janine Fohlmeister of the University of Heidelberg, Germany, and her colleagues have now shown that one of the three main paths is two years and three months shorter than another, and that the quickest of the paths is at least 6 years shorter than the longest.

This large delay raises the possibility of studying events first seen in one image in more detail when they turn up years later in the others. This could allow the most precise estimates yet to be made of the size of a quasar's central engine.



EUROPEAN SPACE AGENCY/NASA/K. SHARON/E. OFEK

PHYSICS

Shields up

Phys. Rev. Lett. **100,** 123002 (2008)

Forget light, objects might also be made invisible to matter. Xiang Zhang and others at the University of California, Berkeley, report that it is theoretically possible to make a cloak that shields objects from incoming atoms — although the technique would work only at temperatures so low that atoms behave like waves.

The cloak would be made of concentric rings of light, an optical lattice configured so as to change the effective mass and electric potential of passing atoms. The changes would deflect incoming atoms around the object before letting them continue along their original path in the same way that 'invisibility cloaks' deal with photons. So far, the authors say, the experimental possibilities look most promising in two dimensions.

JOURNAL CLUB

Norbert Perrimon
Harvard Medical School, Boston, Massachusetts

A signalling scientist marvels at perfect patterns.

The formation of patterns during animal development depends to a great extent on cells, or groups of cells, sending a specific signal that activates a cascade of reactions in the cells that receive and respond to it. Studies of this process in the fruitfly *Drosophila* have provided many insights into the nature of the molecules involved and the mechanisms underlying cell–cell signalling.

The cell surfaces of almost all animals are decorated extensively with large molecules known as heparan sulphate proteoglycans (HSPGs). These modulate most developmental signalling pathways and comprise protein cores modified by the addition of long carbohydrate chains called glycosaminoglycans (GAGs). GAGs are key to mediating interactions between HSPGs and the molecules that they bind.

Recently, Rahul Warrior at the University of California, Irvine, and his colleagues (*Development* **135,** 1039–1047; 2008) explained the puzzling observation that although HSPGs are required for signalling by the protein BMP in certain tissues, they are not required for BMP signalling during very early fly development.

The authors demonstrate that GAG synthesis does not occur in early embryos because the messenger RNAs that encode two enzymes involved in its construction are not translated. Preventing GAG synthesis at this stage allows an 'activity gradient' of BMP to be generated across the embryo that patterns the dorso–ventral axis of the fly. A few hours later, the GAG enzymes are produced, allowing the modified HSPGs to participate in other signalling pathways.

This study illustrates how temporal control of the synthesis of a ubiquitous set of enzymes is used to modulate the activity of signalling pathways in different tissues.

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