

with and without the disease, and found four rare variants of the gene *IFIH1* that seem to protect against diabetes. This gene is involved in the immune response to RNA viruses. The group concludes that resequencing can help to sort out causative from non-causative genes identified by GWAS.

IMMUNOLOGY

Breaking into the brain

Nature Immunol. **10**, 514–523 (2009)

Immune cells can normally penetrate the barrier between the bloodstream and the brain only when the cells along this barrier are inflamed. So how do immune cells enter the brain to initiate the sort of inflammation associated with autoimmune disorders such as multiple sclerosis?

Federica Sallusto of the Institute for Research in Biomedicine, Bellinzona, Switzerland, and her colleagues showed that the cells enter through the choroid plexus, the brain region where cerebrospinal fluid is made. They used a mouse model of multiple sclerosis to show that a subset of T cells gains entry when their CCR6 surface receptors bind to a protein produced by cells of the choroid plexus. Once inside, the immune cells initiate inflammation.

The team also found that this gateway protein is present in the human choroid plexus and that a higher number of T cells from the spinal fluid of patients with multiple sclerosis express the CCR6 receptor.

BIOCHEMISTRY

Changing bases

Science **324**, 930–935; 929–930 (2009)

Modified versions of the four DNA bases — adenine, thymine, cytosine and guanine — can serve special purposes. Parasitic protozoa called trypanosomes have a modified version of thymine called J that has not been documented in other organisms.

In a study published in May, Anjana Rao of Harvard Medical School in Boston and her colleagues searched for enzymes similar to those responsible for making base J that might generate a similar base in mammals. They found TET1, which converts a methylated cytosine to hydroxymethylcytosine. This altered version accounts for 4–6% of all cytosines in the DNA of mouse embryonic stem cells. The researchers think that this enzyme may regulate gene activity through this modification.

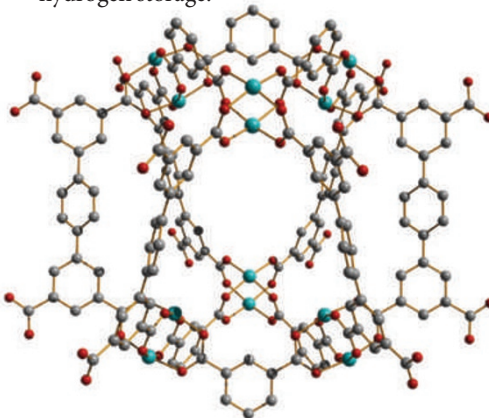
Meanwhile, independently, Skirmantas Kriaucionis and Nathaniel Heintz at the Rockefeller University in New York identified the modified base in the mouse brain.

MATERIALS CHEMISTRY

Marvellous metal–organics

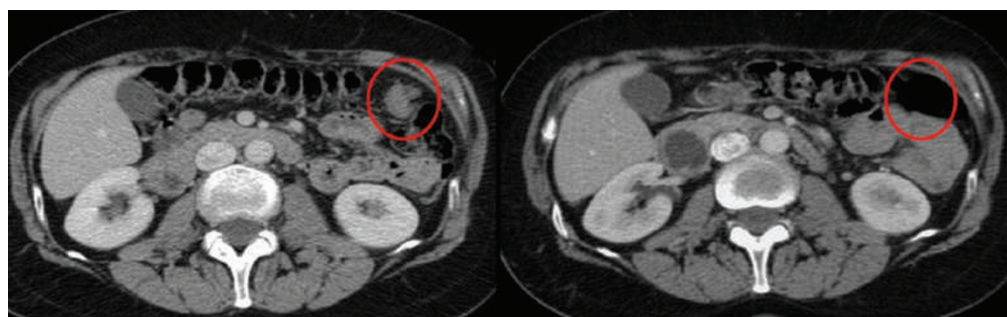
J. Am. Chem. Soc. **131**, 2159–2171; 3625–3627 (2009)

Metal–organic frameworks (MOFs) are porous materials with large surface areas that are made up of metals linked through organic groups. They are the focus of research for a range of applications, including hydrogen storage.



Martin Schröder at the University of Nottingham, UK, and his colleagues investigated which parts of a series of copper-based MOFs (one of which is pictured, above) were responsible for increasing the hydrogen-trapping ability of the materials. They showed that the shape of the linking groups and of the other chemical groups around the copper atoms were important. Bare copper sites held on to hydrogen the strongest. Pore size also affected how much hydrogen could be stored. One of the team's materials was able to store 7.78% by weight of hydrogen.

Another study from Anthony Cheetham at the University of Cambridge, UK, and his colleagues, showed that it is possible to make a multiferroic MOF — a material with more than one unique magnetic property. Multiferroic materials are hard to come by because they require the material to take on different molecular arrangements. But the team created a multiferroic MOF from manganese and organic groups, which might be used as magnetic-field sensors and in other devices.



CLIMATE CHANGE

What's up with sea levels?

Glob. Planet. Change **65**, 83–88 (2009)

Global warming causes sea levels to rise in two ways: by melting land ice and by thermally expanding ocean water. In the past, the two factors have proved difficult to accurately tease apart, but Anny Cazenave of the Laboratory for Studies in Space Geophysics and Oceanography (LEGOS) in Toulouse, France, and her colleagues succeeded in measuring the two processes separately. They used gravity data from the GRACE satellites and temperature records collected by the Argo network of buoys.

They calculate that the thermal expansion of sea water has slowed recently and contributed only 0.3 millimetres per year to sea-level rise between 2003 and 2008. Meanwhile, melting land ice caused ocean levels to increase by about 2 millimetres per year.

CANCER DRUG DEVELOPMENT

Targeted tumour take-out

N. Engl. J. Med. **361**, 123–134 (2009)

Tumour cells with a mutation that affects their ability to repair severed DNA can be killed with a drug that knocks out a second repair mechanism. That's the finding from a phase I clinical trial that enrolled patients with cancer-associated mutations in the *BRCA* DNA-repair genes.

Johann de Bono of the Institute of Cancer Research in Sutton, UK, and his co-workers gave patients olaparib, which inhibits an enzyme involved in a second DNA-repair pathway. Out of 19 patients with a *BRCA* mutation, 12 showed signs of tumour shrinkage or stabilization. (Pictured below: left, a computed tomography scan of the abdomen of one patient with ovarian cancer (circled); and right, showing complete tumour regression after four months of treatment.)

The study shows promise for using cancer molecular biology to devise personalized therapies that exploits a tumour's genetic or molecular defects.