temperature and humidity near ground level at 25 sites in Switzerland and 8 in Germany, and then derived values for long-wave radiation, including heat radiating from the ground. The data indicate that the warming attributable to incoming short-wave radiation — and thus to fewer aerosols in the atmosphere — accounts for two-thirds of the overall warming of the past two decades. This totals about 1 °C in Europe.

MOLECULAR BIOLOGY

RNA repair

Science doi:10.1126/science.1165313 (2009).

The machinery involved in the RNA interference (RNAi) pathway may protect genomes against some accidental changes in how DNA is chemically modified, geneticists have found.

Modifying DNA by adding methyl groups is a common way in which cells silence certain genes, but methylation can erode over time, making the silencing less effective.

Vincent Colot at the École Normale Supérieure in Paris and his colleagues studied *Arabidopsis thaliana* mutants that have reduced DNA methylation throughout the genome. They crossed these mutants with normal plants and found that methylation gradually returned to some genes in offspring that no longer carried the mutation. Previous research had shown that methylation doesn't return once lost. Sites that were remethylated complemented the sequence of small RNA molecules that are involved in RNAi; methylation was not restored in mutants that did not make these RNAs.

NANOTECHNOLOGY

The fine print

Nature Nanotechnol. doi:10.1038/nnano.2008.415 (2009)

The limit for information density seemed to be set: at best, a bit could be stored in the presence, or absence, of an atom or electron. But Chris Moon and his colleagues at Stanford University in California have found a way to store data in subatomic spaces using quantum holograms.

They stuck carbon monoxide molecules on a thin layer of copper using a scanning tunnelling microscope. A pond of electrons 'illuminated' the arrangement of these gas molecules, and where extra information was stored in the probabilistic shape of an electron's quantum wave, that electron formed part of a hologram. Together, the data-rich electrons formed an 'S' — for Stanford — with a linewidth as small as 0.3 nanometres.

BIOLOGY

Stench sense

J. Biol. doi:10.1186/jbiol108 (2009)

How is perception of a smell kept stable over a range of concentrations? *Drosophila melanogaster* larvae (pictured below) are attracted to the fruity odour of ethyl butyrate across a 500-fold range of concentration, according to Leslie Vosshall of the Rockefeller University in New York and her colleagues.

Mutant larvae that received input from only one of a subset of three olfactory sensory neurons were attracted to a smaller concentration range of ethyl butyrate than normal larvae, in which all three neurons were functional. Furthermore, activation of just one neuron was insufficient to trigger inhibitory neurons, which respond to high ethyl butyrate concentrations, stopping the smell from becoming overpowering.

S. GSCHMEISSNER/SPL

CHEMISTRY

Membranous mopping

Angew. Chem. Int. Edn doi:10.1002/anie.200804582 (2009)

A hollow-fibre catalytic membrane developed by researchers in China and Germany could scrub the greenhouse gas nitrous oxide from the exhausts of chemical plants.

The membrane has a type of crystal structure known as perovskite, and contains barium, cobalt, iron and zirconium. It catalyses the breakdown of nitrous oxide to free nitrogen gas and oxygen atoms, which end up bound to its surface. These atoms recombine into molecular oxygen too slowly to avoid clogging up the membrane and slowing the process. Adding methane to the system solves this problem because it mops up the oxygen as it forms. This reaction generates 'synthesis gas', a mixture commonly used in industry as a fuel or chemical feedstock.

The system's architects, Haihui Wang from South China University of Technology in Guangzhou and his colleagues, say that their membrane is the first from which oxygen can be removed quickly enough to avoid attenuating the membrane's catalytic effect.

JOURNAL CLUB

Jean Dalibard
Kastler Brossel Laboratory, CNRS, France.

A quantum-gas specialist learns about crystals from his own science.

Crystals can behave as electrical insulators or conductors. In a few crystals and under the right conditions, electrons flow perfectly. And in a subset of these superconducting crystals, the minimum temperature for perfect conduction is bizarrely warm.

On the whole, physicists have tried to explain this using models with a small number of parameters, such as the probability of an electron jumping between two sites, and the interaction energy between two neighbouring electrons. Extensive laboratory studies measuring every conceivable property of the curious crystals confirm several predictions of these models, but their general solution is still hotly debated.

Recently, a couple of research groups have been casting around for less obvious ways to understand superconducting crystals, and turned to the field that is my bread and butter: quantum gases. They have modelled electrons zooming through these crystals using gases of cold potassium atoms moving around in a space demarcated by laser beams — a kind of egg box made with light.

In December, a group led by Immanuel Bloch detected cold potassium gas switching to a state with exactly one atom per compartment of the egg box. Such an ordered state is considered a key ingredient for superconductivity. Bloch's team was not the first to see the switch, but the group's measurement of the size of the gas revealed a crucial property of this phase: its incompressibility (U. Schneider *et al. Science* **322,** 1520–1525; 2008).

This means that quantum gases are insulators as well as conductors, making the experimental analogy to superconducting crystals more complete — and making them more useful playthings for scientists studying superconducting crystals.

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