RESEARCH HIGHLIGHTS 2009

As the year draws to an end, *Nature*'s editors look back on some of their favourite papers published elsewhere this year.

ATMOSPHERIC SCIENCE

Stealth ozone destroyer

Science **326,** 123–125 (2009)

Thanks to the Montreal Protocol, emissions of chlorofluorocarbons (CFCs) have dropped, resulting in early signs of recovery of the ozone layer. However, the battle is not yet won. Researchers report that nitrous oxide (N_2O) — a gas that behaves similarly to CFCs in triggering global ozone destruction, but is not regulated by the protocol — is now the most significant ozone-depleter being emitted.

A. R. Ravishankara and his colleagues at the National Oceanic and Atmospheric Administration in Boulder, Colorado, calculated the 'ozone depletion potential' of N_2O and used it to weight the current emissions level. They found that the 2008 weighted emissions level for N_2O was around double that of the next most important ozone-depleting gas.

They also noted that nitrous oxide's global-warming potential is second only to methane among non-carbon dioxide gases in terms of its contribution to warming.

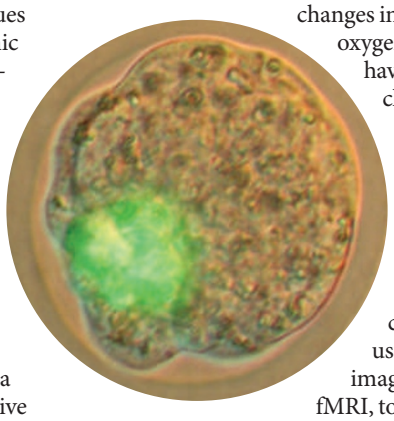
STEM CELLS

Protein reprogramming

Cell Stem Cell **4,** 381–384; 472–476 (2009)

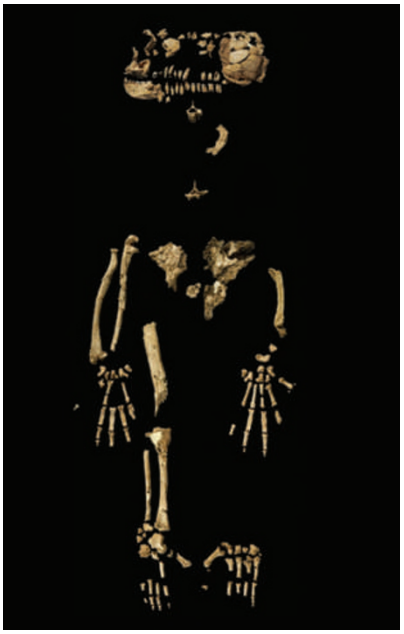
In 2006, researchers made cultured skin cells behave like embryonic stem cells by adding a handful of genes. But the method by which they inserted the genes — using viruses — can turn cells cancerous.

This year, two groups accomplished the same feat by delivering just the protein products of these genes into cells. Sheng Ding at the Scripps Research Institute in La Jolla, California, and his colleagues converted mouse embryonic fibroblasts into embryonic-like stem cells by using the bacterium *Escherichia coli* to engineer modified versions of the proteins that could cross the cellular and nuclear membranes. The cells (pictured green, right) were able to incorporate into early mouse embryos.



Meanwhile, Robert Lanza of Stem Cell and Regenerative Medicine International in Worcester, Massachusetts, Kwang-Soo Kim of Harvard Medical School in Boston, Massachusetts, and their colleagues reprogrammed human fibroblasts. They used a human cell line to generate the proteins, fused with a cell-penetrating peptide.

These papers are just two from this year that improved methods of stem-cell reprogramming.



T. WHITE

Not from chimps

Science **326,** 75-86 (2009)

In October, after 17 years of investigation, researchers reported detailed descriptions of the oldest hominid skeleton yet found. The fairly complete 4.4-million-year-old female *Ardipithecus ramidus* fossil — known as Ardi — was discovered in Ethiopia.

Analysis of the remains by Tim White at the University of California, Berkeley, and a large team of collaborators revealed that humans did not evolve from ancient chimpanzees, as has long been believed. Humans instead evolved along a separate lineage from the last common ancestor shared by early hominids and extinct apes.

Like modern humans, Ardi could walk upright and didn't use her arms for walking, as chimps do. However, she retained a primitive big toe that could have been used in ape-like tree grasping.

Years of field work uncovered Ardi's skull, teeth, arms, hands, pelvis, legs and feet (composite photograph pictured). The paper is accompanied by 10 companion articles.

NEUROSCIENCE

Signal source questioned

Proc. Natl Acad. Sci. USA **106,** 18390–18395 (2009)

Functional magnetic resonance imaging (fMRI) maps brain activity by measuring changes in local blood flow and oxygen levels. Neuroscientists have long thought that most changes in these signals were due to neurons becoming active and requiring more oxygen.

A study in October by Aniruddha Das and his colleagues at Columbia University in New York challenged this idea. They used intrinsic signal optical imaging, a technique similar to fMRI, to measure changes in blood volume and oxygenation in the brains of two macaques while the monkeys performed a visual task. The researchers simultaneously recorded local neuronal activity.

They showed that the initial part of the imaging signal is marked by changes in blood volume, not in blood oxygen levels. The authors concluded that blood volume is more tightly linked to neuronal activity and is thus a better measure to use in brain imaging. They say that boosting blood volume is the brain's way of 'anticipating' neuronal activity to meet the cells' impending need for more oxygen.

GENOMICS

Digging out a diabetes gene

ELSEVIER

Science **324,** 387–389 (2009)

Genome-wide association studies (GWAS) identify genomic regions associated with complex disease, but it can be difficult to pinpoint the exact gene or gene variant involved in the condition. Sergey Nejentsev at the University of Cambridge, UK, and his co-workers show how resequencing certain sections of the genome can bring researchers closer to an answer.

The group resequenced portions of 10 genes — which have been linked to diabetes or related syndromes — in 960 people, half of whom had type 1 diabetes. They then tested these genomic regions' association with diabetes in more than 30,000 people