

RESEARCH HIGHLIGHTS

Carbon from the mountains

Environ. Sci. Technol. doi:10.1021/es903301j (2010)
The greenhouse-gas emissions of conventional coal-fired power plants are up to 17% higher when emissions relating to mountain-top coal-mining operations are factored in, research suggests.

The Southern Appalachian Mountains in the United States are the source of almost one-quarter of the country's coal. Using published data on factors such as forest and soil carbon, James Fox of the University of Kentucky in Lexington and Elliott Campbell at the University of California, Merced, calculated the carbon emitted when companies cut down trees and sheer off mountain tops to access coal.

The authors show that land disturbance increases emissions by 2–12%, depending on the practice. Those figures increase to 7–17% if emissions produced during coal extraction and transport are included.



L. STONE/CORBIS

NEUROSCIENCE

Baby blues

J. Neurosci. 30, 2571–2581 (2010)
Stress or trauma in very early life can lead to anxiety and depression in adulthood, and previous evidence has implicated corticotrophin-releasing hormone (CRH) as a contributor to this outcome.

Louis Muglia of Vanderbilt University in Nashville, Tennessee, and his colleagues have narrowed down CRH's involvement using mice in which they could control expression of the hormone in the forebrain. When the researchers raised CRH levels during the first 21 days after birth, the mice went on to show anxious and despairing behaviours as adults. These behaviours could be normalized with antidepressants.

The mice could serve as a model to help find a means of preventing long-term consequences of childhood stress.

PARTICLE PHYSICS

Dazzling dysprosium

Phys. Rev. Lett. 104, 063001 (2010)
Physicists have trapped the first ultracold gas of dysprosium, prized for being one of the most magnetic atoms in the periodic table.

Using lasers and magnets to cool and trap

atoms is easiest in atoms that have only a few electrons whirling around. But cooling dysprosium, which has many electrons, was thought to be near impossible. However, with the aid of a powerful blue laser, Mingwu Lu and his colleagues at the University of Illinois at Urbana-Champaign cooled half a billion dysprosium atoms to below 3 millikelvin, bringing them close to a standstill.

The authors suggest that, cooled a little further, dysprosium could spontaneously form new phases of quantum matter akin to the patterns seen in liquid crystals.

MOLECULAR IMAGING

Tumour glows out

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0910261107 (2010)

In cancer surgery, taking out every last bit of a tumour improves a patient's prognosis. By targeting glowing proteins to cancer cells and illuminating them with magnetic resonance and fluorescence imaging, researchers have succeeded in completely removing tumours in mice, increasing survival rates.

Roger Tsien and his team at the University of California, San Diego, injected tumour-bearing mice with a fluorescently tagged cell-penetrating peptide linked to a neutralizing peptide. Enzymes common in tumours

cleaved the two peptides, releasing the tagged one and allowing it to infiltrate tumour cells (pictured far left). After cutting out the tumour (large arrow, left), the team was able to spot the remaining cancer cells (small arrow).

On average, the enhanced

visibility allowed the researchers to remove 90% more residual cancer cells than when they didn't use the marker. Tumour-free survival rates increased by 50–500%, depending on the cancer type.

EVOLUTIONARY BIOLOGY

On the invasion front

Proc. R. Soc. B doi:10.1098/rspb.2009.2231 (2010)
The geographical spread of invasive, non-native species may be limited by how they adapt over climate gradients. To investigate, Robert Colautti of the University of Toronto in Canada and his co-workers combined mathematical modelling with field surveys and greenhouse experiments on purple loosestrife (*Lythrum salicaria*). This invasive wetland plant — native to Europe — is common in eastern North America, where its range is rapidly expanding. This allowed the researchers to see how changing conditions affect the plant's evolution.

The authors' model and experiments showed that plants that had adapted to more northern climates, where the growing season is shorter, had done so at a cost: they flowered earlier, but were smaller and produced fewer seeds. The authors suggest this constrained adaptation may ultimately limit the northern spread of this invasive plant.

CELL BIOLOGY

Lost in the mail

J. Cell Biol. doi:10.1083/jcb.200911115 (2010)
Many proteins carry signal sequences — segments that act like shipping labels, directing the protein to specific structures in the cell. Ramanujan Hegde at the National

