Jersey Medical School in Newark found that mutant mice lacking AC5 lived, on average, 30% longer, weighed less, and exhibited less age-induced heart stress and bone loss. Mutant mice also produced more of the antioxidant enzyme superoxide dismutase.

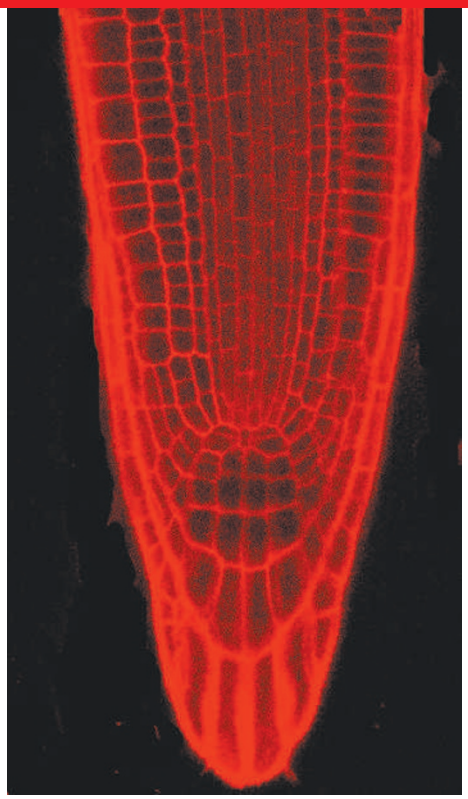
BOTANY

At the root of it all

Science **312,** 507–510 (2007)

In plants, ethylene responds to environmental signals such as being touched. Now, ethylene has also been discovered to relay these signals to the very heart of the root's stem-cell production factory.

Inside the root tip (pictured right), a group of four cells known as the quiescent centre (QC) gives rise to all the cells in the tissue systems of the root. Liam Dolan at the John Innes Centre in Norwich, UK, and his colleagues, compared wild-type *Arabidopsis thaliana* (thale cress) with mutants that had defective synthesis of ethylene. They found that ethylene promotes cell division in the QC to create further stem cells. But it does not induce them to differentiate. The latter task is more closely associated with the hormone auxin, and the two chemicals work in concert to orchestrate root growth.



ASTROCHEMISTRY

Anions in space

Astrophys. J. **664,** L43–L46 (2007); *Astrophys. J.* **664,** L47–L50 (2007)

Astronomers using a 100-metre radio telescope have found the largest negatively charged molecule yet in space. According to the researchers, the discovery of octatetraynyl anion (C_8H^-) and three other anions in the past year offers intriguing evidence for a suite of chemical reactions and products not yet observed — including molecules similar to amino acids and other precursors of life.

A team at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, spotted the compound in the dark molecular cloud TMC-1 in the constellation Taurus. And researchers at the National Radio Astronomy Observatory in Charlottesville, Virginia, have found it in the halo of IRC+10 216, a dying star in Leo.

SEX DETERMINATION

Old sperm sires sons

Biol. Lett. doi:10.1098/rsbl.2007.0196 (2007).

Older sperm are more likely than fresh sperm to produce males, at least in lizards. The discovery comes from a species in which females store sperm after copulation for later use, and it may explain why this species' sex ratio skews towards males as the reproductive season progresses. Sperm stored in the females' reproductive tract often outcompetes sperm from more recent inseminations.

A team of zoologists, led by Mo Healey of the University of Wollongong, Australia, set up breeding pairs of a small lizard called the Australian painted dragon (*Ctenophorus pictus*) in the laboratory. Stored sperm produced 55% sons, whereas fresh sperm sired only 32%.

NANOTECHNOLOGY

The look and feel of nano

Nature Nanotechnol. **2,** 407 (2007)

Ozgur Sahin of Harvard University and his colleagues have developed a specialized atomic-force microscope (AFM) that 'feels' a surface's softness. Existing AFMs create images by passing a vibrating cantilever with a sharp tip across a material. Sahin's team used a T-shaped cantilever that twisted as it vibrated up and down. The twisting changed in response to the material's softness, providing more detailed information than conventional tools allow.

Sahin says the technique shows promise for a variety of nanotechnology and biotechnology procedures, such as probing the mechanical properties of proteins and DNA.

Correction

In the Research Highlight 'Assorted fungi' (*Nature* **447,** 1034; 2007) there was an error in the reference. The correct details are: *Mycol. Res.* **111,** 509–547 (2007).

JOURNAL CLUB

Paul Kenrick
The Natural History Museum, London, UK

A palaeobotanist finds answers to the origin of roots in the genes of a living moss.

Roots have been called the hidden half of plant diversity. Confined mainly to the subterranean, their unseen influence extends well beyond the plant that they sustain to form an integral component of soil ecosystems and a significant link in the carbon cycle.

In my research, I use fossils to piece together how the fundamental organs and basic lifecycles of plants evolved, and roots are one of the key systems. The fossil record shows that roots were an early innovation in the colonization of the land, and that they evolved remarkably rapidly, developing a diversity of forms comparable to those of the aerial shoots, stems and leaves. Comparative morphology is good for documenting how roots evolved, but are there any underlying molecular developmental similarities among the rooting structures of early plants?

An elegant piece of recent research shows that a similar transcription factor encoded by the gene *ROOT HAIR DEFECTIVE 6* regulates root-hair development in the flowering plant *Arabidopsis thaliana* and rhizoid development in the moss *Physcomitrella patens* (B. Menand *et al. Science* **316,** 1477–1480; 2007). Because flowering plants and mosses diverged more than 400 million years ago, this surprising result implies that the cells with a key role in nutrient acquisition and anchorage in most land plants share a molecular developmental pathway that is very ancient indeed.

More surprising still is the notion that these genes are expressed in both haploid and diploid plants — that is, those whose cells have one or two sets of chromosomes, respectively. Many plants cycle between haploid and diploid forms during their lifecycles. Menand *et al.* propose that genes expressed in early haploid plants were turned on in many tissues during the evolution of plants with diploid phases. Pending further testing, this interesting model is plausible for components of the vascular system, cortex, epidermis, shoot and root.

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