

accumulate in cirrhotic livers and form the structural basis for fibrosis. The researchers then gave a liver-damaging compound to mutant mice that lacked a protein required for senescence. These animals suffered more liver fibrosis than normal mice.

Other experiments revealed that senescent cells seem to attract the attention of immune cells called natural killer cells. These target the senescent cells for destruction, aiding in a partial recovery from liver fibrosis.

GEOSCIENCES

Goodbye April showers

Geophys. Res. Lett. doi:10.1029/2008GL034828 (2008)

Climate models predict that as Earth warms, the Northern Annular Mode (NAM), a flip-flopping pattern of climate variability in the Northern Hemisphere, will flop more firmly to its low-pressure-near-the-pole state.

By studying climate records, Stephanie McAfee and Joellen Russell of the University of Arizona in Tucson have shown what this means for spring weather in the southwestern United States — spring weather being particularly sensitive to the NAM's behaviour. An intensified NAM leads to warm weather coming earlier, shortening the winter rainy season and leading to drier weather that year. Their findings agree with work on changes in the path of the jet stream, and thus in the tracks that storms follow. Broadly speaking, more storms tracking further to the north mean less rain in the south.

NEUROSCIENCE

Coke heads

Neuron 59, 621–633 (2008)

Repeated exposure to cocaine increases the density of connections among the nerve cells in a brain region that is central to motivation and reward. The change seems to stymie long-lasting behaviours associated with chronic drug use rather than promote them, as scientists had previously thought.

Working with mice, Christopher Cowan at the University of Texas Southwestern Medical Center in Dallas and his colleagues have found that cocaine suppresses the protein MEF2, encouraging medium-sized spiny neurons in the nucleus accumbens to form more links. Artificially upping the levels of MEF2 blocked this process, as expected, but surprisingly caused mice to behave as though their sensitivity to cocaine had increased.

The researchers propose that MEF2 suppression and the consequent increase in neuronal connections attenuate the harmful effects of long-term cocaine use.

ARCHAEOLOGY

Amazonian urbanites

Science 321, 1214–1217 (2008)

The Amazon is not a pristine wilderness. In fact, there is increasing evidence for sophisticated town planning there long before Europeans arrived.

Michael Heckenberger at the University of Florida in Gainesville and his band of archaeologists (pictured below) have uncovered a network of settlements around the Xingu River in Brazil. These hamlets were connected by criss-crossing roads that emanated from a central village that was probably more ceremonial than residential.

The dispersed pattern of settlements is unusual. The authors suggest that this arrangement, coupled with the power of Amazonian foliage to overrun abandoned sites, has perhaps blinded researchers to the extent of human impact on the rainforests.



ASTROPHYSICS

Far off fly-by

Astrophys. J. 683, 722–749 (2008)

M31, the spiral galaxy nearest the Milky Way, and NGC 205, a nearby dwarf elliptical galaxy, appear to be stuck in an eternal *pas de deux*. At least, that is what it looks like through a telescope. But Kirsten Howley of the University of California at Santa Cruz and her colleagues have used what is known as a genetic algorithm to determine that NGC 205 is actually swinging around M31.

The algorithm sifted through more than a billion trillion possible orbits for NGC 205, identifying which of them best fitted the galaxy's observed motions and light characteristics.

Howley's team found that NGC 205 was zipping past M31 at hundreds of kilometres per second, close to its escape velocity. NGC 205's motion is perpendicular to, and therefore independent of, a streamer of stars previously thought to be associated with it.

SCIENCE/AAAS

JOURNAL CLUB

Caroline Harwood

University of Washington, Seattle

A microbiologist hopes to disrupt bacterial 'decisions'.

Cyclic-di-GMP is small but important. It is an intracellular signalling molecule that controls lifestyle choices in bacteria. When should a bacterium become virulent? When should it differentiate into a new cell type? When might it do better to stop moving around and stay still with many others? Bacteria that gather together tend to encase themselves and their neighbours in a carbohydrate slime, forming what is known as a biofilm. I, like many microbiologists, am keen to find ways to disrupt biofilms, and a better understanding of how cyclic-di-GMP works may provide a way to do this.

Recently, answers have started to emerge. First it was shown that cyclic-di-GMP can bind to certain proteins that modulate the activity of flagellar motors — which propel free-swimming bacteria — and to enzymes that make the biofilm-cementing slime. Then researchers found a protein that 'turns on' some of the slime genes when it attaches to cyclic-di-GMP. But one paper shows a completely new way in which cyclic-di-GMP can control bacterial lifestyle choices: by binding to a regulatory region, called a riboswitch, on a messenger RNA molecule (N. Sudarsan *et al.* *Science* 321, 411–413; 2008).

Ronald Breaker and his team at Yale University in New Haven, Connecticut, report how they used various molecular-biology techniques to demonstrate that part of the RNA hitches itself to cyclic-di-GMP. They also proved that cyclic-di-GMP-binding riboswitches from several bacterial strains can function as genetic 'off' as well as 'on' switches.

These findings are noteworthy because humans do not make cyclic-di-GMP, so the molecule could be a target for new antibiotics. Medicines that attack cyclic-di-GMP should be able to treat biofilm-related disorders such as periodontal disease and ear infections, which are often resistant to existing drugs.

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