The team made RNA switches sensitive to a particular signal or 'smell' — here a chemical very similar to caffeine. If there is none of this chemical about, the switch will prevent production of a protein needed for 'swimming'. But the presence of the signal flips the switch and activates the production of the protein, enabling the cells to, in effect, swim up a gradient of increasing signal concentration — although many immobilized *E. coli* that went in the wrong direction will litter the route to the source.

GEOLOGY

Seasonal shaking

Geophys. Res. Lett. **34,** L08304 (2007)

There are more earthquakes in the Himalaya in the winter than in the summer, according to a new study of Nepalese seismic records from 1995 to 2000.

The fact that there are 37% more earthquakes in winter in Nepal, say Laurent Bollinger of the French Atomic Energy Commission and colleagues, can be attributed, indirectly, to the weather. The researchers theorize that summer monsoons weigh down northern India with rainfall and fill underground aquifers. This changes the stress patterns in the surrounding rock and in the fault systems that stretch up into the Himalaya, suppressing summer seismicity.

ECOLOGY

Stream of tears

Glob. Clim. Change Biol. **13,** 942–957 (2007)

Although many studies show the grim ecological effects of climate change, some ecosystems are somewhat neglected, including streams. Isabelle Durance and Steve Ormerod of Cardiff University, UK, have shown, through a 25-year project on Welsh stream macroinvertebrates such as mayflies and stoneflies, just how big the effects might be. After the team factored out other cyclical climate phenomena, they concluded that winter temperatures in the streams rose by 1.4–1.7 °C during the study period, with clear ecological consequences.

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Their results suggest that in the most species-rich streams the abundance of invertebrates in the spring-time could decline by one-fifth for every degree of temperature gain. An increase of 3 °C could see up to ten species extinct locally — as much as 25% of the typical richness, the scientists say.

MOLECULAR BIOLOGY

All about growing yeast

J. Biol. **6,** 4 (2007)

Researchers have catalogued the changes in gene expression, protein abundance and metabolite composition that accompany cell growth in the yeast *Saccharomyces cerevisiae*.

Previous attempts to characterize cell growth did not separate the effects of growth from responses to nutrient depletion as the growing cells exhausted nutrients from the medium. Now, Stephen Oliver of the University of Manchester, UK, and his colleagues have grown yeast cultures under four different nutrient limitations and at three different growth rates. They then measured changes in the abundance of thousands of cellular compounds, looking for trends dependent on growth rate and independent of nutrient deficiency.

Their results provide a catalogue of parameters that could be used in mathematical models and to make genetic engineering of metabolic pathways easier.

CHEMISTRY

Snap, crackle and glow

J. Am. Chem. Soc. doi:10.1021/ja0716498 (2007)

Bubbles created by ultrasound can collapse violently and agitate crystals of certain chemicals to the point of bursting. These crystals then give off light. And the gases released in the process can react with each other, say researchers at the University of Illinois in Urbana-Champaign.

Kenneth Suslick and Nathan Eddingsaas closely watched this mechanoluminescence in a slurry of the organic molecule resorcinol in the solvent dodecane. The emitted energy responsible for the luminescence was 1,000 times as intense as that produced if the same crystals had been cracked by mere milling or grinding. Suslick attributes this to the increased speed of molecular collisions under ultrasound conditions, and the subsequent increase in emitted energy from both inert and radioactive gases caught in the discharge. It is those gases, specifically oxygen and small hydrocarbons, that went on to react.

JOURNAL CLUB

Eric Wolff
British Antarctic Survey, Cambridge, UK

An ice-core scientist wonders what makes the Earth run hot and cold.

In the past 800,000 years, Earth has seen long, cold phases punctuated every 100,000 years by short, warm interglacials. If I claim to understand climate, then I should know why these cycles occur and why we are in a warm phase today.

The most obvious external controls on our climate are small changes in Earth's orbit. These affect the variation of incoming sunlight (insolation) with season and latitude. 'Milankovitch theory' says that this in turn controls the occurrence of glaciations.

There is one obvious problem: although 100,000 years is the period of eccentricity of Earth's orbit, insolation shows much stronger effects at shorter periods, such as 41,000 and 23,000 years.

A recent paper (E. Tziperman *et al. Paleoceanography* **21,** PA4206 doi:10.1029/2005PA001241; 2006) suggests a way around this. It uses a model in which climate varies with an average period controlled by internal features — such as the time needed for ice-sheet growth — on a 100,000-year timescale.

However, the exact timing of climate changes is paced by orbital cycles at shorter periods. The result is that a wide range of plausible internal controls on climate can give similar predictions of how climate has evolved with time, all of them with a 'Milankovitch imprint'.

This frees us from the apparent misconception that we need an external forcing with a period of 100,000 years, but it does not identify the internal mechanisms responsible.

I used to think this was a problem for others to solve, but as part of the team that extended the ice-core record back 800,000 years, I have the tantalizing hope that the clues we need might be locked in our cold room.