Physics in Amsterdam, the Netherlands, find, with infrared spectroscopy, that water molecules around hydrophobic methyl groups on organic molecules rotate at least five times more slowly than they do in bulk water. Although not quite the ice cage originally proposed, this slowing down may help to explain the hydrophobic interaction.

NEUROSCIENCE

Hard to forget

Cell **131,** 160–173 (2007)

Researchers have unpicked the mechanism by which memories tied to strong emotions are recalled with greater clarity. The effect has been linked to release of the neurotransmitter noradrenaline during emotional situations. Now, Roberto Malinow of Cold Spring Harbor Laboratory in New York and his colleagues have determined that noradrenaline acts by regulating a class of receptor, known as GluR1-containing AMPA receptors, that is involved in learning.

In mice, both the fear caused by exposure to fox urine and the experimental injection of adrenaline, which boosts noradrenaline, triggered the addition of phosphates to two sites in GluR1. This phosphorylation meant that GluR1 could be more easily incorporated into synapses, which improved the animals' learning in behavioural tests carried out immediately after adrenaline injection. Noradrenaline had no effect on learning in mice that contained a mutant GluR1 that lacked the phosphorylation sites.

ANIMAL BEHAVIOUR

An ear to the ground

Biol. Lett. doi:10.1098/rsbl.2007.0443 (2007)

The marine iguanas of the Galapagos eavesdrop on the warning cries of

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mockingbirds, report Maren Vitousek of Princeton University in New Jersey and her team. It's the first time that a non-vocal species has been spotted taking advantage of another animal's vocal communication.

Vitousek's team played recordings of different mockingbird calls to marine iguanas (*Amblyrhynchus cristatus*) on Santa Fe island, where both species are vulnerable to hawk attacks. In response to 'alarm' calls, about 45% of iguanas raised their heads or began to move away. Only 28% on average responded to playbacks of non-alarm birdsong. The tactic may give the iguanas — whose need to sunbathe can conflict with their need to keep watch — an early warning of the predators' presence. The picture (above) shows an iguana that didn't get away.

CHEMICAL BIOLOGY

Bittersweet reaction

Angew. Chem. Int. Edn **46,** 7697–7699 (2007)

As those who take artificial sweeteners will know, saccharin isn't all sweetness — it leaves a bitter metallic aftertaste. Although this seems to be harmless, no one knows what causes it. Now Gerhard Klebe of the Philipps University of Marburg in Germany and his co-workers think they have a clue.

They have found that saccharin is a surprisingly potent inhibitor of certain carbonic anhydrases — enzymes that have various roles in metabolism, acidity regulation and other aspects of biochemistry. Nanomolar concentrations of saccharin deactivate several variants of the enzyme, including one present in saliva that is involved in olfaction and taste. Compounds used to inhibit these enzymes for clinical purposes also have bitter, metallic aftertastes, so this might be a general side effect of such inhibitory action.

SYSTEMS BIOLOGY

Circadian *ménage à trois*

Science doi:10.1126/science.1148596 (2007)

Most organisms keep time with a circadian clock driven by changes in the expression of particular genes, but cyanobacteria do it differently. Erin O'Shea at Harvard University in Cambridge, Massachusetts, and her colleagues have devised a model that could explain how they tick.

The clock of the cyanobacterium *Synechococcus elongatus* centres on a protein, KaiC, that has different phosphorylation states. Over a roughly 24-hour period, a protein called KaiA functions with KaiC to add phosphates to two sites on KaiC, until another protein, KaiB, joins the complex and blocks KaiA's action. The phosphates then fall off.

Shea's team noticed an order to how the phosphates add and drop off that determines when KaiB can bind KaiC. This detail allowed them to explain how collections of these proteins maintain a cycle, even in a test-tube, instead of sitting in equilibrium.

JOURNAL CLUB

Francis Albarede
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A geochemist goes *à la recherche des climats perdus*.

As a young postdoc at the California Institute of Technology (Caltech) in Pasadena I remember glancing through the 1952 logbook of a gas mass spectrometer while the machine readied my samples. In the book, Sam Epstein, one of the founders of modern geochemistry, had scribbled numbers representing the first attempt to determine past temperatures from oxygen-isotope abundances in fossils.

Since Epstein's measurements, the abundance of oxygen-18 in the carbonate skeletons of fossil sea creatures has become a broadly used indicator of past ocean temperatures. Such data are key to understanding modern climate change. But the usefulness of ^{18}O in 'palaeothermometry' is limited by problems including variations in oxygen-isotope levels in sea water and in the way different organisms take up the isotopes.

Recently, a group at Caltech proposed a measurement that may work better. As before, the carbonates are broken down into carbon dioxide for analysis. Instead of looking only for molecules containing ^{18}O, the Caltech team measures the abundance of molecules that contain both ^{18}O and the uncommon carbon isotope, carbon-13. The excess of this species over what would be expected through random combination of carbon and oxygen atoms indicates the temperature at which the carbonate formed.

Early tests of this 'clumped' thermometer on corals and fish ear bones were promising (P. Ghosh *et al. Geochim. Cosmochim. Acta* **70,** 1439–1456; 2006; and **71,** 2736–2744; 2007). Since then, the method has provided a new record of ocean temperature during the Palaeozoic era, which began 543 million years ago (R. E. Came *et al. Nature* **449,** 198–201; 2007).

I believe that clumped isotope thermometry is going to be a valuable new tool for palaeoenvironmental studies.

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