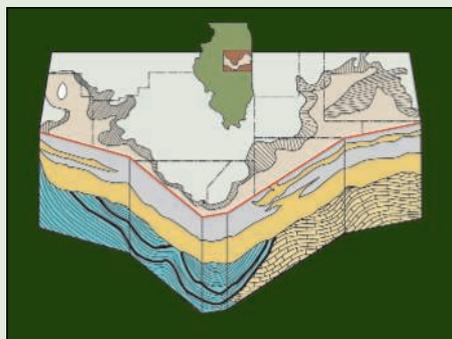


edited by Gilbert Chin



The Mahomet aquifer.

GEOCHEMISTRY

Reducing Arsenic

Dangerously high concentrations of arsenic can be found in groundwater drawn from unconsolidated sediments around the world. Previous studies have shown that bacteria, particularly those that reduce arsenate, can release arsenic from sediments and, in essence, add it to the groundwater.

Kirk *et al.* have studied the Mahomet glacial aquifer in central Illinois and found that high arsenic concentrations correlate with low sulfate concentrations. The authors suggest that in regions

where sulfate-reducing bacteria are active, they produce sulfides that precipitate arsenic and remove it from the water. In contrast, where methanogenic bacteria are active, little sulfide is produced and arsenic is not precipitated. If arsenic concentrations are indeed affected by bacteria in this fashion, then a low sulfate concentration, which is much easier to measure, can be used as a sign of potentially unsafe water. Furthermore, adding sulfate to arsenic-rich aquifers may stimulate sulfate-reducing bacteria and thus reduce arsenic concentrations. — LR

Geology 32, 953 (2004).

CHEMISTRY

Give and Take

Alkene binding to low-valent transition metals is common. The strong interaction involves electron donation from olefin to metal, as well as back-bonding from metal d-orbitals to the olefin. For s-block metals such as the alkaline earths, however, there are no d electrons to give back, and examples of alkene coordination have been elusive. Beyond fundamental interest, such compounds would model intermediates involved in metal-catalyzed alkene polymerization.

By tethering a butenyl chain to a cyclopentadienyl (Cp) ligand, Schumann *et al.* have succeeded in preparing compounds of the three heavy alkaline earth metals (Ca, Sr, and Ba) that show evidence of alkene interaction. The metal is sandwiched between two Cp rings, and x-ray diffraction reveals close contact in the solid state between the metal center and the C=C bonds dangling from each ring, whereas in the Mg compound, the butenyl chains face away from the metal and do not interact with it. — JSY

Angew. Chem. Int. Ed. 43, 6208 (2004).

PSYCHOLOGY

Crunch Time

All of us have had to perform under pressure, either during an athletic contest or an academic examination, and sometimes we miss the penalty kick or choose the antonym instead of the synonym. A great deal of research, some of it under the contemporary guise of sports psychology, has indicated that pressure elicits suboptimal performance of oft-rehearsed sensorimotor tasks by disrupting automated

CLIMATE SCIENCE

Uniformly Productive

Moist tropical forests of the Amazon basin experience a seasonal variation of rain, in which the radiation available for photosynthesis is much more abundant during the dry season. In spite of this fluctuation, these forests maintain high rates of primary production throughout the 5-to-6 month dry season. Two non-exclusive explanations have been proposed: the first is that many plants in the tropical forest have deep roots, which would allow them access to water during the dry season; the second is that they have developed patterns of leaf phenology (the cycle of leaf fall and emergence) that facilitate an even growth rate.

Xiao *et al.* have combined analyses of satellite images and field data from a CO₂ flux tower site in a Brazilian forest in order to develop and validate a new satellite-based vegetation photosynthesis model for estimating the dynamics of production in seasonally moist tropical evergreen forest. They find

that this forest displays subtle changes in the seasonal dynamics of leaf phenology and that the forest experienced no water stress in the dry seasons of 1998–2002. They use these data as input to a model that successfully predicts high productivity in the late dry season, consistent with observation. — HJS

Remote Sensing Environ. 94, 105 (2005).

ECOLOGY/EVOLUTION

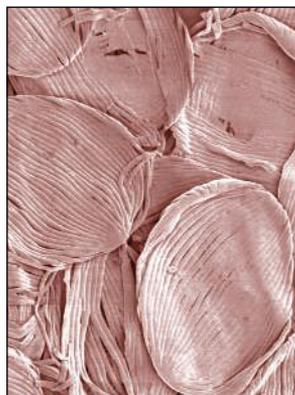
Balls of String

The two great lineages of flowering plants—the monocots and dicots—diverged early in flowering plant evolutionary history more than 100 million years ago (Ma). Fossils from the Early Cretaceous have provided evidence of the range of form in early dicots, but the relationships and appearance of the early monocots have remained more mysterious.

Friis *et al.* have unearthed a new fossil monocot from deposits in Portugal, dating to approximately 120 Ma. The fossil, named *Mayoa*, mostly consists of pollen and associated structural fragments and is clearly allied to the family

Araceae, whose modern representatives include arum lilies and cheeseplants. *Mayoa* pollen shows highly distinctive narrow ribs separated by grooves, giving the pollen grains the appearance of neat balls of string—a morphology that is most similar to that of the modern aroid genus *Holochlamys*, which occurs in tropical Southeast Asia. *Mayoa* provides the best fossil evidence to date of a recognizable monocot family soon after the dawn of the angiosperms. — AMS

Proc. Natl. Acad. Sci. U.S.A. 101, 16565 (2004).



Scanning electron micrograph of *Mayoa* pollen.

execution; in other words, pressure engages explicit monitoring and results in our having to learn how to perform the task all over again.

Beilock *et al.* have shifted the spotlight from the pitch into the classroom and assessed the performance of college students on easy and hard modular arithmetic problems in the absence or presence of social and monetary inducements to select the right answer quickly. The hard problems demanded lots of working memory, and the results suggest that the effect of pressure is to distract some portion of working memory, leaving less available to support problem-solving. In another analysis, Beilock and Carr find that when comparing a group of individuals with high working memory capacity to one with less, the performance (on difficult problems) of the former group under pressure declines to the



France v. England, Euro 2004.

point where their advantage over the other group (measured on easy problems) actually disappears. The implication, as they note, is that the high-achieving students (see Garman, Book Reviews,

p. 1685) may be more likely to stumble under pressure. — GJC

J. Exp. Psych: Gen. 133, in press (2004); *Psychol. Sci.* 16, in press (2005).

BIOMEDICINE

Profiling Bystanders

Remarkable progress has been made in identifying the molecular features of tumor cells that mediate their survival and uncontrolled growth. Tumor cells do not grow in isolation, however, and recently there has been heightened interest in exploring the extent to which their behavior is influenced by nonmalignant cells in the tumor microenvironment.

A new study shows that, at least for one tumor type, the cells in the tumor microenvironment may determine the clinical course of the disease. Dave *et al.* carried out gene expression profiling analyses on tumor biopsy samples obtained at diagnosis from patients with follicular lymphoma, a cancer for which survival ranges from less than 12 months to more than 20 years. Surprisingly, the genes that served as the best predictors of patient survival were not expressed by the tumor cells themselves but rather by the nonmalignant immune cells infiltrating the tumors (T cells, macrophages, and follicular dendritic cells). These results not only underscore the critical interplay between tumor cells and their environment, but they provide an important starting point for identifying the immune cell-derived signals that influence the growth of follicular lymphoma cells—information that could lead to new therapies. — PAK

N. Engl. J. Med. 351, 2159 (2004).

HIGHLIGHTED IN SCIENCE'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT



More Than a Scaffold

Yotiao is an anchoring protein that, in the heart, mediates the formation of a complex consisting of the I_{Ks} channel (a subunit KCNQ1 and regulatory subunit KCNE1), protein kinase A (PKA), and protein phosphatase 1 (PP1). Mutations that disrupt this complex interfere with the cardiac response to stress and can cause death. The effect of PKA on the channel can be mimicked by a mutation (S97D) in the KCNQ1 subunit. Using cells transfected with this mutant channel, Kurokawa *et al.* demonstrated that interaction with Yotiao increased channel current by slowing channel deactivation in the absence of cAMP. This effect was not blocked by inhibitors of PKA or protein kinase C, indicating that Yotiao was not promoting phosphorylation. Conversely, Yotiao did not alter wild-type channel kinetics in the absence of cAMP, which suggests that Yotiao not only promotes PKA phosphorylation of the channel but may also exert subsequent phosphorylation-dependent effects on channel deactivation kinetics. — NG

Proc. Natl. Acad. Sci. U.S.A. 101, 16374 (2004).

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