

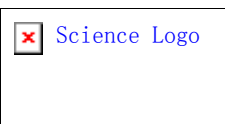
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Editors' Choice

Volume 323, Number 5919, Issue of 06 March 2009

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PHYSIOLOGY: Mad Dogs and Englishmen

It is well established that organisms respond to climate change by adapting, by shifting their geographic distribution, or--in the unluckier cases--by becoming extinct. Most models of responses to climate change focus on changes in distribution, usually based on "climatic envelope" concepts: that is, the range of climatic conditions that a species can endure. For cold-blooded animals such as reptiles and insects, a missing element from such models has been the ability of these organisms to regulate their body temperature by behavioral means, such as not going out in the midday sun, which has the potential to buffer their geographic response to changing climate. By including such thermoregulatory behavior in biophysical models of temperature responses of Australian ectotherms, Kearney *et al.* show that the challenge for many such species in a warming world will be to stay cool. If moving with the climate is not an option, which it will not be for many tropical organisms, survival will depend on factors such as the availability of shade and the ability of ectotherm species to alter their seasonal or daily patterns of activity. -- **AMS**

Proc. Natl. Acad. Sci. U.S.A. **106**, 10.1073/pnas.0808913106 (2009).

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PALEONTOLOGY: Slipping Through the Cracks

The fossil record shows that, at least in the marine realm, unusually small taxa predominate in the aftermath of mass extinctions. In extreme cases such as after the end-Cretaceous extinction, 65 million years ago, it took several millions of

years for diversity to recover. This pattern poses a potential bias in assessing the impact of the extinction, as small species tend to be more difficult to preserve in the fossil record. Sessa *et al.* evaluate this bias by comparing fossils in lithified and unlithified sediments across the Cretaceous-Paleocene boundary from thick sections in the Gulf of Mexico. Their data show that small fossils are indeed lost (perhaps by dissolution) from the fossil record as sediments are compacted and form rocks--by a factor of up to 2.4. This process, however is not systematic in time, and lithified sediments tend to predominate in the Paleocene after the mass extinction. Thus, the pattern of a delayed recovery may be partly exaggerated by the sediment record, as might enhanced diversity before the extinction. This bias decreases further back in time, as unlithified sediments become scarce, but illustrates the inherent selection of the fossil record. -- **BH**

Geology **37**, 115 (2009).

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CHEMISTRY: Zeolites Left and Right

Formally, a chiral substance is one that changes its appearance upon rotation about any axis, followed by reflection in a perpendicular plane. This property can arise from arrangements as simple as four elementally distinct atoms bonding to a central carbon, or as complex as hundreds of atoms mutually adopting slight positional shifts in an extended crystal lattice. From a practical standpoint, however, most chirally selective processes in chemical syntheses and separations rely on the influence of purified small molecules, whether free in solution or tethered to an achiral solid support. Dryzun *et al.* have now analyzed the parameters of previously characterized solid zeolite structures and uncovered 20 bulk crystal lattices that manifest extended chirality. Moreover, calorimetry revealed that several such zeolites distinguish between the enantiomers (mirror-image isomers) of the amino acid histidine. Given the widespread role of zeolites in catalysis, the authors envision potential for enantioselective extensions of their current applications. -- **JSY**

J. Mater. Chem. **19**, 10.1039/b817497k (2009).

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NEUROSCIENCE: Putting mRNA in Its Place

Many cell types, including epithelial cells and neurons, have structurally and functionally separate cytoplasmic compartments, which enable them to perform distinct functions. This cellular polarization can be established by blocking the immediate translation of some mRNAs, allocating them instead to specific locations in the cell. Translation can then be initiated as needed, thus ensuring that the proteins are synthesized only in the selected location at the required time. In neurons, mRNAs coding for synaptic proteins are transported to



dendrites, where they are translated into proteins upon synaptic stimulation. Di Penta *et al.* have found that the factor LSm1, which has previously been shown to participate in the degradation of mRNAs, is involved. They identified a protein-mRNA complex containing LSm1 and the nuclear cap-binding protein CBP80, which recognizes the modified nucleotide that caps the 5' end of the mRNA. The authors propose that this complex assembles in the nucleus, which would indicate that the mechanisms that regulate localized protein synthesis come into play soon after transcription, and in neurons this protein-mRNA complex was targeted to dendritic spines. These alternative functions for an mRNA degradation factor and a nuclear cap-binding protein in mRNA transport reveal molecular links between apparently diverse cellular processes. -- **HP***

J. Cell Biol. **184**, 423 (2009).

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ATMOSPHERIC SCIENCE: Ozone in the Gulf

Ozone is a secondary pollutant formed in the interactions of reactive carbon compounds, nitrogen oxides, and ultraviolet sunlight, with large potential impacts on the health of both animals and plants. Tropospheric ozone is a naturally occurring atmospheric species, but the highest concentrations are found in sunny areas with abundant air pollution, such as the Los Angeles basin in California. Lelieveld *et al.* analyze another area in which ozone pollution is severe--the Persian Gulf region. The locale possesses all of the ingredients for ozone production in abundance: intense air pollution (arriving from long distances as well as originating from strong local anthropogenic emissions), unusually vigorous stratospheric-tropospheric exchange, sparse deep convective mixing and precipitation, and copious sunlight. Using an atmospheric chemistry model, air-quality measurements, and support from satellite data, the authors predict and observe intense ozone pollution during the period from 1996 to 2006. Reducing the levels of ozone pollution in this region will depend largely on both decreasing the amounts of long-range pollution advected to the region and reducing local sources of nitrogen oxides. -- **HJS**

Atmos. Chem. Phys. **9**, 1393 (2009).

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PSYCHOLOGY: Seeking a Second Opinion

A marketplace--whether for ideas or goods and services--provides a remarkably efficient means of information exchange, and prediction markets yield astonishingly accurate forecasts of election outcomes, Oscar winners, and so



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forth. But how might a single individual, lacking access to the wisdom of the crowds, attempt to improve his or her best guess? Herzog and Hertwig offer one prescription based on the Hegelian dialectic: After making the first estimate, consider the reasons and assumptions underpinning that estimate (and how they might be off target), and then formulate a new, second estimate. They tested the efficacy of this method by asking university students to date a collection of 40 historical events covering the past four centuries and tabulating the average of repeated guesses from the same individual, which is analogous to standard reliability sampling, to the average (synthesis) of the dialectical guesses (thesis and antithesis). They found that the improvement in accuracy (in years) over the first estimate was twice as large for the dialectical average than for the repeat average, although averaging the first estimates from two random individuals worked better still. -- **GJC**

Psychol. Sci. **20**, 231 (2009).

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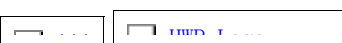
NEUROSCIENCE: Getting to the Right Place

The six-subunit protein complex known as Elongator is known for its role in the acetylation of histone H3 and its association with actively transcribed regions of the genome. However, how this function fits with observations linking genetic disruption of the scaffold subunit Elp1 in humans to a defective development of autonomic and sensory neurons has been puzzling. Creppe *et al.* show that Elongator--particularly the acetyltransferase subunit Elp3--participates in the development of neuronal cells. In the brain, the proliferation of precursor cells generates neuronal cells, but these neurons find their place and adopt their shape only after they have finished their last cell division. For the accurate development and integration of cortical projection neurons, the newly born cells must migrate to the cortex and then form extensive networks of connections with other neurons. The authors suggest that the Elongator complex supports neuronal migration and branching by acetylating tubulin, a component of the cytoskeletal network. -- **PJH**

Cell **136**, 551 (2009).

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