Science
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EDITORS' CHOICE

EDITED BY GILBERT CHIN AND JAKE YESTON

EVOLUTION

No *b* to Rule Them All

The dependence of basal metabolic rate (BMR) on body mass (*M*) in mammals is generally expressed as BMR = aM^b, but the value of the exponent *b* has long been disputed. Some researchers argue for geometric scaling ($b = 0.67$), as predicted by surface area–to–volume ratios. Others claim quarter-power scaling ($b = 0.75$), which has been supported by theoretical analyses of nutrient supply networks. However, most empirical "mouse-to-elephant" studies have not accounted for the shared evolutionary history of the sampled species. To do so, White *et al.* use two methods: phylogenetic generalized least squares and independent contrasts. They consider high-quality BMR data from 585 species (which include only measurements on inactive, fasted, nonreproductive adults in a thermoneutral environment) and a subset of 537 species that excludes lineages for which BMR may not be measurable. Their phylogenetically informed estimates of *b* fall between 0.67 and 0.75, and all of their statistically valid analyses reject both values. In addition, they find that *b* differs among lineages. Their results reinforce doubts as to the existence of a universal allometric relationship between mammalian BMR and body mass. — SJS

Evolution **63**, 2658 (2009).

CHEMISTRY

Poison Probe

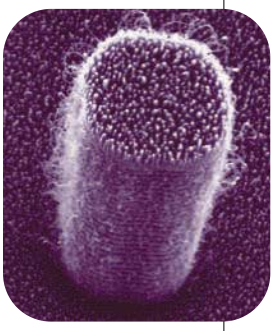
The toxic compound methylmercury often bioaccumulates in fish tissues, where it can exceed recommended maximum levels for human consumption. There is thus a need for simple screening procedures to rapidly detect methylmercury in samples of fish intended for human consumption. Climent *et al.* now report such a method, in which the presence of methylmercury triggers the opening of pores in a mesoporous inorganic material by liberating a tethered capping group. Upon opening, the pores release multiple dye molecules previously trapped inside, thereby amplifying the detection signal. The authors tested their method on fish samples with known methylmercury content, straightforwardly processed by acid digestion and subsequent toluene extraction. The results showed that the method yields accurate results and is selective for methylmercury even in the presence of Hg^{2+} and numerous other metal ions. — JFU

Angew. Chem. Int. Ed. **48**, 8519 (2009).

MATERIALS SCIENCE

Up, Up and Away

When hot vapor comes in contact with a cold surface, such as a shower wall, liquid droplets are created that quickly coalesce and form a film. This condensation process is ubiquitous in natural as well as artificial environments. In industrial settings, preventing film formation is generally desirable because liquid films are poor heat conductors. However, it can be challenging to remove the droplets more quickly than they coalesce, particularly when nonvertical sample orientations preclude help from gravity. Boreyko and Chen demonstrate the spontaneous elimination of droplets from a horizontal surface. They prepare a superhydrophobic substrate consisting of carbon nanotubes deposited on silicon micropillars (shown at right). Video imaging of the condensation of ambient moisture reveals that, after the droplets are formed, they initially coalesce without moving, then eventually reach a mobile phase where several droplets fuse and leave the surface of the sample in a dramatic out-of-plane jump. The energy for the jump is provided by the decrease in surface energy gained by coalescence; the average condensed droplet size is an order of magnitude smaller than that observed in gravitational removal. Interestingly, a similar mechanism is thought to be used by a type of mushroom to eject a spore from its sterigma. — JS



Phys. Rev. Lett. **103**, 184501 (2009).

CELL BIOLOGY

As It Happens

RNA polymerase moves information from the genome (DNA) into pre-messenger RNA (pre-mRNA), from which introns are removed and exons are ligated to make a mature mRNA. To follow the progress of transcription on single genes from start to finish, Wada *et al.* chose five long human genes whose expression could be switched on by the cytokine tumor necrosis factor–α. Putting together snapshots taken at 7.5-min intervals for 3 hours, they documented the waves of RNA synthesized by polymerase, with each molecule of enzyme jumping on at the transcription start site and hopping off over 100 kb away. During each round, upstream introns were excised as the polymerase moved downstream, often before the next intron was reached. Furthermore, it appeared that later rounds of transcription were begun and continued for a few kilobases before being aborted, as if the polymerases were colliding with a checkpoint that kept track of downstream occupancy of the gene. Each wave of transcription traveled at ~3 kb m^{-1}, although the accumulation of polymerase at regions bound by the insulator proteins CTCF and cohesion, both of which are involved in chromosome looping, suggested that polymerase may be held up at specific sites. — HP

Proc. Natl. Acad. Sci. U.S.A. **106**, 18357 (2009).

CREDITS (TOP TO BOTTOM): ISTOCK PHOTO; BOREYKO AND CHEN

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