STRESS SIGNALING
Seeing stress signaling in living mice
Stress activates the eIF2α-ATF4 pathway to reduce global protein production while enhancing targeted gene expression, which helps cells adapt and survive. Activation of this pathway is associated with various pathologies, such as tissue fibrosis after injury. Chaveroux et al. developed transgenic mice in which the activation of this pathway could be monitored at the whole-animal level and at the tissue and cellular level. Activation was tissue-specific, depending on the initiating stress. Chemically induced liver fibrosis correlated with activation of the eIF2α-ATF4 pathway by a specific kinase. — NRG

BIOMECHANICS
A beetle’s internal bomb
Bombardier beetles shoot a toxic pulse at potential predators and other harassers. The toxic spray is created by a chemical reaction that occurs inside the beetle’s body. Although the details of the reaction are known, how the beetle is able to precisely combine the chemicals at appropriate times and release the pulse at regular intervals has remained a mystery. Arndt et al. used synchrotron x-ray imagery to observe the process as it occurs within live beetles. Expansion and contraction of an internal expansion membrane facilitate the precise cyclic injection of reactants and the subsequent ejection of toxic sprays that keep the beetle’s predators at bay. — SNV
Science, this issue p. 564

IN OTHER JOURNALS
Edited by Sacha Vignieri and Jesse Smith
Groups of hair cells influence each other’s growth through quorum sensing

CELL BEHAVIOR
Sense-ible hair
Could restoring hair growth depend on group behavior? Chen et al. report that damaged and healthy hair follicles grow cooperatively. The authors found that plucking 200 hairs in a specific pattern and density on the back of a mouse elicited not only the regrowth of the injured follicles but also the growth of up to five times that number of nearby uninjured follicles. Injured follicles release CCL2, a factor that recruits macrophages to the damaged area, and these secrete tumor necrosis factor-α, which stimulates stem cells in both plucked and unplucked follicles. The process reflects quorum sensing, where a population of cells communicates and coordinates behavior of the group through a signaling mechanism. — LC

NONCODING RNAs
Signaling stress
Small nucleolar RNAs (snoRNAs)—small noncoding RNAs better known for their roles as sequence guides for modification of other RNAs—may function to promote elimination of damaged cells undergoing metabolic stress. Youssef et al. explored RNA binding partners of the protein kinase PKR (protein kinase RNA–activated) and found them to be enriched in snoRNAs. Such binding activated PKR and was increased in cells treated with palmitic acid to mimic the metabolic stress seen in obese animals. Thus, snoRNAs appear to link metabolic stress to the activation of PKR, which in turn inhibits protein synthesis and promotes the death of stressed cells. — LBR

T CELLS
T cells require mRNA modifications
T cells are important components of our immune system that recognize and respond to immune threats. Stimulation of
T cells results in up-regulation of the RNA binding protein CELF2 (CUGBP, Elav-like family member 2). This gene is associated with posttranscriptional modifications of RNAs, including alternative splicing. Mallory et al. show that in response to T cell stimulation, expression of CELF2 is up-regulated and its transcripts are stabilized, ensuring an increase in the availability of this RNA. Furthermore, this up-regulation of CELF2 is associated with specific alternative exon transcripts and isoform expression within stimulated T cells. These results suggest that regulation of specific transcripts is important for mounting an immune response. — LMZ

**MATERIALS SCIENCE**

**Seeing sonic hot spots**

Mechanical impact can detonate explosives, but how impact heats these materials to initiate reactions has been unclear. You et al. used mild ultrasound irradiation to study composite materials—small crystals of sucrose or table salt in rubber—while performing thermal imaging. Uncoated particles remained unheated, but particles that had a coating that could delaminate (a polyethylene glycol layer that liquefies or Teflon) heated very rapidly (up to ~22,000 K per second). Delamination allows the particle to move and friction-heat against the matrix, an effect that authors also saw in samples of polymer-bonded explosive (PBX). — PDS

Nat. Commun. 10.1038/ncomms7581 (2015).

**MINERAL PHYSICS**

**Strength to put a stop to sinking slabs**

Tectonic plates plunging toward Earth’s core can unexpectedly stop sinking in the middle of the mantle. Marquardt and Miyagi provide a potential explanation involving the abundant mantle mineral ferropericlase. Their X-ray diffraction experiments revealed a large increase in the strength of ferropericlase with increased pressure. This translates to a viscosity increase at mid-mantle depths, providing a rheological barrier that subducted ocean lithosphere cannot easily penetrate. This mechanism of slab stagnation may also explain some of the mantle’s well-known chemical heterogeneity. — BG

Nat. Geosci. 10.1038/ngeo2393 (2015).

**ANTIBIOTICS**

**Extent of children’s antibiotic exposure**

Antibiotics are widely used in human and veterinary medicine and in personal care products, so people are increasingly exposed to them in the environment and in food. How high is the resulting antibiotic burden? Wang et al. measured the concentrations of 18 representative antibiotics in the urine of 1064 schoolchildren from three economically and geographically distinct areas in eastern China. They show that 58.3% of samples contained at least one antibiotic and that more than 20% of samples contained more than one. A lack of suitable analytical methods for some commonly used antibiotics means that the total antibiotic burden is likely to be even higher. Based on contamination data for the aquatic environment, exposures of children in the United States and Europe may be similar to those in this study. — JFU

Extent of children’s antibiotic exposure
Julia Fahrenkamp-Uppenbrink

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