MICROBIOLOGY

PHAGE INVADERS

Aquatic viruses play important roles in regulating the abundance of marine cyanobacteria and eukaryotic algae. They do this by lysing marine primary producers but, by releasing organic carbon matter, they also stimulate secondary production. To determine the contribution of viruses in planktonic communities, Yau *et al*. performed a metagenomic survey of the simple microbial loop system of a stratified Antarctic lake and found abundant evidence for Sputnik-like virophages. Virophages infect amoebas but can only replicate in the presence of other double-stranded DNA viruses, which act as "helpers" by supplying essential proteins and exchanging genes. Sputnik virophages damage the ability of the helper virus to replicate successfully itself, and it appears, from modeling of the microbial loop dynamics, that by damping the virulence of the helper viruses to their algal hosts, virophages may be instrumental in maintaining the stability of the microbial food web during the prolonged light-dark cycles in the Antarctic and elsewhere. — CA

Proc. Natl. Acad. Sci. U.S.A. **108**, 6163 (2011).

IMMUNOLOGY

Teaching Self Control

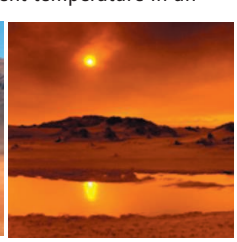
Central to the design of an effective immune system is the ability to avoid disastrous consequences of autoimmune reactions in which healthy cells of a host organism are targeted for destruction rather than damaged cells or invading pathogens. In natural killer (NK) cells of the innate immune system, signaling through an array of activating and inhibitory receptors "educates" cells to respond appropriately to self ligands and ligands that signal cell damage or infection. Guia *et al*. report that in mice, potentially self-reactive NK cells are kept in check through sequestration of signalling molecules within the plasma membrane. Spot variable fluorescence correlation spectroscopy to monitor the movement of receptors revealed that, in NK cells genetically engineered to not be properly educated, inhibitory and activating receptors were confined together in domains where they were associated with an actin network below the membrane. When these cells were educated to allow appropriate activation, inhibitory receptors became diffusely distributed, whereas activating receptors were present in nanodomains or "rafts" characteristic of active receptor signaling. This mechanism, as compared to transcriptional reprogramming, may allow the NK cells greater flexibility to switch between an unresponsive state and a state in which they are competent to respond to stimuli. — LBR

Sci. Signal. **4**, ra21 (2011).

PSYCHOLOGY

Climate Change, Viscerally

Students were put outdoors and asked a series of questions about a number of topics, such as firearms, marijuana, and climate change. How they rated climate change—on a scale from unproven theory to proven fact—correlated with their political stance, with Republicans/conservatives tending toward the unproven end of the scale. Not very surprising, you might say. Yet their answers also correlated with the ambient temperature, with colder days favoring ratings at the unproven end. How did this occur? Risen and Critcher supply a sequence of experiments demonstrating that this effect is not due to participants using ambient temperature in an evidentiary sense: Repeating the study indoors and explicitly calling participants' attention to the over- or underheated interrogation room did not abolish the effect. Nor is this effect due to conceptual accessibility, meaning that implicitly priming the concept of heat failed to reproduce the correlation. What they did find is that participants who experienced warmth viscerally were more apt to form clear mental images of hot environments and that this simulational fluency was linked in turn to a greater belief in climate change as a fact. — GJC



J. Pers. Soc. Psychol. **100**, 10.1037/a0022460 (2011).

CHEMISTRY

Competitive Self-Assembly

Two-dimensional networks can form when polyvalent organic molecules interact with mobile metal atoms on a surface. Shi *et al*., using scanning tunneling microscopy and low-energy electron diffraction, found that 1,3,5-tris(pyridyl)-benzene (TPyB) formed networks with copper and iron with unusually high thermal stability on the (111) surface of gold. Hexagonal copper networks formed through bidentate binding by TPyB molecules were stable up to 600 K, whereas trigonal iron networks formed through tridentate binding were stable up to ~680 K.

Annealing a sample prepared at 293 K, with both networks present, to 400 K resulted in the formation of the thermodynamically more stable iron network and copper islands. However, a copper network formed near room temperature (293 K) was kinetically stable in the presence of added iron atoms up to 449 K, and traces of it remained up to about 500 K. — PDS

J. Am. Chem. Soc. **133**, 10.1021/ja2010434 (2011).

PHYSICS

On Your Marks, Get Set…

The firing of the starting pistol sets the runners out of their blocks and hurtling down the racetrack, and the race is often over in a blink of an eye. In the process of photoionization, photons with the right energy impinging on an atom will release an electron and leave behind a positively charged ion. Unlike the runners all lined up in a row, electrons are packed into atoms in a certain order, filling up different energy levels, generally the lowest first. Klünder *et al*. use an interferometric technique based on a frequency comb to study the dynamics of the photoionization process with electrons emitted from different energy levels in argon gas, specifically the $3s^2$ and $3p^6$ shells. With the capability of taking snapshots of the process at attosecond resolution, they show that there is a time delay between emissions of electrons from the different shells. Moreover, they also show that the timing of the electron emissions from a particular shell is dependent on the energy of the photons. The time resolution afforded by this and related spectroscopic techniques is providing insights into the ultrafast processes occurring within atoms that were once too rapid to see. — ISO

Phys. Rev. Lett. **106**, 143002 (2011).

GEOLOGY

All Natural

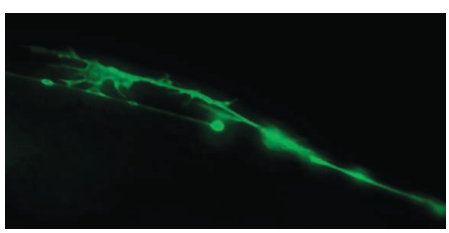
Occupational asbestos exposure is usually associated with one of two classes of minerals: amphibole and serpentine. Of these, amphibole asbestos is generally regarding as by far the more hazardous. At the same time, amphibole minerals are present in a variety of rocks. Although the asbestiform habit is relatively rare and restricted to specific occurrences and types of amphiboles, many amphiboles have an elongated habit that fits a generic definition of fibers used in many regulations, namely any particle longer than 5 μm and with at least a 3:1 aspect ratio. Most exposure to amphibole asbestos has been in mining or other occupational settings where the fibers are disturbed, but natural exposure is a persistent fear, and attempts at remediation could be enormously expensive. To assess the natural occurrences, Thompson *et al.* analyzed a U.S. Department of Agriculture soil database sampling tens of thousands of soils from across the United States. Amphiboles were widespread, occurring in about 13% of all samples and in samples from every state except Rhode Island (though it is likely that some amphibole is present locally there too). Separate checks on habits imply that, by the occupational hazard definition, many soils in the United States should be considered contaminated with asbestos, including many farmlands, which are regularly disturbed. This census illustrates the difficulty in extrapolating the occupational definition to mineralogic contexts. — BH

Am. Mineral. **96**, 609 (2011).

NEUROSCIENCE

Severed Nerves, Reunited

Peripheral nerves show some ability to regenerate after damage, but it is not an easy process. When an axon is severed, the neuronal cell body must convert the remaining axon stump into a developing axon with a growth cone. Then the axon must find its way past the damaged region and on to its original target, along the way contending with disrupted tissues, inhibitory signals, and an absence of the developmental signals that built the connection in the first place. In crayfish, earthworm, and leech, the tip of a severed axon can actually fuse with the



distal remainder of the axon, leapfrogging over regeneration hurdles. Now, Neumann *et al*. show that axons severed by lasers in the nematode *Caenorhabditis elegans* can fuse and reestablish function. As the axon stumps regenerated, they often came into contact with the distal remainder, which could then be reincorporated into neuronal function. The membranes fused and cytoplasmic movements connected pre- and post-injury portions of the axon. Without such contact, the distal remainder degenerated and disappeared. When more than one axon was severed, the axons usually found the correct partners. The molecular cues that help a growth cone identify its fusion partner remain to be elucidated. — PJH

Dev. Dyn. **240**, 10.1002/dvdy.22606 (2011).

CREDIT: NEUMANN *ET AL., DEV. DYN.* **240**, 10.1002/DVDY.22606 (2011)

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All Natural

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