

a potentially inexpensive material attractive for structural applications. —BG

Science, this issue p. 1347

CANCER THERAPY

Speedy screen for tumor therapies

Cell death screens using patient biopsies could be used to identify effective treatments for cancerous solid tumors. However, it takes several days to obtain results, meaning that the cells guiding treatment decisions may become molecularly distinct from those in patients. Bhola *et al.* developed a high-throughput method that, within 24 hours, identifies drugs that initiate cell death programs in tumor cells from freshly isolated patient biopsies. This method identified drug therapies that shrank breast and colon tumors in mice, but which would not have seemed as promising when screened in cells cultured for several days. —LKF

Sci. Signal. **13**, eaay1451 (2020).

INFLUENZA

Resistance to influenza antibodies

Broadly neutralizing human antibodies (bnAbs) to the stem of hemagglutinin (HA), a trimeric glycoprotein found on the surface of influenza viruses, are valuable therapeutics and can guide the development of universal influenza vaccines. For their use in therapy development, it is important to understand the extent to which HA stem variants with resistance to bnAbs can develop. Wu *et al.* used saturation mutagenesis combined with next-generation sequencing to systematically search for resistance mutations to prototypic bnAbs in two influenza subtypes, H3 and H1. They found that the genetic barrier to resistance to stem bnAbs was low for the H3 subtype but higher for the H1 subtype. The ability of H3 to develop resistance to

bnAbs presents a challenge in the development of a universal influenza vaccine. —VV

Science, this issue p. 1335

BIODIVERSITY CHANGE

Land-use change and forest biodiversity

Land-use change by humans, particularly forest loss, is influencing Earth's biodiversity through time. To assess the influence of forest loss on population and biodiversity change, Daskalova *et al.* integrated data from more than 6000 time series of species' abundance, richness, and composition in ecological assemblages around the world. Forest loss leads to both positive and negative responses of populations and biodiversity, and the temporal lags in population and biodiversity change after forest loss can extend up to half a century. Land-use change precipitates divergent population and biodiversity change. This analysis has consequences for projections of human impact, ongoing conservation, and assessments of biodiversity change. —AMS

Science, this issue p. 1341

ELECTROCHEMISTRY

Cutting it close for radical coupling

In principle, electrochemistry is an ideal method for radical coupling: One precursor oxidized at the anode pairs up with a counterpart that has been reduced at the cathode. The trouble is that either or both coupling partners might not stay stable long enough to meet in the middle. Mo *et al.* resolved this issue by closely spacing the electrodes in a microfluidics platform (see the Perspective by Liu *et al.*). They showcase coupling of dicyanobenzene as the cathodic radical precursor with a variety of oxidatively generated partners. —JSY

Science, this issue p. 1352;
see also p. 1312

IN OTHER JOURNALS

Edited by **Caroline Ash**
and **Jesse Smith**

Scanning transmission electron micrograph of wire-shaped morphology in BiSel.



THERMAL CONDUCTIVITY

Simple structures to slow heating

Materials with low thermal conductivity are important as barrier coatings and for other applications. Wang *et al.* found a bismuth selenohalide, BiSel, with an extremely low thermal conductivity over a range of temperatures. The authors attributed their observations to the simple crystal structure of the material, along with other features that inhibited thermal transport. The characteristics that give bismuth selenohalide a low thermal conductivity could constitute a template for finding other materials that are good thermal barrier coatings or those that could be used for thermoelectrics. —BG

Sci. China Mater. 10.1007/s40843-020-1407-x (2020).

CORAL REEFS

Rot in the national bedrock

Coral reefs face numerous threats in today's changing environment. For low-lying atoll countries built on reef systems, the consequences can be catastrophic. The best-recognized threat to coral is climate change, but not all damage is outside local control. Local

pollution seems to be taking a considerable toll in Tuvalu, a country in the South Pacific composed of several coral reef atolls. Nakamura *et al.* examined the composition of Tuvalu coral cores spanning decades. Since the 1990s, annual growth layers have been punctuated by black bands containing heavy metals, notably redox iron, and the genetic remnants of anaerobic bacteria. The authors

FORESTRY

Genetic variation in boreal conifers

Boreal forests are suffering from the effects of climate change. Trees take decades to grow, and it is difficult to test their adaptive capacity. Depardieu *et al.* took advantage of a common garden experiment set up in 1979 in which tree seeds from 43 geographic origins were planted in a single location in Quebec, Canada. Tree-ring data from white spruce cores in 2006 showed growth responses to droughts in 1997, 2001–2002, and 2005. Trees from locations with drier climates displayed alterations in xylem anatomy and better recovery after drought than trees originating from more humid locations. These variations may reflect genetic adaptation to local climate conditions in this widely distributed northern conifer. This information will be valuable in efforts to offset drought sensitivity in reforestation planning. —PJH

New Phytol. 227, 427 (2020).



White spruce trees (*Picea glauca*) native to the boreal forests of North America show genetic adaptation to the local environment.

infer that the black bands are produced by annually occurring anoxic conditions caused by pollution-driven algal overgrowth and coral suffocation. Such direct evidence of local conditions eroding the very bedrock of a country may provide enough motivation for change. —SNV

Sci. Rep. 10, 7338 (2020).

CELL BIOLOGY

Monitoring mitophagy

Mitophagy is the autophagic process by which mitochondria are degraded in lysosomes. It removes dysfunctional mitochondria that accumulate in a variety of human diseases. New tools are needed to quantify autophagy and mitophagy in living cells. Katayama *et al.* have developed a signal-retaining

fluorescent autophagy indicator (SRAI). The signal is not affected by delivery to the low-pH lysosomal environment and can be used in fixed as well as live samples. In a mouse model of Parkinson's disease, the indicator revealed that dopaminergic neurons selectively failed to execute mitophagy. This method will be useful in providing a reliable readout of mitophagy in a range of experimental biomedical settings. —SMH

Cell 181, 1176 (2020).

NEUROSCIENCE

“Flash and freeze” synaptic plasticity

The eponymous mossy fibers in the hippocampus of the brain connect the dentate gyrus to the CA3 pyramidal region and are

implicated in short-term memories spanning a few seconds to minutes. How such memories are held in the circuit is a puzzle. One candidate is post-tetanic potentiation, a form of synaptic plasticity that decays within tens to hundreds of seconds and regulates synaptic strength at hippocampal mossy fiber–CA3 pyramidal neuron synapses. Vandael *et al.* simultaneously recorded from pairs of mossy fiber terminals and postsynaptic CA3 pyramidal neurons and followed measurements with “flash and freeze” electron microscopy. The authors observed that post-tetanic potentiation was induced by an increase in the size of the readily releasable pool of synaptic vesicles in granule cells. —PRS

Neuron 10.1016/j.neuron.2020.05.013 (2020).

QUANTUM INFORMATION
Set, exchange, measure, repeat

Successful protocols for quantum information processing and quantum computation depend on the reliable storage and manipulation of the quantum state of a qubit. Qubits, however, are prone to errors because complete isolation from the environment is not possible. Methods for correcting these errors must also contend with the fact that direct measurement of a qubit destroys it. Xue *et al.* describe a repetitive quantum nondemolition method on a two-qubit system in which the state of the main qubit is mapped onto a second qubit that acts as an ancilla. Repeated measurement of the ancilla qubit allows the main qubit to be maintained and read out with higher fidelity. Such a protocol provides a route to robust quantum information processing in solid-state systems. —ISO

Phys. Rev. X 10, 021006 (2020).

SCIENCE AND POLICY

Testing peer review in government

To improve the role of science in government, some have called for more peer review. To test this approach, Ho and Larrimore Ouellette randomly assigned pending U.S. patent applications to external academic technical experts whose reviews were then provided to government patent examiners. Compared with matched, non-peer-reviewed applications, peer review increased examiners' efforts to search for earlier publications (“prior art”), increased citations to nonpatent literature, and reduced the propensity to initially grant the application. However, the effort was costly because of strict requirements (for example, time spent translating legalese) for how reviews could be introduced into the examination process. —BW

J. Empir. Leg. Stud. 17, 190 (2020).

Genetic variation in boreal conifers

Pamela J. Hines

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