occurs when the material is electrically excited with a series of voltage pulses. Using ultrafast electron diffraction, the researchers monitored the structure of a vanadium dioxide sample after excitation and found evidence of a metastable metallic phase that appears during the transition. —JS

Science, abc0652, this issue p. 352

NEUROSCIENCE

Conserved spatial memory mechanisms

Food-caching birds are memory specialists that can remember thousands of hidden food items. Using electrophysiological recordings from freely behaving birds, Payne *et al*. analyzed neuronal activity in the likely hippocampus homolog of two bird species, the tufted titmouse and the zebra finch. They chose these two species to compare, respectively, birds that do and do not display food-caching behavior. Place cells and typical hippocampal firing patterns that resembled rodent neuronal activity could be detected in the extreme memory specialists. Compared with titmice, however, spatial activity was noticeably weaker and less abundant in zebra finches. These findings provide evidence that the neural processes underlying spatial memory are remarkably conserved across widely divergent hippocampal circuits separated by millions of years of evolution. —PRS

Science, abg2009, this issue p. 343

Conserved brain circuits enable spatial recall for seed-caching tufted titmice.

EMERGING INFECTIONS

Correlates of protection

Vaccines against Ebola virus (EBOV) are difficult to test in humans because of the sporadic nature of EBOV outbreaks. Therefore, understanding correlates of protection in preclinical models is necessary. Meyer *et al.* tested five candidate mucosal EBOV vaccines in cynomolgus macaques and showed that, despite sharing the same EBOV glycoprotein as an antigen, they varied in their ability to protect animals from EBOV challenge. The authors interrogated correlates of protection and found that functional qualities of the antibody response were associated with protection. By contrast, neutralizing antibody titers did not correlate with survival. Thus, looking beyond the presence of neutralizing antibodies may be necessary to understand the protective effect of EBOV vaccines. —CSM

Sci. Transl. Med. **13**, eabg6128 (2021).

NEUROSCIENCE

Coordinated pause for plasticity

Protein synthesis and structural remodeling in dendritic spines mediate synaptic plasticity, the long-lasting changes in neuronal connectivity that underlie learning and memory. Mendoza *et al*. determined how these processes are coordinated. In mouse hippocampal neurons, glutamate-induced phosphorylation of the translation elongation factor eEF1A2 triggered its dissociation from its activator, thereby transiently inhibiting protein synthesis. This phosphorylation event also triggered the dissociation of eEF1A2 from actin fibers, thereby facilitating cytoskeletal remodeling. —LKF

Sci. Signal. **14**, eabf5594 (2021).

IN OTHER JOURNALS

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

PHYSIOLOGY

Too hot to freeze

Embryonic sharks grow within external cases that are often translucent. In response to signs of predators, the embryos of several shark species become motionless (or "freeze"). The amount of time that they can remain still is limited by their need for oxygen exchange stimulated by their movement. Ripley *et al.* exposed small-spotted catshark embryos to water at 15° and 20°C, and found that the time they could remain motionless was reduced by sevenfold at the higher temperature. Although the precise mechanism was not clear, the authors conclude that this was in part a result of higher metabolic requirements at higher temperatures. Thus, the ability to "freeze" at higher temperatures may be compromised, leading to higher rates of predation in warmer oceans. —SNV *Conserv. Physiol.* **9**, coab045 (2021).

A small-spotted catshark (*Scyliorhinus canicular*) embryo within its translucent egg case

PHOTOS (LEFT TO RIGHT): S AND D AND K MASLOWSKI/MINDEN PICTURES; INGO ARNDT/MINDEN PICTURES

LIPID MEMBRANES

Permeability depends on chirality

In biological systems, nucleic acids, proteins, and lipids, which are the building blocks of cells, have set chirality, whereas natural secondary metabolites and synthetic drugs can have more varied stereochemistry, even when using familiar elements such as amino acids or sugars. Hu *et al.* investigated how varying the chirality of alkyne-labeled amino acids changed their permeability through a phospholipid bilayer in a specially designed microfluidics setup. There were considerable differences for some amino acids and dipeptides, which could be eliminated by using achiral lipids or reversed by using abiological lipids of opposite chirality. —MAF

Nat. Chem. 10.1038/s41557-021-00708-z (2021).

CELL BIOLOGY

Keeping warm one cell at a time

Adipose thermogenesis is a conserved response to environmental cold or dietary excess and is classically triggered by ligand-dependent receptor activation. Johansen *et al.* report that cold regulation of Gs-coupled receptor expression represents a parallel point of control. Gpr3 turns out to be the most cold-induced Gs-coupled receptor in both brown and beige thermogenic adipose tissues. GPR3 has high basal Gs-coupled activity in the absence of an exogenous ligand. Mimicking the cold induction of Gpr3 triggered cAMP production, activated the thermogenic response, and counteracted metabolic disease in mice. A disease-associated genetic variant in GPR3 in patient-derived adipocytes revealed that GPR3 also acts as a regulator of human thermogenic adipose tissue. Targeting GPR3 could thus enable therapeutic stimulation of thermogenic adipose tissue in metabolic disease. —SMH

Cell **184**, 3502 (2021).

CANCER IMMUNOLOGY

I'll see melanoma too

Type 2 innate lymphoid cells (ILC2s) are known to help initiate and coordinate allergic and anthelmintic immunity. Recent studies have also pointed to the role that ILC2s play in the promotion and inhibition of various cancers. Jacquelot *et al.* show that in melanoma, ILC2s infiltrate tumors and control antitumor immunity. Tumor-infiltrating ILC2s produce the proinflammatory cytokine GM-CSF, which in turn enhances the recruitment, activation, and survival of anti-melanoma eosinophils. Notably, these ILC2s also express programmed cell death protein-1 (PD-1), which dampens their antitumor activity. When the authors combined anti–PD-1 immunotherapy with administration of the ILC2-activating cytokine interleukin-33 in a mouse model of melanoma, they saw better antitumor responses. ILC2 and eosinophil accumulation in tumors correlated with improved melanoma patient survival, suggesting that these cell populations have potential as cancer immunotherapy targets. —STS

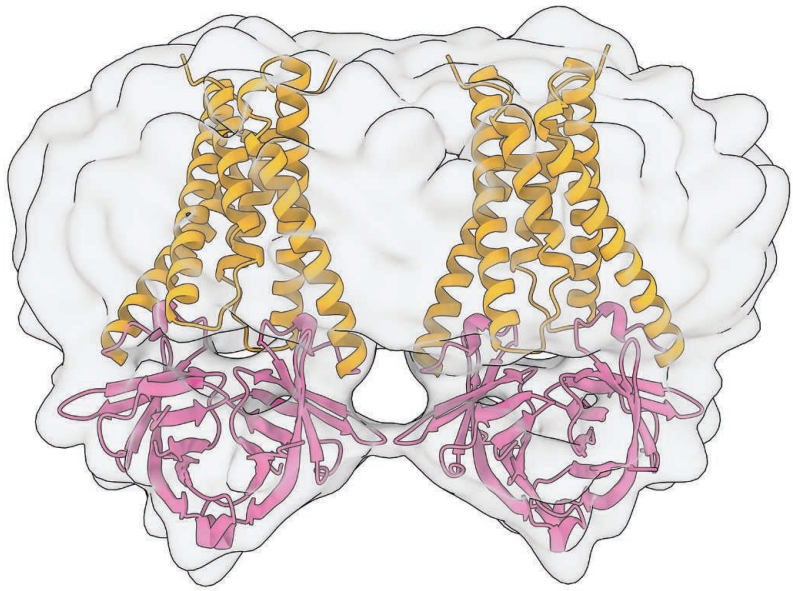
Nat. Immunol. **22**, 851 (2021).

STRUCTURAL BIOLOGY

Transmembrane targets

In the battle against COVID-19, attention has focused on the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spike protein, which initiates viral entry into host cells, and on viral proteins directly involved in replication. However, other viral proteins also play a role in pathogenicity and are potential drug targets. Kern *et al.* focused on ORF3A, a transmembrane protein that is implicated in apoptosis and inhibition of autophagy and may form an ion channel. The authors used electron microscopy to determine the structure of a dimer at 2.1-angstrom resolution. Although a polar cavity extends from the cytoplasm into the membrane, conformational changes would be required to open a conduction pathway across the membrane. In liposomes, SARS-CoV-2 3a has a nonselective cation channel activity that is blocked by polycation channel inhibitors. —VV

Nat. Struct. Mol. Biol. 10.1038/s41594-021-00619-0 (2021).



Model for the structure of the putative SARS-CoV-2 transmembrane ion channel dimer ORF3A at 2.1 Å

PHOTO: *NAT. STRUCT. MOL. BIOL.* 10.1038/S41594-021-00619-0 (2021).

ORGANIC CHEMISTRY

Catalyst versatility

Asymmetric catalysis relies on subtle interactions that bias a reaction toward one product at the expense of its mirror image. Strassfeld *et al.* studied the particular influences at play in a squaramide-catalyzed ring opening of oxetanes (C–C–C–O cycles). They found that two different mechanisms were operating simultaneously, respectively co-catalyzed by Lewis and Brønsted acids. The optimal catalyst induced high selectivity in both of them, attributable through modeling to favorable cation-pi and hydrogen-bonding interactions. Results such as these can shed light more generally on the nature of privileged catalyst motifs that prove selective in multiple distinct reaction scenarios. —JSY

J. Am. Chem. Soc. **143**, 9585 (2021).

ASTROPARTICLE PHYSICS

Supernova neutrinos reveal no secrets

In the Standard Model of particle physics, neutrinos only interact through the weak nuclear force. Several proposed extensions to the Standard Model introduce additional ways that neutrinos could interact with each other (but not with different types of particles), and these are known as secret interactions. Shalgar *et al.* calculated how any secret interactions would affect core-collapse supernovae, in which an explosion is driven by a vast flux of neutrinos flowing outward from a dying star's core. If there were secret interactions, then neutrinos would become trapped in the core and no supernova would occur. The authors used this to set upper limits on neutrino physics beyond the Standard Model. —KTS

Phys. Rev. D **103**, 123008 (2021).