transition metal or other ion-oxide layers remain octahedral rather than switching over to trigonal prismatic coordination. —MSL

Science, this issue p. 708

CORONAVIRUS

Locking down the SARS-CoV-2 spike

Many efforts to develop therapies against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are focused on the spike (S) protein trimer that binds to the host receptor. Structures of trimeric S protein show its receptor-binding domain in either an up or a down conformation. Toelzer *et al*. produced SARS-CoV-2 S in insect cells and determined the structure by cryo–electron microscopy. In their dataset, the closed form was predominant and was stabilized by binding linoleic acid, an essential fatty acid. A similar binding pocket appears to be present in previous highly pathogenic coronaviruses, and past studies suggested links between viral infection and fatty acid metabolism. The pocket could be exploited to develop inhibitors that trap S protein in the closed conformation. —VV

Science, this issue p. 725

ECOLOGICAL TRACKING

Ecological "big data"

Human activities are rapidly altering the natural world. Nowhere is this more evident, perhaps, than in the Arctic, yet this region remains one of the most remote and difficult to study. Researchers have increasingly relied on animal tracking data in these regions to understand individual species' responses, but if we want to understand larger-scale change, we need to integrate our understanding across species. Davidson *et al*. introduce an open-source data archive that currently hosts more than 15 million location data points across 96 species and use it to show distinct climate change responses across species. Such ecological "big data" can lead to a wider understanding of change. —SNV

Science, this issue p. 712

ARCHAEOLOGY

A woman hunter in the early Andes

The ethnographic record of modern hunter-gatherers indicates that men were the primary, almost exclusive, hunters of big game. However, to what extent this pattern existed in prehistory has been challenged on both empirical and theoretical grounds. To examine this question, Haas *et al*. studied the artifacts recovered from a burial of a young woman at a site on the Andean Altiplano dated to more than 8000 years ago. Found with her was a tool kit used in animal processing and numerous projectile points, strongly indicating that she hunted. Additional examples of female hunters at late Pleistocene and early Holocene sites in the Americas were also identified, findings that support a model of relatively undifferentiated subsistence labor among early populations in the Americas. —MSA

Sci. Adv. 10.1126/sciadv.abd0310 (2020).

ORGANIC DEVICES

Low-noise organic photodetectors

Although the high performance and low cost of visible light silicon photodetectors suffice for most applications, their small size and rigid nature are not optimal for applications such as wearable sensors. Organic photodetectors can be flexible and large in area but are often noisy. Fuentes-Hernandez *et al*. found that optimized choices of the semiconductor and electrode materials that improve diode characteristics enable organic photodetectors that can detect low light levels with low noise. —PDS

Science, this issue p. 698

IN OTHER JOURNALS

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

EPIDEMIOLOGY

Famine's intergenerational partner

Famine extends its dangerous reach across generations: Witness the epigenetic effects of the Dutch famine in 1944–1955, which led to diabetes and metabolic disease among the grandchildren of those affected. Sixty years ago (1958–1962), a great famine caused by a collapse of the food system prevailed across China. Cheng *et al.* investigated whether the high levels of pulmonary tuberculosis (TB) currently found in Sichuan Province might be a consequence of that famine two generations later. The authors accessed more than 1 million TB cases diagnosed between 2005 and 2018 and identified 12,000 cases that could be attributable to the famine. Malnutrition and accompanying immune suppression are likely to activate latent TB. Subsequently, among the low-birthweight famine cohort (F_1), starvation was associated with greater risk of adult TB emerging and, furthermore, of an increased risk of adult TB emerging in their children (F_2). This effect is most likely mediated by intergenerational damage to immune responses and lung anatomy rather than just exposure to infected family members. The work starkly shows how societal shocks can cut across generations. —CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.2008336117 (2020).

Survivors of the Great Chinese Famine of 1958–62 suffered starvation, which has left a legacy of tuberculosis that still prevails today.

PHOTO: HONG KONG GOVERNMENT/AFP VIA GETTY IMAGES

Published by AAAS

NEUROSCIENCE

Change with distance from the soma

Hippocampal neurons receive and integrate synaptic input along their dendritic tree. Inputs located near the cell soma or in the distal dendrite contribute differently to neuronal integration by a variety of mechanisms, including NMDA receptor (NMDAR)–dependent plasticity processes. Using superresolution microscopy, single-nanoparticle imaging, and glutamate uncaging, Ferreira *et al.* investigated the nanoscale organization of NMDARs containing the subunits GluN2A and GluN2B along the dendritic tree. The organization and surface dynamics of GluN2B-NMDARs, but not of GluN2A-NMDARs, changed between proximal and distal clusters, with a gradual increase in receptor local density from proximal to distal dendritic segments. At the proximal dendrite, the nanoscale organization and membrane dynamics of GluN2B-NMDARs were influenced by physical interplay with the protein kinase CaMKII. —PRS

Proc. Natl. Acad. Sci. U.S.A. **117**, 24526 (2020).

NEUROSCIENCE

Mitochondrial anchoring in synapses

ATP has a limited diffusion capacity in axons, so locally anchored presynaptic mitochondria may be used to support high metabolic demand. Only 33% of presynaptic active zones in hippocampi retain mitochondria. Sustained synaptic activity is mainly restricted to these mitochondria-containing synapses during long-term potentiation. Li *et al.* investigated whether increased energy consumption during intensive synaptic activity contributes to presynaptic energy stress and how mitochondria are recruited to synapses. Syntaphilin (SNPH) anchors axonal mitochondria, and deleting *snph* enhances axonal mitochondrial motility in vitro and in vivo. Synaptic activity induces presynaptic energy stress, which activates the AMPK-PAK signaling cascade, triggering presynaptic mitochondrial recruitment and SNPH-mediated anchoring. Cross-talk between energy sensing and mitochondrial anchoring enables neurons to capture presynaptic mitochondria in response to local energy stress during intensive synaptic activity. —SMH

Nat. Metab. **2**, 1077 (2020).

MOLECULAR DIFFUSION

Mobile aryl groups on graphene

Phenyl groups on aromatic rings can migrate to an adjacent carbon atom under acidic conditions through an ipso arenium ion intermediate. He and Swager show that analogous migration of aryl groups on p-doped graphene surfaces can occur if functional groups weaken the bond to graphene. They patterned graphene with a copper mask to create circular islands of phenyl, 4-trifluoromethylphenyl, and 4-methoxyphenyl groups. Upon oxidative etching of the copper, which leads to p-doping of the graphene, Raman imaging showed that the aryl pattern remained for the first two groups. For 4-methoxyphenyl, migration of these groups several micrometers from their original position occurred through a random walk. —PDS

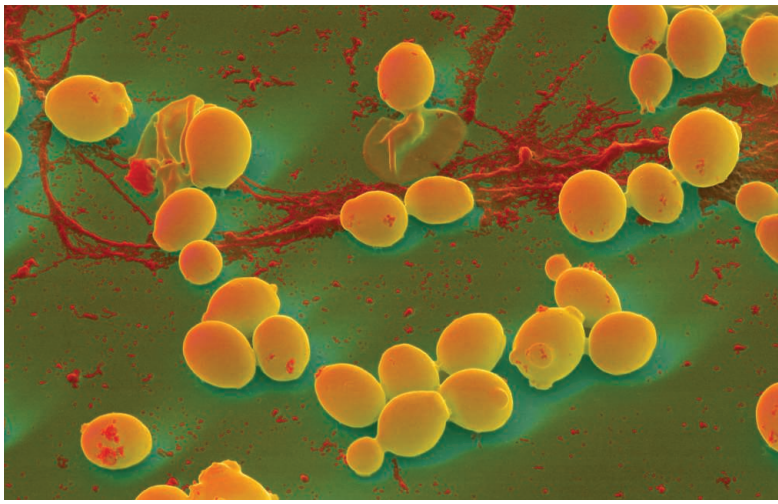
J. Am. Chem. Soc. **142**, 17876 (2020).

IMMUNOLOGY

Making peace with the beast within

One way that immune cells such as neutrophils and macrophages contribute to host defense is by engulfing microbes. This process, known as phagocytosis, typically entails the formation of an organelle around the microbes called the phagosome, which then fuses with lysosomes to facilitate degradation. However, some pathogens can survive and even thrive within phagosomes. Westman *et al.* investigated the process by which phagosomes sequester and control the rapidly growing fungus *Candida albicans* after phagocytosis. The macrophage phagosome expands to match the fungus' growth through the calcium-dependent insertion of lysosomes. If lysosomal fusion is inhibited, the phagosomes rupture, leading to NLRP3 inflammasome activation, host cell death, and the enhanced growth and escape of *C. albicans*. However, by tolerating the burgeoning fungus, lysosomal fusion appears to contain infection and give the host precious time to mount its defenses. —STS

Cell Host Microbe 10.1016/j.chom.2020.09.004 (2020).



***Candida albicans*, shown here, is a yeast-like fungus that can be contained within host phagocytes while immune defenses build.**

IMAGE: EYE OF SCIENCE/SCIENCE SOURCE

QUANTUM SYSTEMS

Efficient transfer of entanglement

Processing quantum information across a network relies on the encoding, storage, manipulation, and transfer of quantum states between the nodes along the network chain. However, the information stored in the fragile quantum states can be lost as they propagate along the network, limiting the overall transfer efficiency typically to between 15 and 20% and thereby compromising the scalability of the network. Cao *et al.* developed a method to enhance the efficiency with which the quantum information can be transferred. Using temporally shaped single-photon light pulses and a cold atom storage medium, their protocol can enhance the storage and retrieval efficiency to ~85%. Further improvement in the transfer efficiency of entanglement between the quantum memories and the information carrier (photons) will advance the development of quantum communication technologies. —ISO

Optica **7**, 1440 (2020).

CHEMICAL STRUCTURE

Computer-aided design of metal borides

Because of their extreme hardness and electronic conductivity, transition-metal borides find wide industrial applications. Expanding their elemental space with new elements can enhance their range of useful properties. Using density functional theory calculations, Dahlqvist *et al.* explored chemical ordering upon M-site alloying of M_2AlB_2 (where M is a transition metal, A is an A-group element, and B is boron) in various symmetries for M from groups 3 to 9. Several previously unknown stable phases were identified, and two of them with in-plane chemical order were successfully synthesized and characterized in agreement with theory. The proposed theoretical approach can serve as a powerful tool to explore the chemical space of metal borides when metal alloying is considered. —YS

J. Am. Chem. Soc. 10.1021/jacs.0c08113 (2020).

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