within this region acts as a brake on feeding, suppressing food intake (see the Perspective by Borgland). These neurons were potently and uniquely modified by diet-induced obesity. Thus, discrete populations of lateral hypothalamic area neurons are fundamental regulators of feeding behavior that might be targeted to treat eating disorders. —PRS

Science, this issue p. 1271; see also p.1233

MICROBIOLOGY
Lipid droplets help anti-TB drug efficacy
Improving chemotherapies against intracellular pathogens requires understanding how antibiotic distribution within infected cells affects efficacy. Greenwood et al. developed an approach to visualize antibiotics in human macrophages infected with the tubercle bacillus (see the Perspective by Smith and Aldridge). They showed that the antitubercular (anti-TB) drug bedaquiline accumulated in host lipid droplets. Lipid droplets seemed to act as an antibiotic reservoir that could be transferred to bacteria during host lipid consumption. Indeed, alterations in host lipid droplet content affected the anti-TB activity of bedaquiline against intracellular bacilli. —SMH

Science, this issue p. 1279; see also p.1234

MATERIALS SCIENCE
Nacre-inspired toughened glass
Nacre is a biological composite that is present in seashells. This composite contains a small amount of organic material that toughens brittle ceramics, such that a highly regular three-dimensional brick-and-mortar assembly of microscopic mineral tablets is bonded together with biopolymers. Synthetic nacres have not been able to capture the large-scale sliding of the bricks that is key to enhancing toughness. Yin et al. applied this model to toughening glass, where square or hexagonal borosilicate glass sheets were bonded together using ethylene-vinyl acetate interlayers (see the Perspective by Datsiou). This generated a structure that allows glass plates to slide past each other. The resulting five-layered glass composite was deformable and impact resistant, while maintaining high stiffness, flexural strength, surface hardness, and transparency. —MSL

Science, this issue p. 1260; see also p.1232

QUANTUM FLUIDS
Clustering vortices
Many-body systems generally become more disordered as more energy is pumped into them. A curious exception to this rule was predicted in the context of turbulent flow by the physical chemist Lars Onsager. He suggested that the entropy of certain two-dimensional (2D) systems can decrease with increasing energy, corresponding to an effective negative temperature. Using 2D Bose-Einstein condensates of atoms, Gauthier et al. and Johnstone et al. put Onsager’s theory to the test. They provided energy to the system by perturbing the condensate, creating vortices and antivortices. With increasing energy, the system became more ordered as clusters containing either only vortices or only antivortices emerged. —JS

Science, this issue p. 1264, p. 1267

SENSORY PERCEPTION
A measured sniffer
We humans see the world through a primate-centric viewpoint that has influenced how we test for traits in other animals, most of whom experience the world in very different ways. One area where this bias has been apparent is in tests of animal cognition and perception, where vision is often the focal sense. Plotnik et al. branched out beyond the bounds of sight to test whether elephants, who have a well-known and impressive nose, could differentiate relative amounts of food based entirely on scent. Controlling for alternative interpretations, they found that, indeed, Asian elephants could identify buckets that had more sunflower seeds solely using olfaction. The elephants did struggle to select among the buckets when the amounts of seeds in them differed only slightly, however, this is also the case in most animals tested for visual discrimination, including humans. —SNV

The Asian elephant’s long trunk supports a keen sense of smell.

VIROLOGY
Matchmaking between virus and host
Coronaviruses not only include the deadly respiratory viruses, such as SARS and MERS, but also viruses that usually cause mild respiratory tract infections. However, mild coronavirus infections can cause severe complications in immunocompromised people. To infect cells, trimers of the coronaviruses’ transmembrane spike glycoprotein bind to host receptors. Tortorici et al. determined the cryo–electron microscopy structures of the trimeric spike from human coronavirus HCoV-OC43 in isolation and in complex with a 9-O-acetylated sialic acid—a modification found on glycoproteins at the host cell
MOLECULAR BIOLOGY

Noisy transcription

Transcription factors (TFs) bind to a promoter, a DNA region next to a gene. TFs recruit cofactors and RNA polymerase (RNAP) to initiate gene transcription in bursts. In single cells, RNAP bursting at a certain gene is stochastic. Using a single-molecule imaging approach, Donovan et al. visualized TF dynamics and RNAP bursting kinetics simultaneously at a single gene in budding yeast cells. The binding affinity of the TF for its binding site dictates its dwell time on the promoter. Dwell time determines bursting duration of RNAP, and the frequency of bursting within each duration depends on the effective concentration of TF on the promoter. —SYM


QUANTUM COMPUTING

Coding fault-tolerant quantum computing

Recent advances in creating quantum processors comprising several tens of qubits bring the era of quantum advantage tantalizingly close. Reaching that point, however, will require quantum processors that are scalable and fault tolerant. With the underlying architectures of these processors based on superconducting qubits laid out in a two-dimensional array, so-called surface codes are being developed that enable a robust error-correction capability due to the collective behavior of several qubits. Li et al. describe compass codes, a generalized version of surface codes, that can deal various kinds of noise affecting the processor. A compass code can be engineered to correct for specific types of noise and thus provides a general route to fault-tolerant quantum processors. —ISO


FOOD POLICY

Unaffordable oasis in a food desert

To address disparities in healthful eating, policy-makers have promoted development of new supermarkets in “food deserts” in poorer neighborhoods, making it easier to find healthy groceries locally instead of having to travel to wealthier neighborhoods. Combining data including household grocery purchases and relocations, and locations of new supermarkets, Alcott et al. conclude that exposing poorer people to healthier food typical of wealthier neighborhoods would increase demand for healthy food by only 10%. They calculate that a subsidy to help poorer people afford healthier food would be much more effective. —BW

Quart. J. Econ. 10.1093/qje/qjz015 (2019).

TREE DEMOGRAPHY

Slow-growing trees sequester more carbon

Dendrochronology—the study of tree growth patterns through the analysis of annual growth rings—is a powerful tool for studying the past but may also help to inform the future. Through tree-ring analysis of living and dead conifers from highland ecosystems in Spain and Russia, Büntgen et al. show that longest-lived individuals are those with the slowest juvenile growth rates. This means that higher levels of carbon accumulation are achieved in communities of slow-growing species, which indicates potential limits to the effectiveness of policies for carbon sequestration that rely on fast-growing tree plantations to mitigate the effects of global warming. —AMS


GRANULAR MATERIALS

Mimicking millions of earthquakes

Earthquakes are simulated in many different ways in the lab, but these simulations tend to produce a limited number of “labquakes.” Lherminier et al. solve this problem by using continuously sheared cylinders filled with photoelastic disks, generating millions of small ruptures in the lab. Their labquakes reproduce size distributions found in regions with lots of earthquakes, along with the foreshock and aftershock behaviors. The experimental approach provides a unique way of simulating and tracking force networks responsible for rupture in the lab and on real-world faults. —BG


Photo: Octavio-Gonzalez/Getty Images

Tree rings mark yearly growth.
A measured sniffer
Sacha Vignieri

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