of the atoms. This gave rise to two independent excitations, which the researchers identified as spinons and holons using a quantum gas microscope. —JS

Science, this issue p. 186

LIGHTNING

Gamma-ray flash from a lightning leader

Terrestrial gamma-ray flashes (TGFs) are millisecond pulses of gamma rays produced by thunderstorms. Neubert *et al*. observed a TGF from above, using instruments on the International Space Station. High-speed photometry in optical, ultraviolet, x-ray, and gamma-ray bands allowed them to determine the sequence of events that produced the TGF. Emission from an intracloud lightning leader was followed within a millisecond by the TGF. The subsequent lightning flash produced an electromagnetic pulse, which induced expanding waves of ultraviolet emission in the ionosphere above the thunderstorm, called an elve. The authors conclude that high electric fields produced within the lightning leader generated the TGF. —KTS

Science, this issue p. 183

ANTIBIOTIC RESISTANCE

Challenges of drug combinations

Combinations of antibiotics are used to treat intractable infections such as methicillin-resistant *Staphylococcus aureus*. Clinically, however, drugs tend to be used empirically, and results can be contradictory. Liu *et al*. translated observations made in vitro to patient samples to understand the role of antibiotic tolerance in promoting or suppressing resistance when drug combinations are used (see the Perspective by Berti and Hirsch). Although bacterial populations exposed to multiple antibiotics can develop tolerance to multiple drugs, one drug in a combination may be able counter resistance to a partner drug and provide effective therapy. However, if tolerance has already emerged to one drug, the combination may end up promoting the transmission of resistance to a partner drug. —CA

Science, this issue p. 200; see also p. 141

GPCR SIGNALING

An accessory protein skews signaling

Ghrelin is a peptide secreted by the stomach during fasting to promote food intake. The accessory protein MRAP2 interacts with the ghrelin receptor GHSR1a, a G protein–coupled receptor (GPCR), and is important for the appetite-stimulating effects of ghrelin. Rouault *et al*. found that MRAP2 promoted biased signaling downstream of ghrelin-mediated activation of GHSR1a by inhibiting β-arrestin recruitment to the receptor and potentiating $G\alpha_{q/11}$-dependent signaling. Accessory proteins, not just ligands, can thus bias GPCR signaling. —WW

Sci. Signal. **13**, eaax4569 (2020).

CATALYSIS

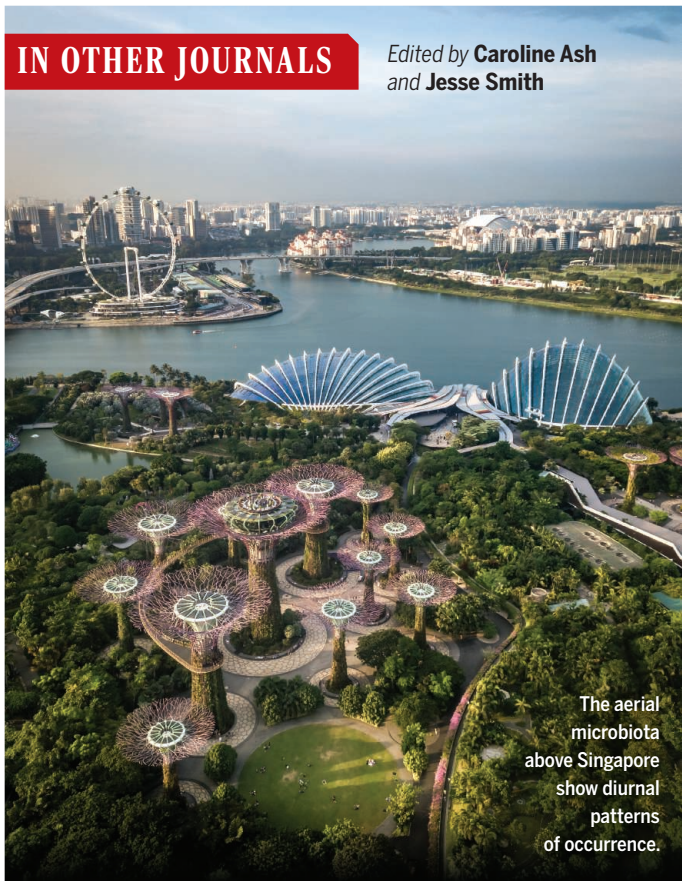
Confining peroxide to make methanol

In principle, hydrogen peroxide would be an efficient oxidant for the conversion of methane to methanol under mild conditions. In practice, however, it is currently too expensive to produce the peroxide ahead of time for this purpose. Jin *et al*. report a catalyst system that generates and concentrates hydrogen peroxide for immediate reaction with methane. A hydrophobically coated zeolite keeps the peroxide close to the gold and palladium active site, where incoming methane is then selectively oxidized to methanol. —JSY

Science, this issue p. 193

IN OTHER JOURNALS

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



The aerial microbiota above Singapore show diurnal patterns of occurrence.

MICROBIOTA

Up in the clouds with the fungi

Airborne transport of microorganisms is assumed to occur over vast global scales, but we know little about it. Gusareva *et al.* undertook a year-long metagenomic study of atmospheric organisms above Singapore. Daily patterns were seen in more than 700 taxa, dominated by eukaryotes. At night, spores of basidiomycete fungi formed the greatest airborne biomass. Ascomycete fungal spores prevailed during daytime and correlated with rainfall. The richness of the bacterial groups Firmicutes and Proteobacteria peaked at noon, whereas Cyanobacteria and Actinobacteria abundances stayed uniform over 24 hours. The chief variable was the shift between temperatures at night (26°C) and day (35°C at noon), which presumably drives lift-off. —CA

Proc. Natl. Acad. Sci. U.S.A. **116**, 23299 (2019).

MOLECULAR BIOLOGY

Coincidence detection stalls ribosome

Translation of aberrant messenger RNAs that lack in-frame stop codons leads to malfunctioning proteins. To prevent this deleterious effect, cells have quality control processes to monitor translation into polyadenylated regions, including ribosome stalling. Using a combination of biochemistry and structural biology approaches, Chandrasekaran *et al.* show how ribosomes stall selectively on polyadenylated regions. Polylysine peptide (the codon AAA is decoded as lysine) in the exit channel of a ribosome slows translation, whereas a stabilized polyadenylated RNA helix in a ribosome decoding

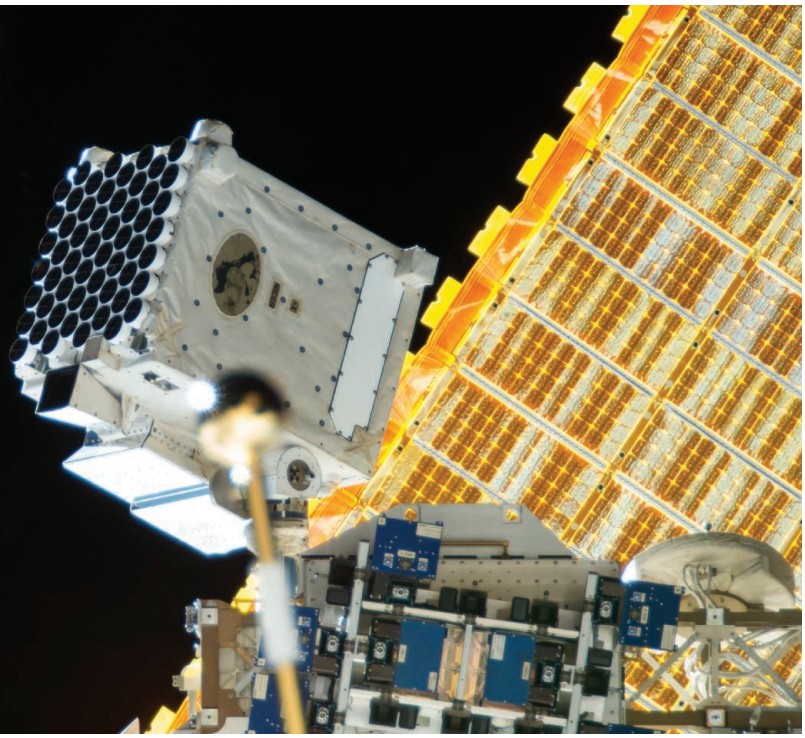
PHOTO: ADEL NEWMAN/SHUTTERSTOCK

ASTROPHYSICS

Interior properties of a neutron star

Neutron star interiors are composed of exotic neutron-rich matter that cannot be produced in laboratories, and its properties are of interest to both astronomers and nuclear physicists. The Neutron Star Interior Composition Explorer (NICER) instrument performs precise timing of x-ray emission from fast-spinning neutron stars. Riley *et al*. and Miller *et al.* report independent blind analyses of the same NICER dataset for a single neutron star. The resulting models have some differences but lead to mass and radius measurements that are consistent within their uncertainties. Companion papers show how the NICER measurements constrain the properties of exotic neutron-rich matter. —KTS

Astrophys. J. Lett. **887**, L21, L24 (2019).



The NICER instrument mounted on the International Space Station

center blocks incoming transfer RNAs. Therefore, coincidence detection of both polylysine and polyadenylate allows polyadenylated regions, but not polylysine, within normal coding regions to halt translation. —SYM

Nat. Struct. Mol. Biol. **26**, 1132 (2019).

GENE EXPRESSION

Sensing amino acid starvation

Most Gram-positive bacteria have genetic switches that regulate the expression of genes involved in amino acid synthesis. These switches are sequences called T-boxes that occur before the coding sequence in the relevant messenger RNAs. They bind to specific transfer RNA (tRNA) and, if it is charged with amino acid, suppress expression of the messenger RNA. Three papers—by Li *et al*., Battaglia *et al.*, and Suddala and Zhang, with an overview provided by Weaver and Serganov—describe the structures of different classes of T-boxes bound to tRNA. The structures show differences in anticodon recognition that ensure specific binding. The papers differ in their interpretations of how expression is inhibited when the tRNA is charged with amino acid. —VV

Nat. Struct. Mol Biol. **26**, 1094, 1106, 1114, 1081 (2019).

IMMUNOLOGY

Infection rewires liver metabolism

The liver serves as an important hub for metabolism and host-pathogen interactions. However, the link between these two functions is poorly understood. To study this link, Lercher *et al.* infected mice with chronic lymphocytic choriomeningitis virus (LCMV). Infection caused pronounced transcriptional changes to the liver's metabolic wiring, which in turn altered the host's systemic metabolism. These effects were driven by reprogramming of the hepatocyte urea cycle by type I interferon signaling. The resulting reduction in the ratio of arginine to ornithine in the circulation suppressed antiviral $CD8^+$ T cell responses. Notably, treatment of mice with recombinant pegylated human arginase 1 (used to inhibit hepatocellular carcinoma proliferation) lessened LCMV-induced hepatitis. Thus, the liver can control T cell–mediated tissue pathology by tweaking the metabolites it releases into the circulation. —STS

Immunity **51**, 1074 (2019).

BIOMATERIAL

A recruitment center for biorepair

Although it is possible to incorporate tissue-specific cells into a biomaterial for tissue repair, it requires cell isolation and expansion and a way to constrain the cells after implantation. An alternative option would be a biomaterial that harnesses and accelerates the body's own capabilities for repair. Adenosine is found throughout the body, but its concentration will temporarily and locally spike after a tissue injury because it acts as an extracellular signaling molecular to encourage repair. Because boronate molecules bond to and sequester adenosine, Zeng *et al*. developed a polymeric material that incorporates 3-(acrylamido) phenylboronic acid. When implanted as a patch at the site of a bone injury, the polymer maintained an increased level of adenosine, thus promoting osteoblastogenesis and angiogenesis. —MSL

Adv. Mat. 10.1002/adma.201906022 (2019).

GENDER BIAS

A higher standard for women

Despite the absence of explicit gender bias among journal editors and reviewers, female economists were held to a higher standard in order to publish their work. Four leading economics journals shared data on nearly 30,000 manuscripts with Card *et al*., who found that author gender did not influence key aspects of the evaluation process. However, when looking at future citations as a proxy for the quality of the research, female-authored papers received 25% more citations than similarly evaluated male-authored papers, suggesting that women needed to produce higher quality work than men in order for referees to recommend publication. —BW

Quart. J. Econ. **135**, 269 (2020).

PHOTO: NASA

A higher standard for women

Brad Wible

Science **367** (6474), 159-160.
DOI: 10.1126/science.367.6474.159-g