

STELLAR ASTROPHYSICS

A relic star cluster under the floor

Globular clusters (GCs) are gravitationally bound assemblies of thousands to millions of stars that orbit in the outskirts of large galaxies. GCs consist of old stars with low metallicity containing low proportions of chemical elements heavier than hydrogen and helium. However, GCs appear to have a minimum metallicity, known as the floor, implying that at least some of those elements were required for their formation. Larsen *et al.* have found a GC in the nearby Andromeda Galaxy with a metallicity beneath the floor. This unexpected discovery will inform models of GC formation and incorporation into galaxies. —KTS

Science, this issue p. 970

ZIKA VIRUS

Domesticating Zika virus

Why hasn't Zika virus (ZIKV) disease caused as much devastation in Africa, its continent of origin, as it has in the Americas? Outside of Africa, this flavivirus is transmitted by a ubiquitous mosquito subspecies, *Aedes aegypti aegypti*, which emerged from the African forerunner subspecies *A. aegypti formosus* and acquired a preference for human blood and a peridomestic lifestyle. Now, this subspecies colonizes many intertropical cities, aided by climate change and human trash. Aubry *et al.* tested 14 laboratory mosquito colonies for their relative susceptibility to ZIKV. Quantitative trait locus mapping showed differences on chromosome 2 between mosquitoes from Gabon and



A feeding female *Aedes aegypti* mosquito, the primary species that transmits Zika virus

Guadeloupe. Mouse infection experiments revealed that African mosquitoes transmitted a smaller virus inoculum than the South American insects. Increased susceptibility coupled with the ability of *A. aegypti aegypti* to breed in any discarded object containing water has amplified the problematic nature of this virus as it has circumnavigated the world. —CA
Science, this issue p. 991

CORONAVIRUS

A strong cocktail against SARS-CoV-2

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection is initiated by the trimeric spike protein that decorates the virus and binds the ACE2 receptor. Antibodies against the spike that neutralize viral infection have potential as therapeutics. Tortorici *et al.* describe two very potent antibodies, S2E12 and S2M11. Electron microscopy structures characterized the binding and showed that S2E12 traps the spike in a conformation that cannot bind ACE2. Both antibodies protected hamsters against SARS-CoV-2 challenge and may be useful in antibody cocktails to combat the virus and prevent the development of resistance. —VV

Science, this issue p. 950

GEOPHYSICS

Finding the Emperor's head

Volcanic island and seamount chains form from deep-seated plumes of hot material upwelling through the mantle. The most famous of these is the Hawaiian-Emperor seamount chain. However, a large volcanic structure associated with a plume head that should precede the chain has long been missing. Wei *et al.* finally identified the likely location of this structure in the mantle under eastern Russia. The structure was likely subducted 20 million to 30 million years ago, and the location helps constrain several geodynamic processes. —BG

Science, this issue p. 983

IN OTHER JOURNALS

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LIGHT POLLUTION

Too bright to breed

Most coral species reproduce through broadcast spawning. For such a strategy to be successful, coordination has had to evolve such that gametes across clones are released simultaneously. Over millennia, lunar cycles have facilitated this coordination, but the recent development of bright artificial light has led to an overpowering of these natural signals. Ayalon *et al.* tested for the direct impact of different kinds of artificial light on different species of corals. The authors found that multiple lighting types, including cold and warm light-emitting diode (LED) lamps, led to loss of synchrony and spawning failure. Further, coastal maps of artificial lighting globally suggest that it threatens to interfere with coral reproduction worldwide and that the deployment of LED lights, the blue light of which penetrates deeper into the water column, is likely to make the situation even worse. —SNV

Curr. Biol. 10.1016/j.cub.2020.10.039 (2020).

Night light from coastal cities overpowers natural signals for coral spawning from neighboring reefs.

SIGNAL TRANSDUCTION

How RAS mutations really work

Mutations in the small guanine triphosphatase RAS occur in many human tumors and are thought to act by activating the mitogen-activated protein

kinase (MAPK, also called ERK) signaling pathway. Gillies *et al.* used imaging of live single cells to measure MAPK activity in cells expressing a single wild-type or mutant isoform of human RAS. The dynamic range of the signaling pathway and its growth factor responsiveness were surprisingly



INFECTIOUS DISEASE

Undercover parasites

The protozoan *Plasmodium falciparum* is transmitted from mosquitoes to humans, where it replicates in red blood cells to cause malaria. In many countries where malaria is endemic, most transmission occurs during the rainy season, so how does the parasite persist during the dry season? Andrade *et al.* analyzed *P. falciparum* from the blood of Malian individuals during the dry season and found that they had low numbers of parasites and no symptoms. Compared with the febrile cases that occur during the rainy season, parasites in asymptomatic infections exhibit distinct gene expression patterns and reduced binding to the endothelium lining blood vessels. Asymptomatic cases also show longer circulation and continual clearance of infected red blood cells by the spleen. Such low-level infections do not stimulate an acute immune response and can persist until the next transmission season, when mosquitoes can breed and resume transmission. —GKA
Nat. Med. 10.1038/s41591-020-1084-0 (2020).

The rainy season in Mali is the trigger for mosquito breeding and transmission of persistent infections of human malaria parasites.

unperturbed. Although RAS mutants are biochemically more active, negative feedback and other regulatory mechanisms still exert control. The oncogenic effects of RAS mutations could reflect a small increase in baseline activity of the pathway. RAS mutations may be common in cancer in part because they can be constrained and thus do not lead to cell death. —LBR

Mol. Syst. Biol. 16, e9518 (2020).

TRANSPOSONS

Transposable drivers or passengers?

Transposable element activity has been associated with cancer genomes, but whether this activity drives cancers or is incidental to tumorigenesis has been difficult to resolve. Tiwari *et al.* tested the function of the oncogene p53 on LINE1s, transposable elements found in human cells. Oncogene p53 stimulates repressive histone marks on LINE1s, which keeps them from replicating. If p53 becomes mutated in human cells, the epigenetic repressors on

the LINE1s are not maintained. This allows LINE1s to become hyperactivate and replicate within the genome. In some cases, this causes chromosomal breakage, a hallmark of p53 loss-of-function cancers, and stimulates inflammation. Thus, when function is lost in p53 mutants and LINE1 activity increases, an acute oncogenic crisis looms. —LMZ

Genes Dev. 34, 1439 (2020).

PHYSICS

Testing an exotic magnet

In quantum spin liquid (QSL), an exotic state of matter predicted to occur in certain materials, spins remain in a liquid-like state down to the lowest temperatures. A theoretical realization of a QSL is the Kitaev model, where spins reside on a two-dimensional hexagonal lattice. The layered material RuCl₃ is thought to display the Kitaev model physics. Modic *et al.* studied magnetic anisotropy in RuCl₃. They focused on the magnetotropic coefficient, which reflects the rigidity of a material to rotation in a magnetic field. In a certain temperature range, the

coefficient scaled linearly with the magnetic field, indicating that the relevant energy scales were those set by temperature and magnetic field rather than by magnetic interactions intrinsic to the material. —JS

Nat. Phys. 10.1038/s41567-020-1028-0 (2020).

ORGANOMETALLICS

A crystallographic conundrum

X-ray crystallography is often construed as the most direct means of characterizing molecular structure. Nonetheless, it still relies on an accurate assessment of elemental composition to begin with. Amemiya *et al.* report a strange case in which a structure previously assigned to a cadmium carbonyl compound appears much more consistent with a rhenium carbonyl. Although the initial refinement statistics seemed reasonable, the ratio of displacement parameters for the metal versus the ligand atoms was unusually small. The authors further concluded that

coordinative carbon and chlorine sites in the ligands were more likely to be nitrogen and sulfur, respectively. —JSY

Chem. Sci. 10.1039/d0sc04596a (2020).

PEPTIDE TOXINS

Redirecting a wasp's sting

Venomous animals typically produce peptides and proteins that have potent biological activities through their interaction with membranes or cellular targets. Silva *et al.* analyzed the sequence and structure of a short peptide toxin from the wasp *Vespula lewisii* and reengineered it into an antimicrobial peptide. Modifications to the end of the peptide reduced toxicity to mammalian cells while preserving the ability to disrupt the outer membrane of Gram-negative bacteria. Antimicrobial activity in mouse infection models demonstrated promising potential for the original design and various analogs. —MAF

Proc. Natl. Acad. Sci. U.S.A. 117, 26936 (2020).