

the activation of glial cells. The spread was mediated by gliotransmitters that diffuse widely, even reaching the cerebrospinal fluid at biologically relevant concentrations. —PRS

Science, this issue p. 1144

STRUCTURAL BIOLOGY

Zika virus is fit to be tied

Zika virus (ZIKV) has been associated with fetal microcephaly and Guillain-Barré syndrome. Other mosquito-borne flaviviruses, such as dengue virus, encode noncoding subgenomic flavivirus RNAs (sfRNAs) in their 3' untranslated region that accumulate during infection and cause pathology. Akiyama *et al.* now report that ZIKV also produces sfRNAs that resist degradation by host exonucleases in infected cells. The authors solved the structure of one of ZIKV's sfRNAs by x-ray crystallography and found that the multi-pseudoknot structure that it adopts underlies its exonuclease resistance. —KLM

Science, this issue p. 1148

HEMATOPOIESIS

How to maintain hematopoietic stem cells

Hematopoiesis provides the body with a continuous supply of blood cells (see the Perspective by Sommerkamp and Trumpp). Taya *et al.* report that amino acid content is important for hematopoietic stem cell (HSC) maintenance in vitro and in vivo. Dietary valine restriction seems to “empty” the mouse



Hematopoietic stem cell

bone marrow niche. Ito *et al.* used single-cell approaches and cell transplantation to identify a subset of HSCs at the top of the HSC hierarchy. Self-renewal relied on the induction of mitophagy, a quality-control process linked to a cell's metabolic state. Both studies may be helpful in improving clinical bone marrow transplantation. —BAP

Science, this issue p. 1103, p. 1152; see also p. 1156

VACCINATION

Protecting by changing the code

Live attenuated vaccines can be very potent, but their potential to revert to their pathogenic form limits their use. In an attempt to get around this, Si *et al.* expanded the genetic code of influenza A viruses. They propagated viruses that were mutated to encode premature termination codons (PTCs) in a cell line engineered to be able to express these flu proteins. Despite not being able to replicate in conventional cells, PTC-containing viruses were highly immunogenic and protected mice, guinea pigs, and ferrets against influenza challenge. —KLM

Science, this issue p. 1170

OXIDATIVE STRESS

Overactive antiviral responses in lupus

Detection of viral RNAs causes oligomerization of mitochondrial antiviral signaling (MAVS) protein, which leads to the production of type I interferons (IFNs). Buskiewicz *et al.* found that MAVS oligomerization in the absence of virus may contribute to lupus disease severity. Mitochondrial reactive oxygen species (ROS) induced MAVS oligomerization and type I IFN production in uninfected cells. The MAVS C79F variant, which is associated with decreased lupus severity, did not oligomerize in response to ROS, and cells expressing this variant produced less type I IFN. —JFF

Sci. Signal. **9**, ra115 (2016).

IN OTHER JOURNALS

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



INSECT GENOMICS

Acquiring the genes to digest wood

The larvae of the invasive Asian longhorned beetle burrow into and kill trees. On sequencing the genome, McKenna *et al.* found that gene transfers from fungi and bacteria, followed by functional evolution and gene family expansions, appear to have conferred the ability to the beetles to find plants, digest cellulose, and nullify harmful compounds made by the plants. Interestingly, other wood-feeding beetles appear to have undergone a similar evolutionary trajectory, one that is distinct from that of wood-feeding insects such as termites. —LMZ

Genome Biol. **17**, 227 (2016).

Asian longhorned beetle larvae digest wood by using acquired genes.

PLANT BIOLOGY

Targeting tip growth

Tip growth, which characterizes cells as diverse as root hairs and brain neurons, depends on secretory vesicles to add new plasma membrane in a defined subdomain. Bloch *et al.* show that in growing *Arabidopsis* pollen tubes, the exocyst subunit SEC3a is a target for secretory vesicles at the tip. SEC3a

localization defines the axis of growth and the domain where new pectin is added to the cell wall. Pollen tubes of tobacco, which are fatter than those of *Arabidopsis*, showed more complex patterns: During isotropic growth, SEC3a was distributed in a broad subapical domain, whereas during rapid elongation growth, SEC3a was localized to the apical tip. —PJH

Plant Physiol. **172**, 980 (2016).

CELL BIOLOGY

Getting an UPR hand on recovERy

The endoplasmic reticulum (ER) is an intracellular membranous labyrinth that provides the entry point to the secretory pathway. During proteotoxic stress, the ER expands to cope with the added burden of misfolded or unfolded proteins. This is termed the unfolded protein response (UPR). Fumagilli *et al.* asked how, after the stress is removed, the cell returns its ER to normal levels. In cultured mammalian cells, they uncovered a process called “recovER-phagy.” During recovER-phagy, excess ER membranes are targeted for destruction. Unexpectedly, a component of the ER protein translocation machinery, Sec62, appears to provide a key autophagy receptor in this process, independently of its canonical function. —SMH

Nat. Cell Biol. **18**, 1173 (2016).

HUMAN BIOLOGY

Neuron development in human embryos

Mammalian fertility depends on the secretion of gonadotropin-releasing hormone (GnRH) from a population of specialized neurons residing in the hypothalamus. During embryogenesis, these neurons develop at the olfactory placodes, and they subsequently migrate to the brain. Very little is known about the process in humans, however. Casoni *et al.* have studied this in depth by using donated human embryonic tissue. They tracked the differentiation and migration of GnRH neurons through the first trimester of gestation by examining samples at different developmental stages and identified important differences between humans and rodents. Unexpectedly, they also found that some of these neurons migrate to extra-hypothalamic regions of the brain, suggesting that they play roles in other processes not linked to fertility. —SH

Development 10.1242/dev.139444 (2016).



Corals share gastrulation signals for mouth-anus development with vertebrates.

ANIMAL DEVELOPMENT

Keeping tissue layers separate

Gastrulation is the conversion of an embryo from a single sheet of pluripotent cells into a structure with multiple tissue layers. This process establishes the future body plan and is highly conserved among metazoans. In vertebrate embryos, the transcription factor Brachyury delineates the middle tissue layer (the mesoderm) from the outer (ectoderm) and the inner (endoderm) layers. Yasuoka *et al.* discovered that in coral embryos, which lack a mesoderm, *brachyury* is regulated by the same signaling pathway as that found in vertebrates. In corals, it demarcates ectoderm from endoderm and is essential for the development of the mouth-anus. —SH

Curr. Biol. **26**, 2885 (2016).

ROBOTICS

Autonomously eat, digest, move, repeat

Truly autonomous robots require a robust and independent way to move and a means to harvest energy from the environment. Philamore *et al.* push toward these goals by devising a soft robotic mouth for use in aquatic environments that gathers organic biomass, which is processed in a microbial fuel cell to generate useful energy. Origami-like folding of a membrane pulls particulate-laden water into the mouth; the mouth is then closed for operation of the microbial fuel cell, which can be isolated

from the water and connected in series. When combined with state-of-the-art electronics, the energy output from the fuel cell was boosted to usable values for powering motors and artificial muscles within the robot. —MSL
Soft Robotics 10.1089/soro.2016.0020 (2016).

NEUROSCIENCE

Side effects for placebo poppers

Patients in clinical trials may see their conditions improve, sometimes dramatically, even when they are in the control arm of the study. Tétrault *et al.* used

brain imaging to analyze the connectivity during placebo and pain relief treatment for arthritis-induced knee pain. Brain activity associated with the placebo effect was recorded in the right midfrontal gyrus circuitry of about half of the participants. In contrast, duloxetine-induced analgesia stimulated activity deep in the right parahippocampal gyrus. In some patients, duloxetine interfered adversely with the placebo effect. The responses of individuals can now be differentiated, and their exposure to ineffective therapies can be monitored. —CA

PLOS Biol. 10.1371/journal.pbio.1002570 (2016).

Science

Keeping tissue layers separate

Sarah Harrison

Science **354** (6316), 1115-1116.
DOI: 10.1126/science.354.6316.1115-e

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