

poppy's biosynthetic pathway for morphine. The enzyme turns out to be an unusual protein that contains both cytochrome P-450 and oxidoreductase modules. Together these modules process two subsequent steps in the biosynthetic pathway. The identification of this enzyme may enable alternate routes for morphine biosynthesis that are less dependent on poppy cultivation. — PJH

Science, this issue p. 309

SEX DETERMINATION

How germ cells become sperm or egg

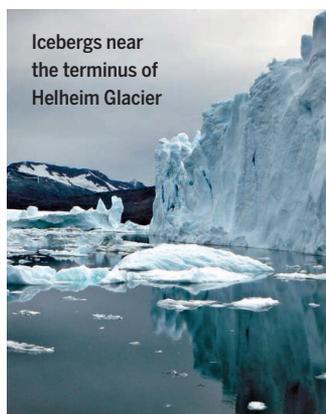
During vertebrate development, germ cells switch from a sexually indifferent to a committed state for either egg or sperm. Signals from somatic gonadal cells are generally thought to influence the sexual differentiation of germ cells. However, Nishimura *et al.* demonstrate that germ cell-intrinsic sex determination cues are at play in the teleost fish medaka. The forkhead box transcriptional factor foxl3 represses the initiation of spermatogenesis. In the absence of foxl3 function, females develop ovaries filled with functional sperm. Thus, the male gonad environment is not required for spermatogenesis. —BAP

Science, this issue p. 328

ICE SHEETS

Movers and shakers

When the edge of an ice sheet breaks off and falls into the sea (calves), the remaining section



Icebergs near the terminus of Helheim Glacier

of the ice sheet moves backward and down and can suffer a glacial earthquake. Murray *et al.* studied calving from Greenland's Helheim Glacier. The forces that cause the change in the motion of the ice sheet at its terminus also trigger the accompanying earthquakes. Because these seismic signals can be detected by instruments located all over the globe, it should be possible to use these glacial earthquakes as proxies for glacier calving. — HJS

Science, this issue p. 305

DRUG DISCOVERY

Long-acting drug to treat resistant malaria

Malaria kills 0.6 million people annually. Currently available drugs are no longer fully effective, because the malarial parasite has developed resistance. Now, Phillips *et al.* have identified a drug, DSM265, that kills both drug-sensitive and drug-resistant parasites by targeting their ability to synthesize precursors required for synthesis of DNA and RNA. DSM265 kills parasites in the blood and the liver and is sufficiently long-acting that it could potentially cure malaria after a single dose or provide effective chemoprevention if given weekly. — OMS

Sci. Transl. Med. **7**, 296ra111 (2015).

INFECTIOUS DISEASE

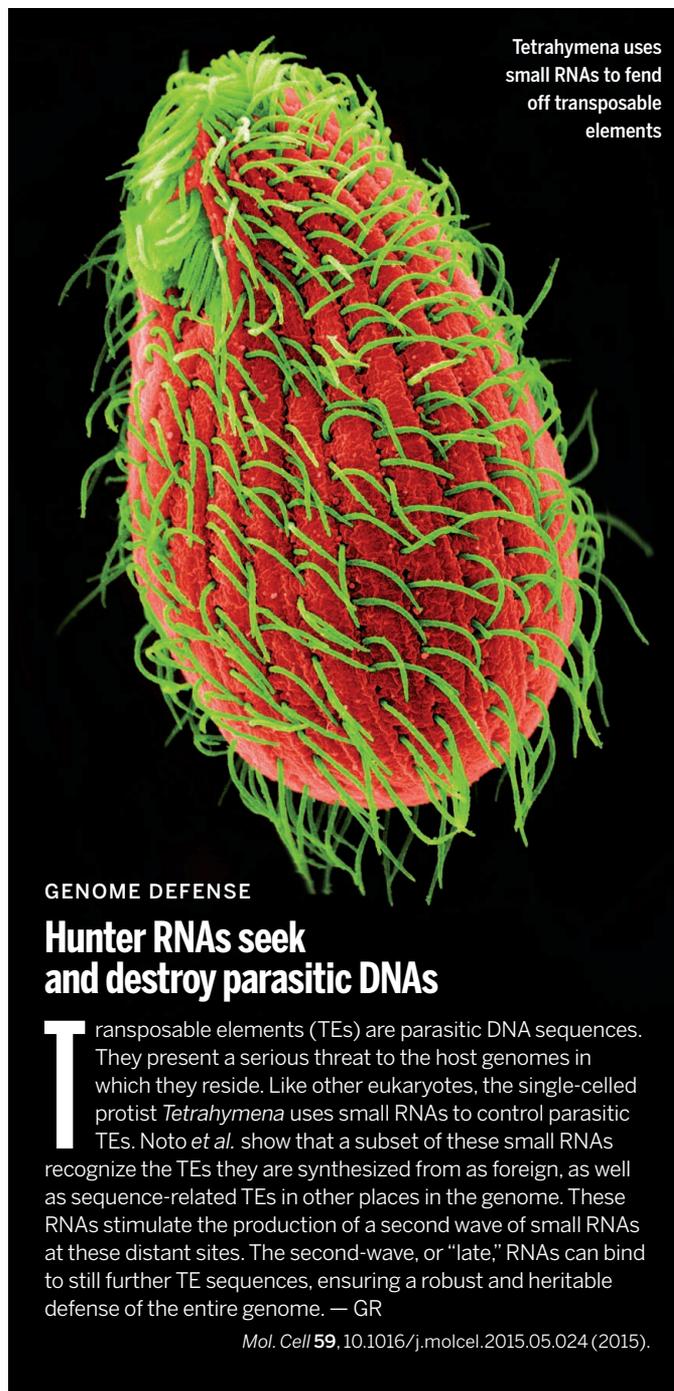
GBS toxin activates mast cells for host defense

Ascending Group B streptococcus (GBS) is a major cause of preterm birth. How the mother defends against GBS infections is not clear. Working in mice, Rajagopal *et al.* found that immune cells, called mast cells, are activated by a lipid toxin produced by GBS. This lipid toxin is an ornithine rhamno-polyene that stains the bacteria red. The toxin assists penetration of the placenta by the bacteria. The toxin also stimulates mast cell degranulation, an early step in host efforts to defeat the bacterial infection. — PLY

Sci. Adv. **10**, 1126/sciadv.1400225 (2015).

IN OTHER JOURNALS

Edited by **Sacha Vignieri** and **Jesse Smith**



Tetrahymena uses small RNAs to fend off transposable elements

GENOME DEFENSE

Hunter RNAs seek and destroy parasitic DNAs

Transposable elements (TEs) are parasitic DNA sequences. They present a serious threat to the host genomes in which they reside. Like other eukaryotes, the single-celled protist *Tetrahymena* uses small RNAs to control parasitic TEs. Noto *et al.* show that a subset of these small RNAs recognize the TEs they are synthesized from as foreign, as well as sequence-related TEs in other places in the genome. These RNAs stimulate the production of a second wave of small RNAs at these distant sites. The second-wave, or "late," RNAs can bind to still further TE sequences, ensuring a robust and heritable defense of the entire genome. — GR

Mol. Cell **59**, 10.1016/j.molcel.2015.05.024 (2015).

ASTROPHYSICS

X-ray echoes used as a cosmic yardstick

Determining accurate distances to astronomical x-ray sources is notoriously difficult, but Heinz *et al.* have developed a new technique for doing so.

They exploited "light echoes" from the object Cir X-1, in which x-rays emitted during a large flare bounced off foreground dust and appeared months later as delayed rings of emission around the source. By comparing the x-ray rings to radio data, they were able to identify the

foreground clouds of dust and thereby measure the distance to Cir X-1 with an accuracy of 10%. Previous estimates had varied by almost a factor of 3. — KTS
Astrophys. J. **806**, 265 (2015).

PHYSICS

A gap in a topological surface state

Topological insulators (TIs) have, in theory, conducting surfaces and insulating bulks. In practice, TIs often have a considerable bulk conductance that masks the conduction from the topologically protected surface states. To make the surface state nonconducting—in other words, to open a gap in its dispersion—researchers usually resort to magnetic doping. Now, Weber *et al.* demonstrate that a topological surface state of the compound Bi_4Se_3 is naturally, although partially, gapped. To show this, the authors use a combination of photoemission measurements and calculations. The results may be more general within the subclass of TIs to which Bi_4Se_3 belongs. — JS

Phys. Rev. Lett. 10.1103/PhysRevLett.114.256401 (2015).

PROTEIN FOLDING

Trapped on the wrong pathway

Protein folding can be described as diffusion over an energy landscape in conformational space to reach an energy minimum that represents a stable folded structure, and it is implicated in many diseases. A particularly dramatic example is the prion protein, PrP, that folds rapidly into a native monomeric structure but also has a stable oligomeric form that causes prion disease. Yu *et al.* used single-molecule force spectroscopy to monitor misfolding of a PrP dimer. The dimer misfolds along a single pathway involving several intermediates, one of which blocks native folding. Diffusion across the energy landscape is 1000 times slower than for the folding of native

prion monomers, probably indicating that many unproductive interactions occur during misfolding. — VV

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1419197112 (2015).

GLOBAL CARBON CYCLE

Seeing the forest from the trees

Boreal forests contain nearly half of the carbon stored by the trees of the world, and thus are a critical component of the global carbon cycle. How much carbon is contained in this part of the ecosystem still is inadequately known, though. Chen and Luo studied the net annual above-ground biomass change of four

major boreal forest types in western Canada over the period between 1958 and 2011 and found that it declined for all of those groups. They attribute the loss to increased tree mortality and reduced growth, caused mostly by persistent warming and decreasing water availability, trends that are expected to escalate in the future. — HJS

Global Change Biol. 10.1111/gcb.12994 (2015).

NEUROSCIENCE

Contextual memory networks in monkey brains

Memory tasks activate a number of areas in the prefrontal cortex of the brain. Lesions in this region

cause memory deficits; however, lesions in only a fraction of the activated areas actually lead to severe memory loss. Osada *et al.* measured whole-brain activity during a memory task in monkeys. The activated areas and their task-specific functional connectivity formed a hierarchical network centered on a hub. This functional hub largely matched the documented sites where lesions had the most dramatic effect. Neighboring sites where lesions had no impact were much less affected. The functional connections of an area predicted the degree of memory loss much better than its role in the anatomical network. — PRS

PLOS Biol. 10.1371/journal.pbio.1002177 (2015).



Angiopoietin-1 expression varies with brain size in guppies

BRAIN EVOLUTION

The genetic underpinnings of brain size

What genes and selective processes lead to an increase in brain size and intelligence is one of the greatest questions in human evolution. Chen *et al.* present findings in fish that may help us understand this process. When guppies were selected for brain size, expression differences were observed in the *Angiopoietin-1* (*Ang-1*) gene. These differences seem to be due to noncoding variation; furthermore, lowering *Ang-1* expression in the zebrafish also affected brain size. On the basis of these results, the authors suggest that further study of *Ang-1* may help provide insight into the evolution of brain size and cognition in other species, including humans. — LMZ

Proc. R. Soc. London Ser. B 10.1098/rspb.2015.0872 (2015).