SIGNAL TRANSDUCTION
Local specificity of growth signals
The mechanistic target of rapamycin complex 1 (mTORC1) regulates cell growth in response to nutrients. Marat et al. found that the lipid phosphatidylinositol 3,4-bisphosphate [PI(3,4)P₂], which, when generated at the cell surface, is linked to stimulation of mTORC1 and promotion of cell growth, does the opposite when synthesized at the late endosome or lysosome. In cells deprived of nutrients, PI(3,4)P₂ was produced at lysosomes, where it recruited an inhibitor of mTORC1. The results elucidate the complex regulation of mTORC1, which is altered in human diseases such as cancer and neurodegeneration. —LBR

HIV CLINICAL TRIALS
Vaginal microbiome influences HIV acquisition
Tenofovir is a preexposure drug used to prevent HIV infection. In clinical trials, tenofovir was effective for men, but not women. Klatt et al. now show that tenofovir efficacy in women depends on the composition of the vaginal microbiome (see the Perspective by Tuddenham and Ghanem). In a clinical trial of 688 women, tenofovir was three times as effective among those with a Lactobacillus-dominant vaginal microbiome as it was among other women. Gardnerella vaginalis tended to predominate in the women for whom tenofovir was less effective, and the authors found that the organism could rapidly metabolize and thereby inactivate the drug. —PNK

Science, this issue p. 938; see also p. 907

CLIMATOLOGY
Human impacts on rainfall distribution
Changes in precipitation patterns could disrupt agricultural productivity. On the basis of paleoclimatic records, Putnam and Broecker argue that future rainfall patterns will change in response to human-induced global warming. Especially alarming is the suggestion that the effects will differ from one season to the next. During summers, for example, regions that are now wet will become wetter, and regions that are now dry will become drier. During northern winters, rain belts and drylands will expand northward. Thus, climate change projections need to be taken into account when evaluating future freshwater resources on a global scale. —KVH


CANCER
No escape for KRAS mutant tumors
RAS mutant tumors are usually resistant to PARP inhibitors, one of the newest classes of anticancer therapeutics. Sun et al. discovered that inhibition of MEK or ERK (proteins in the RAS pathway) reversed PARP inhibitor resistance in KRAS mutant tumors in mouse models of aggressive tumors such as ovarian and pancreatic cancer. Because MEK and PARP inhibitors are clinically approved drugs, they provide a readily translatable therapeutic combination to treat human cancer patients. —YN


ANIMAL COMMUNICATION
Flexible geckos
In noisy environments, mammals (including humans) and birds alter the amplitude of their calls, a phenomenon termed the Lombard effect. Brumm and Zollinger tested whether such an effect also occurs in reptiles—specifically, the noisy tokay gecko (Gekko gecko). They found no evidence of amplitude alteration, consistent with its absence in other herpetiles. However, they did find that the lizards modulated their calls to be better heard. The lizards both increased the length of each call type and varied the percentages of call types made, with calling in noisy environments including more loud “geck-o” calls. These results suggest that reptile call flexibility may be higher than thought and suggest that the Lombard effect evolved independently in the bird and mammal lineages. —SNV


PLANT EVOLUTION
Arabidopsis out of Africa
Arabidopsis thaliana is one of the most studied plant species, and, as a model organism, there is a need to understand its origin and genetic diversity. Durvasula et al. investigated the genetic diversity of Arabidopsis populations from Africa. Contrary to previous hypotheses suggesting that Arabidopsis was introduced recently to Africa, the samples examined did not derive from other continents. Furthermore, Arabidopsis samples examined from sub-Saharan Africa were native and exhibited more variation and ancient diversity than Eurasian samples, suggesting an African origin. Interestingly, the spread of Arabidopsis out of Africa reflects the patterns of genetic diversity seen in other species, including humans.
ImmunoLoGy
Orchestrating pathogen defenses in the skin
In the tropics, the single-celled parasite *Leishmania major* transmitted by biting sandflies causes cutaneous leishmaniasis. This difficult-to-treat infection causes disfiguring lesions, and there is no protective vaccine. Glennie et al. studied a population of skin-resident CD4+ memory T cells that can promote a protective immune response in mice. They found that within 3 days of infection, these cells recruited inflammatory monocytes to the infection site. The monocytes helped to kill the parasites by releasing nitric oxide and reactive oxygen species. The skin-resident T cells were key to protection; circulating T cells could not substitute for their protective role within the skin. Thus, the barrier function of the skin is fortified by the presence of these immunological sentinels. —SMH  

Near-Field Cosmology
Milky Way satellites going in circles
The satellite dwarf galaxies that orbit our Milky Way can be used to constrain models of cosmology. Cautun and Frenk examined the 10 Milky Way satellites whose three-dimensional velocities have been measured precisely and compared them with a cosmological simulation. They find that the observed velocities are mostly tangential (i.e., favoring circular orbits), whereas the simulation predicts that radial motions should dominate. That difference is unlikely but not impossible: Only a few percent of simulated galaxies are as extreme as the Milky Way. Either the observations or models are biased, the Milky Way is a statistical outlier, or our understanding of cosmology is incomplete. —KTS  

Physics
A quantum-well magnetic tunnel junction
Magnetic tunnel junctions, which are essential to the function of hard drive read heads in modern computers, allow current to pass when the spins of their two ferromagnetic layers are pointing in the same direction. Eisenstein et al. built a magnetic tunnel junction out of much more exotic components: a bilayer of GaAs quantum wells, each hosting a two-dimensional electron gas. A perpendicular external magnetic field caused the electrons in each well to group into the so-called Landau energy levels. When the filling fraction was 5/2 in one layer and 7/2 in the other, the junction acted as a diode, allowing the tunneling of current in essentially only one direction. This suggests that each layer acted like a ferromagnet, with full spin polarization. —JS  

Ocean Oxygen
Less oxygen in a warmer ocean
Climate warming should decrease the concentration of dissolved oxygen (O2) in the surface ocean, for a variety of reasons. This trend, predicted on theoretical grounds and by ocean models, has been difficult to detect within the much greater range of natural variability, though. Ito et al. analyzed existing measurements of O2 in the ocean collected from 1958 to 2015, and they report that a widespread negative O2 trend has begun to emerge. Further work will be needed to understand which mechanisms are responsible for the global and regional trends, however. —HJS  

Climate Change
Greening the Antarctic
The ecological consequences of climate change in the polar regions are becoming increasingly evident. A study in the Antarctic now shows how terrestrial vegetation may be responding to rising temperatures. Amesbury et al. analyzed peat cores spanning the past 150 years from moss banks in the western Antarctic Peninsula. Multiple proxies in the cores—including carbon isotope discrimination, populations of testate amoebae, and the balance of moss growth and decomposition—are indicative of an increase in biological activity over the past 50 years, coinciding with the increasing rate of temperature rise. This activity is likely to lead to further greening in the Antarctic, as is already evident in Arctic landscapes. —AMS  

Antarctic moss banks show increased biological activity consistent with the effects of warming temperatures.
Flexible geckos
Sacha Vignieri

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