

POLIO ERADICATION

Two vaccines together are better than one alone

Polio is proving difficult to eradicate. Making the choice between administering a live attenuated vaccine orally (Sabin) or an inactivated vaccine (Salk) by injection has been highly controversial. Patients prefer the Sabin vaccine, but it requires many doses to offer immunity. Jafari *et al.* tested the two vaccines together in northern India. The injected vaccine significantly reduced virus shedding and boosted intestinal mucosal immunity in children already given the oral vaccine. Thus, using both vaccines could help speed the eventual global demise of polio. — CA

Science, this issue p. 922

CLIMATE

Deep-sea warming slows down global warming

Global warming seems to have paused over the past 15 years while the deep ocean takes the heat instead. The thermal capacity of the oceans far exceeds that of the atmosphere, so the oceans can store up to 90% of the heat buildup caused by increased concentrations of greenhouse gases such as

carbon dioxide. Chen and Tung used observational data to trace the pathways of recent ocean heating. They conclude that the deep Atlantic and Southern Oceans, but not the Pacific, have absorbed the excess heat that would otherwise have fueled continued warming. — HJS

Science, this issue p. 897

TUBERCULOSIS

How immune cells fight TB and show it

Mycobacterium tuberculosis causes an infection that can sometimes kill, but it proceeds to disease in only about 10% of individuals. Now, Montoya *et al.* provide a clue to how most people keep this bacterium in check. They show that when people fight tuberculosis, their immune cells secrete the cytokine interleukin-32, which may work through an antimicrobial pathway that uses vitamin D. The researchers analyzed five different clinical data sets and found that interleukin-32 may indicate latent tuberculosis. Interleukin-32 therefore may both contribute directly to the host response to tuberculosis and reflect protection against the disease. — ACC

Sci. Transl. Med. **6**, 250ra114 (2014).

IMMUNOGENETICS

Opening and closing blood enhancers

As cells develop and differentiate into different types, the shape and accessibility of their DNA can change. Lara-Astiaso *et al.* studied this phenomenon in blood. They developed a technique that examines a relatively small number of cells to identify the changes that affect DNA during blood development. They found that the DNA of noncoding regions, called enhancers, is set in an open position when cells are undifferentiated and able to take on a variety of roles and gradually closes as cells mature into their final forms. — LMZ

Science, this issue p. 943

IN OTHER JOURNALS

Edited by **Kristen Mueller** and **Jesse Smith**

NEUROSCIENCE

Tissue mimics brain's cortical layers

They may look like Play-Doh, but these colorful spongy rings are alive and may one day even learn. Tang-Schomer *et al.* engineered the rings to mimic the structure and function of the six layers of human cortical brain tissue.

Brainlike tissue is a practical test bed

The researchers coaxed the neurons to grow around a matrix of silk proteins immersed in collagen gel. The cells cling to the structure as they branch out and connect, forming 3D networks resembling real neural circuits, the authors say. The team hopes to keep the neuronal sponge alive for 6 months, longer than any previous model, to study how its neural networks respond to insults such as disease or traumatic injury, and perhaps to see if its activity is altered by experience, a form of learning. — EU

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1324214111 (2014).



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CANCER TREATMENT

How to boost cancer immunotherapy

Why does our immune system protect us so well against infection but not against cancer? In part, this is because cancer cells use clever ways to escape immune responses designed to destroy them. A therapeutic strategy called "immune checkpoint blockade" thwarts these escape tactics and renders cancer cells vulnerable to immune attack. Although remarkably effective, only a subset of patients respond to it. Seeking possible explanations for this limited response, Kim *et al.* identified a specific immune cell population that interferes with the therapy in mouse tumor models. When the authors coadministered drugs that reduced

the levels of these cells (called myeloid-derived suppressor cells), the efficacy of immune checkpoint blockade therapy greatly improved. — PAK

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1410626111 (2014).

EDUCATION

Students produce assessment materials

If teaching someone else is the best way to learn, what will students gain from writing their own test questions? Every week, as part of an introductory undergraduate physics class, Bates *et al.* required students to contribute one original test question, answer five others, and critique an additional three. The researchers used Bloom's taxonomy criteria for cognitive



Oceans stow recent heat excesses

PHOTOS: (TOP TO BOTTOM) TUFTS UNIVERSITY; GETTY IMAGES/ISTOCKPHOTO

level and quality of explanation—a standard scale—to rate the questions. Seventy-five percent of questions produced by first-year students were of high quality, with a large portion of the questions constituting true problems, as opposed to simple multiple choice questions. Overall, involving students in the summative assessment strategy for their own course increased both engagement and learning. — MM

Phys. Rev. ST Phys. Educ. Res. 10.1103/PhysRevSTPER.10.020105 (2014).

ENVIRONMENTAL SCIENCE

How much methane from landfills?

Landfill sites emit substantial amounts of the greenhouse gas methane, but how much of the methane in the atmosphere comes from such sites?



Methane emission varies daily at landfills

Scientists have measured widely varying fluxes, so estimates have been highly uncertain. Xu *et al.* measured methane emissions from a landfill site in Lincoln, Nebraska, from June to December 2010. They found that emissions varied widely from one day to the next, depending on the air pressure: The higher the air pressure, the lower the emissions. They conclude that measurements must be taken for at least 10 days to obtain a good estimate of annual methane emissions from landfill sites. This conclusion also could apply to other environmental sources

of methane, such as wetlands and peatlands. — JFU

Global Biogeochem. Cy. 10.1002/2013GB004571 (2014).

STEM CELL NUMBER

Counting human intestinal stem cells

The cells that line the intestine, called intestinal epithelial cells, turn over, meaning that old ones die and new ones take their place. Stem cells located at the base of fingerlike structures called intestinal crypts support this high rate of turnover. Baker *et al.* investigated how this process works using human cells. The authors traced the lineage of cells in human intestinal crypts by counting naturally occurring mitochondrial DNA mutations. They identified five to six stem cells per crypt, which itself divides about once every 30 to 40 years. People who had a mutation in the APC gene, common in colon cancer, had more stem cells, and their crypts divided at a faster rate. — BAP

Cell Rep. 10.1016/j.celrep.2014.07.019 (2014).

MYCOBACTERIA

Bacteria scrimp and save themselves

Proteasomes are large protein complexes that degrade cellular proteins. Although widely conserved in mammals, only some bacteria species have machinery resembling the mammalian system (called Pup in bacteria). But why? In *Mycobacterium tuberculosis*, Pup contributes to virulence. Elharar *et al.* now report that in order to survive starvation, non-virulent mycobacteria need Pup too. If nitrogen supplies are low (nitrogen is key for mycobacteria growth), the Pup machinery will chew up some of the bacterium's own proteins to recycle amino acids. This diverts amino acids into maintaining basic metabolism until, hopefully, living conditions improve. — CA

EMBO J. 10.15252/emj.201387076 (2014).



Frequency matters in bat calls

ANIMAL COMMUNICATION

Bat calls shaped by sexual selection

Animals use a variety of signals to communicate, especially during mating. Bats, however, face an unusual problem. Using visual signals is challenging because they are nocturnal; and because they use calls to locate food, food demands constrain how these calls can evolve. Peuchmaille *et al.* now report that sexual selection shapes the calls of Meheley's horseshoe bats. They found that the frequency of males' calls indicated their size and that females preferred the higher-frequency calls emitted by larger males. Furthermore, these larger males sired more offspring. Higher-frequency calls may make these bats less efficient at tracking food, which suggests that the calls evolved in response to countervailing constraints. — SNV

PLOS One 10.1371/journal.pone.0103452 (2014).

ASTROPHYSICS

Giants in the outer halo of the Milky Way

Most stars in the Milky Way reside in the familiar spiral disk structure and probably formed in place. Stars in the galaxy's much larger and far sparser spherical halo, on the other hand, are unlikely to have formed where the gas density is so low. Too few halo stars are known, however, for scientists to model their

origins. Bochanski *et al.* examined the motion and brightness of some candidate stars, and identified two that are the most distant members of our galaxy yet found, more than 30 times farther from the galactic center than the Sun. These observations should help tell whether these stars were captured from dwarf galaxies or ejected from the Milky Way disk. — MMM

Astrophys. J. Lett. 10.1088/2041-8205/790/1/L5 (2014).

Science

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