of summer sea-ice loss differ substantially, making it difficult to evaluate the pace of the loss. Notz and Stroeve observed a linear relationship between the monthly-mean September sea-ice area and cumulative CO₂ emissions. This allowed them to predict Arctic summer sea ice directly from the observational record. Interestingly, most models underestimate this loss. —HJS

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RADIATION DAMAGE
AIMing to block tissue damage
Ionizing radiation kills actively dividing cells such as those in the gut and in the bone marrow. Hu et al. found a pathological role for the protein AIM2 in irradiation-induced tissue damage. AIM2 is best known for its role in sensing double-stranded DNA in the cytoplasm and alerting the body to infections. It seems that AIM2 also senses DNA damage caused by radiation and then triggers intestinal epithelial cells and bone marrow cells to die. Deficiency in AIM2 protected mice from irradiation-induced gastrointestinal syndrome and hematopoietic failure. —KLK


CIRCADIAN RHYTHMS
Airplane air
Can flying help alleviate jet lag? Studies of the biochemical mechanisms that synchronize biological clocks throughout the body show that the low-oxygen environment of airplanes may actually help you adjust to your new time zone. Adamovich et al. observed daily cycles in the concentration of oxygen in blood and tissues of mice kept on a normal light-dark cycle. These variations were sufficient to alter the abundance of the transcription factor HIF1α (hypoxia-inducible factor 1α). In cultured cells, changes in oxygen concentration could entrain the circadian clock only if HIF1α was present. When animals were subjected to a 6-hour change in the light cycle (like traveling eastward on a jet), animals kept in a low concentration of oxygen adapted more quickly. —LBR

Cell Metab. 10.1016/j.cmet.2016.09.014 (2016).

HOST DEFENSE
How macrophages build a wall
Granulomas are a defining feature of infection with Mycobacterium tuberculosis, the causative agent of tuberculosis. Macrophages are the primary component of these cell structures, which are thought to protect the host by walling off the pathogen. Cronan et al. studied granulomas in optically transparent zebrafish infected with M. marinum to directly visualize how they form. They observed that macrophages in

Science, this issue p. 765

IMAGING
A look at early multiple sclerosis
In multiple sclerosis and similar diseases in animals, the brain becomes inflamed, which ultimately causes neurons to degenerate. Gerwien et al. found two protein-degrading enzymes that are absolutely required for this process: MMP-2 and MMP-9. MMP-9 resides in immune cells and is required for the entry of these cells into the brain as the disease begins. The authors developed tools to visualize MMP inhibitors at this initial stage of multiple sclerosis and its mouse equivalent, just as immune cells began their inflammatory infiltration of the brain. —KLK


IN OTHER JOURNALS
Edited by Sacha Vignieri and Jesse Smith

The low oxygen concentration in airplane air may help fight jet lag.

PHOTOS FROM LEFT: GERWEIN ET AL.
Edited by Sacha Vignieri and Jesse Smith

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CONSERVATION GENOMICS

Essential immigrants

As more and more species near extinction, conservation efforts will need to understand the genetic structure and consequences of declining population size. Chen et al. document the negative effects of reduced population connectivity over multiple generations in the Florida scrub jay. Their 19-year data set demonstrates that, for the Florida scrub jay, immigration between small satellite populations into larger, more stable groups is an essential component for maintaining genetic diversity. The reduction in the number of individuals, and hence in the size of satellite populations and immigration, has resulted in increased levels of inbreeding and reduced fitness in this species, demonstrating the impact of habitat fragmentation. —LMZ


NANOMATERIALS

A nano dagger to the heart

Nanomaterials consist of nanometer-scale molecules or particles, which can have unusual mechanical, electrical, or optical properties. Industrial-scale fabrication of such material requires an assessment of their potential toxicity. Zhu et al. use molecular modeling and intracellular imaging to show that long (high aspect ratio), stiff carbon nanotubes can damage lysosome vesicle membranes. Persistent contact with the tip of the tube results in loss of membrane lipids and lysosome membrane instability, potentially activating the cell death pathway. —GR


AQUATIC MICROBIOLOGY

Lake bacteria make methane from P

Freshwater lakes are a major contributor of methane to the atmosphere—more so than the world’s oceans combined. Some anaerobic microorganisms produce methane in sediments or deep anoxic water, but methane can also be produced biologically in oxic surface water. In the upper layers of methane-supersaturated Lake Matano, Indonesia, Yao et al. find that bacterial methane production is linked to phosphorous availability. Heterotrophic bacteria break down methylphosphonate as a phosphorus source, releasing methane in the process. Methane production decreases in culture when phosphate is added. Models for methane emissions from lakes should therefore incorporate nutrient availability in oxic water columns as another potential factor to help improve global methane predictions. —NW


ADAPTIVE OPTICS

Becoming clearer step by step

When a camera or sensor is in an environment of strong illumination or high background noise, scattering from the object, or glare, can be so high that the object can be obscured. Daniel et al. used an adaptive optics technique to manipulate the wavefront of a coherent light source illuminating an object, in this case a toy mannequin, and showed that the direction of scattered light from the object can be controlled. As the wavefront of the illuminating light is iteratively manipulated through a spatial light modulator, the glare is reduced and the image becomes clearer. The technique is general and could be applied to different scenarios such as sensing, microscopy, and other demanding imaging tasks. —ISO


GEOPHYSICS

Metallic melt for the mantle

Ultralow velocity zones (ULVZs) are distinct and dense patches at the very base of Earth’s rocky mantle. Liu et al. suggest that iron carbide may be a vital component of ULVZs on the basis of measurements of iron carbide melting temperatures. Iron carbides could form as iron and carbon exsolve from slabs subducting into the mantle. The high temperature near the base of the mantle could then lead to iron carbide melting and ponding in the ULVZ regions. If this hypothesis is correct, ULVZs are an unrecognized and important carbon reservoir within Earth. —BG