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

EVOLUTIONARY GENOMICS
Identifying genes under recent selection
Evolutionary analyses aim to identify recent genetic changes that are likely to have been subject to selection. Field et al. present a method to identify such changes, the singleton density score, which they applied to over 3000 human genomes. Over the past ~100 generations (2000 to 3000 years), Europeans are likely to have experienced selection for genetic variants, including those that affect skin and hair pigmentation, as well as height. —LMZ

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

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. —KLM

CELL BIOLOGY
A new paradigm for IP₃ signaling
The second-messenger inositol trisphosphate (IP₃) stimulates calcium release from the endoplasmic reticulum (ER). Dickinson et al. triggered the focal release of IP₃ in animal cells and measured calcium “puffs” — intense, localized increases in calcium released from the ER (see the Focus by Leybaert). IP₃ diffused much more slowly within cells than had been originally measured in vitro. Thus, rather than functioning as a global cellular signal, IP₃ can produce local signals, increasing the complexity of information that can be encoded in responses to IP₃-generating stimuli. —NRG

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
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


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


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


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

Optica 3, 1104 (2016).

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

Metallic melt for the mantle
Brent Grocholski

Science 354 (6313), 717-718.
DOI: 10.1126/science.354.6313.717-g