

in the nitrogen-bearing precursor drives the reaction with no need for an external oxidant. All of this can be done for both intermolecular and intramolecular couplings. —JSY

*Science*, this issue p. 1144

## MATERIALS SCIENCE

### Flexible and lightweight shielding

Electromagnetic shielding can be used to isolate devices from outside interference or to protect people from the radiation generated by a device. Shielding usually takes the form of metal sheets, screens, or foams, but often a flexible and lightweight material is preferable. To fulfill this goal, Shahzad *et al.* have constructed a shielding material from flakes of transition metal carbides embedded in a polymer matrix. A multilayered material improves shielding effectiveness owing to the greater absorption resulting from multiple internal reflections of the electromagnetic waves. —MSL

*Science*, this issue p. 1137

## INTERNET ACCESS

### Persistent political bias in Internet allocation

Many groups are using the Internet as a way to share information, organize, and increase their influence. However, there is a digital divide that impedes such efforts that cannot be explained by socioeconomic or geographic factors. Weidmann *et al.* show that ethnic groups who are excluded from political power within countries also have less access to the Internet. —BJ

*Science*, this issue p. 1151

## CELL MIGRATION

### Dissecting collective cell migration

During development or wound healing, cells frequently move in concert. Sunyer *et al.* describe a mechanism by which clusters of cells respond to a

gradient in the stiffness of the extracellular matrix. The same machinery that senses stiffness, the actomyosin cytoskeleton, is responsible for propulsion toward it. This so-called collective durotaxis appears to be a simple and primitive, but nonetheless efficient, mechanism by which clusters of cells migrate. —SMH

*Science*, this issue p. 1157

## ALZHEIMER'S DISEASE

### Losing memory by protein cleavage

Learning and remembering changes the shape of neurons. In mouse models of Alzheimer's disease, neurons do not undergo the morphological changes induced by learning and remembering and they also have defects in calcium signaling. Tong *et al.* found that forms of presenilin-1 (PS1) with familial Alzheimer's disease-associated mutations excessively cleaved and inactivated the calcium sensor STIM1. The cleavage of STIM1 by PS1 may contribute to the memory loss that is characteristic of Alzheimer's disease. —WW

*Sci. Signal.* **9**, ra89 (2016).

## CANCER

### Standardizing the CAR assembly line

Chimeric antigen receptor–modified T (CAR-T) cells are engineered to recognize specific tumor antigens. They have shown promising results in clinical trials for leukemia, but it has been difficult to predict therapeutic efficacy and toxicity for individual patients. To address this issue, Turtle *et al.* treated non-Hodgkin's lymphoma patients with CAR-T cells prepared from strictly defined subsets. By carefully controlling the ratio of CD4 to CD8 T cells, treatment conditions can be characterized that correlate with therapeutic response and toxicity, including the drug regimen before CAR-T treatment. —YN

*Sci. Transl. Med.* **8**, 355ra116 (2016).

## IN OTHER JOURNALS

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

### MICROBIOLOGY

## Sexual development in schistosomes

Schistosomiasis is a severe parasitic disease that affects ~200 million people globally. The flatworms that cause the disease have a complex life cycle in which, unusually, male and female worms must pair to produce eggs. Eggs trapped in host body tissues are the main cause of pathology. Lu *et al.* used RNA-sequencing analysis to show that gonad development in females requires pairing and occurs when the juvenile worms pass through the host's liver. They also found that neuropeptidergic signaling stimulates female gonad development. At present, there is only one safe treatment for schistosomiasis, and thus elucidating the details of sexual development in schistosomes may offer valuable targets for drugs and vaccines. —CA

*Sci. Rep.* **6**, 31150 (2016).



Gonad development in female schistosome worms relies on pairing with males.

### FISHERIES

## Modeling the distribution of tuna fleets

The purse-seine tuna fishery in the eastern Pacific Ocean, off the west coast of the Americas, is fished by vessels with thousand-ton capacities that range over an area the size of Canada. The large size of the fishery means

that vessel distribution is patchy. Sun *et al.* developed a model to predict vessel distribution on the basis of decisions that skippers make before and after going to sea. The model accounts for environmental factors such as chlorophyll content and dissolved oxygen concentration, as well as weather conditions. Modeling the far-flung fishery can inform

regulatory decisions aimed at ensuring a sustainable tuna fishery while minimizing dolphin mortality. —PJH

*PLOS ONE* 10.1371/journal.pone.0159626 (2016).

## SUPERCONDUCTIVITY Lightly doping a Mott insulator

Cuprates usually acquire their superconductivity when charged carriers, typically holes, are chemically introduced into a “parent” state called a Mott insulator. However, this part of the cuprate phase diagram is rich in phases, including a pseudogap and a charge-order phase, whose relationship to each other and to superconductivity is under debate. Cai *et al.* used scanning tunneling spectroscopy of a very lightly doped  $\text{Bi}_2\text{Sr}_{2-x}\text{La}_x\text{CuO}_6$   $\delta$  to unravel the phase conundrum. As the hole dopants were introduced, a pseudogap-like density of states started to emerge, followed by a checkerboard pattern characteristic of the charge order. When further doping caused the material to become superconductive, the charge-order pattern became less prominent, indicating a competition between the two phases. —JS

*Nat. Phys.* 10.1038/PHYS3840 (2016).

## HOST RESPONSES Inflammation blocks recovery

Although antibiotics can clear the pathogen, doctors typically do not prescribe them to treat nontyphoidal *Salmonella* infections, which are a major cause of gastroenteritis worldwide. This is because antibiotics actually extend the course of disease. Now, Dolowschiak *et al.* provide some insight into why. Using a mouse model of *Salmonella* infection treated with ciprofloxacin, they found that the cytokine interferon- $\gamma$  (IFN $\gamma$ ) promotes intestinal pathology even after the majority of the bacteria are cleared.

## CLIMATE CHANGE IMPACTS

### A sea-route change in the Arctic

Arctic sea ice is rapidly disappearing as climate warms, ushering in an entirely novel era in marine transportation with important economic implications, because more frequent open seas will allow increasing volumes of trans-Arctic shipping. Melia *et al.* used an ensemble of climate models from the Fifth Coupled Model Intercomparison Project to project how sea ice loss might increase opportunities for ocean-going vessels to cross the Arctic. They find that standard open-water vessels will have twice as many navigable periods by the middle of the 21st century as they do now, including some across the central Arctic. The shipping season length could reach 4 to 8 months by late century, when moderately ice-strengthened vessels could be able to complete Arctic transits during 10 to 12 months of the year. —HJS

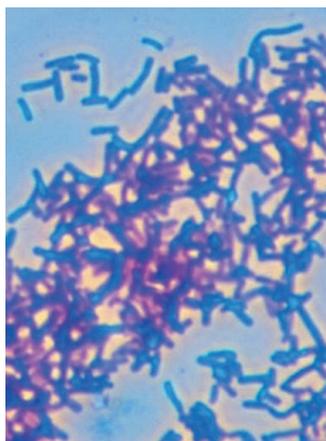
*Geophys. Res. Lett.* 10.1002/2016GL069315 (2016).



Shipping routes across the Arctic Ocean will multiply as climate warms.

T cells and natural killer cells make IFN $\gamma$ , which drives pro-inflammatory myeloid cells to accumulate, spewing forth pathology-causing soluble mediators that prevent tissue repair. Targeting this pathway therapeutically may help alleviate the debilitating symptoms that *Salmonella* can cause. —KLM

*Cell Host Microbe* 20, 238 (2016).



Nontyphoidal *Salmonella* infections are not typically treated with antibiotics.

## INORGANIC CHEMISTRY A pair of tablemates for aromatic benzene

Chemists do not designate a compound as aromatic because it smells nice. Rather, the term refers to the stability conferred by a particular delocalized arrangement of electrons first characterized in benzene and related carbon rings. Is the concept exclusive to carbon? Over the years, inorganic chemists have extended it to a range of analogs composed of other elements, and now Seitz *et al.* introduce two more. Specifically, they prepared hexagonal benzene analogs in which three silicon centers alternate with either three phosphorus or three arsenic centers. Structural and computational characterization supported aromaticity. The reactions fortuitously also produced tetragonal cyclobutadiene analogs that were weakly antiaromatic. —JSY

*J. Am. Chem. Soc.* 10.1021/jacs.6b07389 (2016).

## STRUCTURAL BIOLOGY Bacteriophage fights back

Bacteria and archaea have CRISPR-Cas systems that target and destroy invading DNA from phages and plasmids. However, invaders can fight back. Wang *et al.* report a structure that shows how the bacteriophage protein AcrF3 inhibits *Pseudomonas aeruginosa* Cas3 (PaCas3). The Cascade protein complex recruits Cas3 to target DNA. In addition to binding to a protein in Cascade, Cas3 also binds the nontarget DNA strand. There, Cas3 uses its ATP-driven helicase domain to open up the DNA and its nuclease domain to degrade it. The structure showed an AcrF3 dimer complexed to ADP-bound PaCas3, thus locking it in an inactive conformation. Moreover, AcrF3 blocked both the DNA and the protein binding sites involved in recruiting Cas3 to target DNA. —VV

*Nat. Struct. Mol. Biol.* 10.1038/nsmb.3269 (2016).

# Science

## A sea-route change in the Arctic

H. Jesse Smith

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