

that directly projects to a brain center that plays a key role in generalized alertness, attention, and stress (see the Perspective by Sheikbahaie and Smith). Removal of these cells did not affect normal breathing but left the animals unusually calm. The breathing center thus has a direct and dramatic influence on higher-order brain function. —PRS

*Science*, this issue p. 1411;  
see also p. 1371

## IMMUNOGENOMICS

### Aging and variability among immune cells

How and why the immune system becomes less effective with age are not well understood. Martinez-Jimenez *et al.* performed single-cell sequencing of CD4<sup>+</sup> T cells in old and young mice of two species. In young mice, the gene expression program of early immune activation was tightly regulated and conserved between species. However, as mice aged, the expression of genes involved in pathways responding to immune cell stimulation was not as robust and exhibited increased cell-to-cell variability. —LMZ

*Science*, this issue p. 1433

## CRYSTAL GROWTH

### Predicting the shape of crystals to come

Coprecipitating carbonate and silica can form complex three-dimensional shapes. These range from flowers to trumpets, depending on the pH. Kaplan *et al.* developed a theoretical model to interpret the crystal growth



Coral-like structures formed by carbonate and silica

shapes. The model predicts crystal growth shapes under varying experimental conditions and captures the geometrical aspects of morphological development. —MSL

*Science*, this issue p. 1395

## SOCIAL SCIENCES

### Knowing a name promotes cooperation

When people know each other by name, they are more likely to cooperate with one another. Wang *et al.* looked at the impact of anonymity in the context of “prisoner’s dilemma” experiments. In these experiments, two individuals each have the options to betray or cooperate, and the result depends on the choice made by the other person. Cooperation was more common when participants knew their counterpart by name. Participants in this experiment were acquaintances in the same class before the experiment. It thus remains unclear whether factors such as similar age, similar interests, or prior knowledge about one another encouraged cooperation. —CT

*Sci Adv*. 10.1126/sciadv.1601444 (2017).

## HIV

### Mapping a path to HIV elimination

About 25 million people in sub-Saharan Africa are living with HIV. Coburn *et al.* looked into the design of HIV elimination strategies. They focused on Lesotho, where ~25% of the population is infected with HIV. They combined several large data sets and constructed a map that revealed the countrywide geographic distribution of HIV-infected people. About 20% live in urban areas, and almost all rural communities have at least one HIV-infected person. The spatial dispersion of Lesotho’s population may thus hinder and even prevent the elimination of HIV, and this may hold true for other predominantly rural countries in sub-Saharan Africa. —OMS

*Sci. Transl. Med.* **9**, eaag0019 (2017).

## IN OTHER JOURNALS

Edited by **Caroline Ash**  
and **Jesse Smith**



Antibiotics damage bee microbiota and reduce bee survival.

## APPLIED ECOLOGY

### Common antibiotic hurts bee survival

Several factors have been identified that could be responsible for the collapse of honeybee populations. However, Raymann *et al.* have identified an antibiotic that appears to reduce bee survival by changing the bee microbiome. Hives are frequently treated with tetracycline to prevent infections. When bees were fed tetracycline for 5 days in a laboratory and reintroduced to their hives, half as many survived after 3 days, relative to controls. Antibiotic treatment decreased the number and relative abundance of the bacteria living in the bee gut. After treatment, bees were more sensitive to infection by a *Serratia* species of bacterial pathogen. Bees that were germ-free showed no changes after tetracycline treatment, suggesting that tetracycline was acting on the microbiome and not directly on the bees. —BJ

*PLOS Biol.* 10.1371/journal.pbio.2001861 (2017).

## CANCER

### Metastatic cells feed off a complement

Cancer patients with metastases in the cerebrospinal fluid (CSF) have a poor prognosis. How cancer cells survive in the CSF has been an enigma because this microenvironment is devoid of mitogens and nutrients required for cell growth. Studying mice and patient samples, Boire *et al.* show that cancer cells metastasizing to

the CSF overexpress a protein called complement component 3 (C3). C3 activates a specific receptor in the choroid plexus epithelium, a barrier system in the brain that prevents cells and molecules in the blood from entering the CSF. This activation disrupts the blood-CSF barrier, allowing circulating growth factors into the CSF. A drug that blocks this activation suppressed metastasis to the CSF in mice. —PAK

*Cell* **168**, 1101 (2017).



Hydrogels could be used to facilitate cartilage regeneration, boosting efforts to treat conditions such as osteoarthritis.

## BIOMATERIALS

### Separating chemistry from mechanics

**H**ydrogels based on hyaluronic acid (HA), a major component of cartilage extracellular matrix, are a logical choice for making injectable matrices for cartilage regeneration. However, when one changes the concentration of HA, and thus the chemical cues presented to the cell, this also changes the mechanics of the gels, and both factors influence cell proliferation. Zhu *et al.* used a modified elastin-like protein to form a gel with HA so that the concentration of HA could be adjusted without affecting the gel stiffness. With increasing HA, they found a dose-dependent increase in cartilage marker gene expression and enhanced sGAG deposition, with minimized undesirable fibrocartilage characteristics. —MSL

*Biomaterials* 10.1016/j.biomaterials.2017.02.010 (2017).

## GENETICS

### Manipulating the fly conditionally

The fruit fly *Drosophila* has been indispensable in the genetics and biochemical toolkits. This model organism has enabled many advances in understanding early development, metabolism, cell biology, evolution, and so much more. However, most knockout methods fail to completely eliminate gene function and do not work in differentiated cells. Fisher *et al.* developed “FlpStop” for conditional gene disruption and gene rescue. They showed proof of principle by generating conditional null alleles for the wing development gene *apterous*. Follow-up analyses manipulated genes involved in GABAergic neurotransmission or neuronal excitability within

different cell types or cellular compartments. The tool can now be applied to other differentiated or undifferentiated cells at specific times of development to better understand the interactions between genes and within genetic networks. —BAP

*eLife* 10.7554/eLife.22279.001 (2017).

## MICROBIOTA

### Gut churning controls inflammation

The gut is not an inert tube. It undergoes regular contractions called peristalsis. Rolig *et al.* examined the constant movement in the zebrafish gut and asked whether the enteric nervous system (ENS) plays a role in regulating the microbiota, as well as food flow. If the zebrafish ENS was disabled by knocking

out the gene *sox10*, intestinal neutrophils accumulated, the gut epithelium proliferated, and inflammation resulted. The inflammation was caused by overgrowth of some bacterial lineages and was resolved by transplantation of ENS precursors or when a well-adapted anti-inflammatory bacterial strain was given to the fish.

Thus, peristalsis is important for suppressing the growth of poorly symbiotic bacteria, in zebrafish at least. —CA

*PLOS Biol.* 10.1371/journal.pbio.2000689 (2017).

## WATER CHEMISTRY

### Neon nudges clusters toward bulk liquid

It is hard to get a global sense of what is happening at the

molecular level in a drop of water. The hydrogen bonds responsible for the molecules' mutual attraction are in a constant state of flux. Chemists have learned a lot about the underlying structure by studying cold, isolated clusters that contain just a few molecules at a time. However, these clusters sometimes close in on themselves in tighter arrangements than the bulk liquid typically hosts. Douberly *et al.* show that a neon atom can nudge water tetramers formed in helium droplets to adopt the more open geometries prevalent in the bulk, facilitating detailed study of these motifs. —JSY

*J. Am. Chem. Soc.* 10.1021/jacs.7b00510 (2017).

## EDUCATION

### 3D assessment: The future is here

Science education reforms for kindergarten through 12th grade focus on three-dimensional learning (3D-L), comprising scientific and engineering practices, crosscutting concepts, and disciplinary core ideas. These reforms also exist in undergraduate science, technology, engineering, and math (STEM) programs, and faculty interested in bringing 3D-L to their classrooms need a way to assess student learning. Laverty *et al.* have developed the Three-Dimensional Learning Assessment Protocol (3D-LAP) for use in introductory biology, chemistry, and physics courses at the undergraduate level. The 3D-LAP allows users to characterize the potential of assessment tasks to determine whether students engage with 3D-L and can also be used as a professional development tool for faculty interested in designing new assessments. The 3D-LAP is also ideal for characterizing how assessments change over time with respect to STEM transformation efforts. —MM

*PLOS ONE* 10.1371/journal.pone.0162333 (2016).

## Metastatic cells feed off a complement

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