and computational reconstruction, and they can do so for multiple genes. — LMZ

Science, this issue p. 78

BIRD FLIGHT
Cloud-gliding frigate birds
Frigate birds are among the highest fliers in the avian world. Wiemirskirch et al. show that great frigate birds stay aloft for months at a time, using a variety of strategies that take advantage of atmospheric conditions (see the Perspective by Huey and Deutsch). Locally, they exploit uplift and favorable winds, but for long-distance transoceanic travel, frigate birds fly up to 4000 m to exploit low-pressure conditions within clouds for gliding. Understanding the strategies of these impressive voyagers increases our understanding of long-distance migration and our appreciation for the extremes that flight adaptations can reach. — SNV

Science, this issue p. 74 see also p. 26

CANCER IMMUNOLOGY
Building the route to metastasis
Dying tumor cells release the phospholipid S1P, which stimulates proinflammatory responses in tumor-associated macrophages, including secretion of the protein lipocalin-2. Jung et al. discovered that in the context of breast cancer, this pathway causes lymphatic endothelial cells to release a factor that promotes the formation of new lymphatic vessels. The problem is that breast cancer cells can metastasize via lymphatic vessels. If the S1P–lipocalin-2 pathway is inhibited in mice, then metastasis is suppressed. Likewise, infection can trigger the release of S1P and thus could also enhance metastasis (see the Focus by Rodvold and Zanetti). — LKF

Sci. Signal. 9, ra64 and fs13 (2016).

DRUG DELIVERY
Drinking straws for the stomach
Systemic drug delivery to the gut by oral ingestion is simpler and more direct than routes such as an intravenous feed or an injection. However, barriers that line the stomach, high pH, enzymatic degradation, and limited residence time limit delivery. Fox et al. designed planar devices that are sealed with a membrane containing an array of stiff hollow tubes. Drugs are loaded by immersing the straws into a solution and allowing it to diffuse into the reservoir of the device. In vitro and ex vivo testing show that the straws enhance adhesion of the devices to the intestinal epithelium, while limiting the uptake of foreign molecules into the reservoir, and allow for tunable drug delivery when exposed to fluid flow. — MSL

ACS Nano 10.1021/acsnano.6b00809 (2016).

MATHEMATICAL BRAINS
A special brain network for mathematics
Is language involved in mathematical thinking? Amalric and Dehaene scanned the brains of professional mathematicians and naive study participants while they were performing a

IN OTHER JOURNALS
Edited by Sacha Vignieri and Jesse Smith

MARTIAN GEOLOGY
Unexpected forms of sand dunes on Mars
On Earth, wind and water passing over sand result in the formation of large dunes or small ripples, collectively called bedforms. Laporte et al. analyzed images of bedforms on Mars, taken from orbit and from the Curiosity rover on the surface. They found a third size of bedform on the planet—between ripples and dunes—which is caused by the differing atmospheric conditions. Because bedforms can be preserved in sedimentary rock, in principle their traces can be used to determine the past evolution of Mars’ atmosphere. — KTS

Science, this issue p. 50

TRANSCRIPTION
Spatial structure of RNA expression
RNA-seq and similar methods can record gene expression within and among cells. Current methods typically lose positional information and many require arduous single-cell isolation and sequencing. Stähl et al. have developed a way of measuring the spatial distribution of transcripts by annealing fixed brain or cancer tissue samples directly to bar-coded reverse transcriptase primers, performing reverse transcription followed by sequencing and computational reconstruction, and they can do so for multiple genes. — LMZ

Science, this issue p. 78
POLITICAL SCIENCE

Inducing potential voters to go the polls

A key challenge for any political campaign is to get its voters to actually vote. Field experiments have demonstrated that canvassing and phone calls are more effective than direct mail; all of these interventions increase voter participation by 0.5 to as much as 3 percentage points. With this in mind, Gerber et al. have reexamined an intervention based on the theory that nouns describe more stable attributes than verbs; for instance, “I am a Republican” versus “I vote for Republicans.” They find, using 11,000 voters across three U.S. states, no difference between “noun” and “verb” phone calls and that neither message is as effective as referring to social norms in getting voters to the polls. — GJC


true-false reasoning task, either with advanced mathematical statements or with general knowledge statements. There were clear behavioral and brain-imaging differences between the two groups. Expert mathematical reasoning was underpinned by a brain network that is also used in basic quantity and number processing. This math-specific network was clearly distinct from the canonical language network. — PRS


CELL BIOLOGY

Activating Inflammation

Nuclear swelling recruits leukocytes, and cell swelling directly induces inflammation, but how cells convert changes in volume into inflammatory signals is unclear. Enyedi et al. combined quantitative imaging in live zebrafish and in cell culture and identified a mechanism by which both cell swelling and cell lysis stimulate the production of highly inflammatory lipid mediators. Swollen nuclei of permeabilized or swollen cells attracted leukocytes in vivo. Cell swelling induced nuclear swelling, which caused an enzyme in the inner nuclear membrane to release proinflammatory lipids. Restriction of nuclear swelling by actin filaments could limit this response. Thus, the nucleus plays an unexpected mechanosensory function to sense cell swelling and lysis and activate inflammatory signaling. — SMH

Cell 165, 1160 (2016).

BIOFUELS

Induction is the key to production

The enzymatic conversion of lignocellulose to glucose is a bottleneck in the biological production of ethanol. Inducing the synthesis of active cellulytic enzymes is critical for enhancing the conversion efficiency of a bioreactor. Li et al. developed a method to stimulate the production of high amounts of cellulase in the fungus Trichoderma reesei. The most effective inducer was a sugar mixture synthesized from glucose, which contains sophorose. Batch feeding of the mixture resulted in high cellulase production at levels three to five times higher than previously measured. Adding pretreated corn stover to the reactor resulted in high yields of glucose and of conversion to ethanol. — NW


NEURODEVELOPMENT

Neural tube on a chip

The information that converts an unruly mob of stem cells into an organized, structured tissue, such as the neural tube, includes diffusible factors and three-dimensional constraints. Demers et al. have now constructed a microfluidics device to deliver morphogens at the right time, right place, and in the right sequence for a simplified, experimentally accessible recapitulation of the normal developmental milieu. In this device, mouse stem cells differentiate into motor neurons, not by reading a gradient but rather by reading a specific concentration of the morphogen SHH, which in normal development is present as a gradient. Nascent neurites may, however, be reading a gradient to orient. — PJH

Development 143, 10,1242/10,1242 (2016).
Induction is the key to production
Nicholas S. Wigginton

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