MARINE CONSERVATION

Charts reveal the ghosts of corals past

Coral reef loss adversely affects fisheries, water quality, and storm protection. McClenachan *et al.* used 18th-century British nautical charts that mapped coral reefs as shipping hazards to quantify changes in the Florida Keys over the past 240 years. Entire sections of reef charted before European settlement are now gone. Invisible to modern surveys, such ghost reefs call attention to the importance of historical data in marine conservation. —SN

Sci. Adv. 10.1126/sciadv.1603155 (2017).

SOCIAL SCIENCE

Life under threat of deportation

What is the effect on a child of having parents who are at risk of deportation as unauthorized immigrants? Hainmueller *et al*. developed a quasi-experimental protocol to address this complicated question. They selected mothers who had birthdates either just before or just after the cutoff for the United States' Deferred Action for Childhood Arrivals (DACA) program. Children whose mothers were protected from deportation by DACA had 50% fewer diagnoses of adjustment and anxiety disorder than children with mothers whose birthdates, by coincidence, preceded the cutoff and who thus were not protected. —BJ

Science, this issue p. 1041

SYSTEMS IMMUNOLOGY

Following the immunological clock

Immune function is altered during pregnancy to protect the fetus from an immunological attack without disrupting protection against infection. Aghaeepour *et al.* used mass cytometry to examine the precise timing of these pregnancy-induced changes in immune function and regulation. They developed an algorithm that captures the immunological timeline during pregnancy, validating previous findings and shedding light on immune cell interactions during gestation. By defining this immunological chronology during normal pregnancy, they can now look for alterations associated with pregnancy-related pathologies. —ACC

Sci. Immunol. **2**, eaan2946 (2017).

METALLURGY

A ductile steel shows its strength

Many industrial applications require materials to have high strength while remaining pliable, or ductile. However, the microstructure that increases strength tends to reduce ductility. He *et al*. used a processing mechanism to create a "forest" of line defects in manganese steel. This deformed and partitioned steel was produced by cold-rolling and low-temperature annealing and contained a dislocation network that improved both strength and ductility. —BG

Science, this issue p. 1029

NEUROSCIENCE

A different form of synaptic plasticity

How do synaptic or other neuronal changes support learning? This subject has been dominated by Hebb's postulate of synaptic change. Although there is strong experimental support for Hebbian plasticity in a number of preparations, alternative ideas have also been developed over the years. Bittner *et al*. provide in vivo, in vitro, and modeling data to support the view that non-Hebbian plasticity may underlie the formation of hippocampal place fields (see the Perspective by Krupic). Instead of multiple pairings, a single strong Ca^{2+} plateau potential in neuronal dendrites paired with spatial inputs may be sufficient to produce place cells. —PRS

Science, this issue p. 1033; see also p. 974

IN OTHER JOURNALS

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

CORALS

A proto-particular path to corals

Coral skeletons form less directly than has long been thought. The classical picture of skeleton formation, involving simple inorganic precipitation of aragonite (a form of calcium carbonate) from a calcifying fluid, is now being supplanted by a body of research that identifies biologically controlled processes occurring within cells as the ones responsible. Mass *et al*. present spectromicroscopic evidence from *Stylophora pistillata* coral showing that amorphous calcium carbonate particles first form within the coral's organic tissue and then attach to the surface of the coral skeleton, where they soon crystallize into aragonite. This allows corals to grow faster than through ion-by-ion growth from solution and may make them less vulnerable to the harmful consequences of ocean acidification than has been assumed. —HJS

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1707890114 (2017).

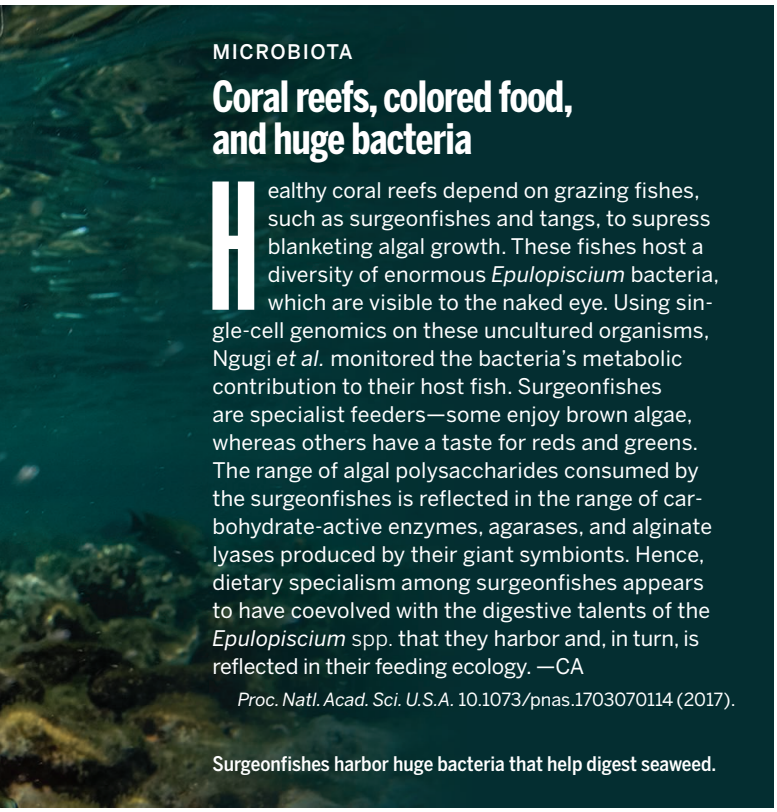
False color image of a *Stylophora pistillata* coral skeleton

CELL BIOLOGY

Memories of past morphologies

When developing neurons round and divide during neuronal differentiation, daughter cells tend to take up the same morphology exhibited by their mother. Boubakar *et al*. set up

CREDITS: (TOP) LUIS JAVIER SANDOVAL/GETTY IMAGES; (BOTTOM) PUPA GILBERT, CHANG-YU SUN, CAYLA STIFLER, UNIVERSITY OF WISCONSIN–MADISON, AND MATTHEW MARCUS, ADVANCE LIGHT SOURCE, LAWRENCE BERKELEY NATIONAL LABORATORY



MICROBIOTA

Coral reefs, colored food, and huge bacteria

Healthy coral reefs depend on grazing fishes, such as surgeonfishes and tangs, to supress blanketing algal growth. These fishes host a diversity of enormous *Epulopiscium* bacteria, which are visible to the naked eye. Using single-cell genomics on these uncultured organisms, Ngugi *et al.* monitored the bacteria's metabolic contribution to their host fish. Surgeonfishes are specialist feeders—some enjoy brown algae, whereas others have a taste for reds and greens. The range of algal polysaccharides consumed by the surgeonfishes is reflected in the range of carbohydrate-active enzymes, agarases, and alginate lyases produced by their giant symbionts. Hence, dietary specialism among surgeonfishes appears to have coevolved with the digestive talents of the *Epulopiscium* spp. that they harbor and, in turn, is reflected in their feeding ecology. —CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1703070114 (2017).

Surgeonfishes harbor huge bacteria that help digest seaweed.

a chick embryo slice model to image the polarization of dorsal root ganglion neurons. These neurons differentiate from neural crest cells (NCCs) generated by bipolar progenitors. The authors examined the young neurons directly after their migration or after additional division in situ. Bipolar NCCs lost their polarity and retracted their processes to round for division. The daughter neurons directly acquired bipolar morphology by emitting processes in the same location. The morphological polarity features appeared to be stored by a polarity-associated protein known as Septin-7. Septin-7 "tagged" the process sites during NCC remodeling, allowing the cells to recolonize the original footprints after division. —SMH

Neuron **95**, 834 (2017).

GRAPHENE

Navigating through graphene

In some materials, current flow resembles the flow of viscous fluids. To reach this so-called hydrodynamic regime, researchers have to tune temperature to the right range. Krishna Kumar *et al.* studied the hydrodynamic flow of the electron liquid in graphene as it passed through narrow passages called constrictions. They found that the electrons flowed through the constrictions with a higher conductance than one would expect from noninteracting electrons; the electron-electron interactions helped the electron liquid avoid momentum loss from bumping into sample boundaries. —JS

Nat. Phys. 10.1038/nphys4240 (2017).

HEART REGENERATION

Cells that fix the heart

The adult heart is thought to lack the capacity to self-repair. Any injury after, say, a heart attack causes scarring and may result in heart failure. In some animals, particularly when very young, heart muscle regeneration does occur. Even in adult mammals, new heart muscle cells (cardiomyocytes) can arise, but they are rare. Most maturing mammalian cardiomyocytes become binucleated and polyploid, and these seem to be incapable of regeneration. Patterson *et al.* found that a few "normal" mononucleated diploid cardiomyocytes (MNDCMs) occur in mice. Some individuals have more MNDCMs than others, and these individuals are better able to recover after heart injury. A gene called *Tnni3k* limits the number of MNDCMs, and it is this that appears to control the capacity for recovery after heart injury. —BAP

Nat. Genet. 10.1038/ng.3929 (2017).

AGRICULTURAL SCIENCE

Crop yields expected to fall as temperatures rise

Climate change will affect agriculture, but unfortunately predicting how is not simple. Zhao *et al.* combined four analytical methods to predict the impact of global temperature increases on the yields of four crops. The results consistently indicate that rising temperatures will lead to reductions in crop yields. An increase of 1°C would be more severe for global maize yield (7.4% decrease) than for rice (3.2% decrease), and decreases in maize yield in the United States would be twice those seen in India (10.3 and 5.2%, respectively). Although this work points to worrying consequences of a warming world, it remains very difficult to predict the cumulative impact of multiple factors related to climate change, such as elevated atmospheric carbon dioxide concentrations and precipitation. —ECM

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1701762114 (2017).

SOLAR CELLS

Purple power leaves the window open

Certain tunable coatings can render windows "smart" by modulating the amount of heat and light passing through them, depending on the desired temperature indoors. Powering these windows with photovoltaics seems sensible, but it is inefficient for the power source to absorb the same light that the coating is meant to regulate. Davy *et al.* resolve this conundrum by preparing a class of solar cells that absorb at the boundary between violet and ultraviolet. Composed from hexabenzocoronene organic semiconductors, these cells interfaced effectively with electrochromic window coatings on square-centimeter scales, leaving the rest of the optical and near-infrared regime open for modulation. —JSY

Nat. Energy **2**, 17104 (2017).

Climate change may reduce the yields of many cereal crops, including rice.

PHOTO: LUKCHAI CHAIMONGKON/SHUTTERSTOCK