

the potential of the system for quantum simulation. A promising approach is to use polar molecules instead of atoms, which interact at much longer length scales. However, “packing” the lattice with molecules is tricky. Moses *et al.* introduced bosonic  $^{87}\text{Rb}$  atoms and fermionic  $^{40}\text{K}$  atoms into an optical lattice, combined them into molecules, and brought the molecules into their ground state, achieving a considerable lattice filling of 25%. — JS

*Science*, this issue p. 659

## PLANT GENETICS

### How flowers separate males and females

Most flowering plant families have bisexual flowers with both male and female function. However, most members of the *Cucurbitaceae* family, which includes melons, cucumbers, and gourds, have unisexual flowers. To understand this difference in sex expression, Boualem *et al.* identified a cucumber gene expressed in the female flowers. Mutations in this gene were associated with solely male flowers. By integrating this finding into a sex determination model, the authors explain how unisexual flowers can coexist in the same plant. — LMZ

*Science*, this issue p. 688

## NONHUMAN GENOMICS

### Symbionts are adapted to work with corals

Many corals have formed mutualistic associations with

dinoflagellate symbionts, which are thought to provide nutrients and other benefits. To examine the underlying genetics of this association, S. Lin *et al.* sequenced the genome of the endosymbiont dinoflagellate *Symbiodinium kawagutii*. The genome includes gene number expansions and encodes microRNAs that show complementarity to genes within the coral genome. Such microRNAs may be involved in regulating coral genes. Furthermore, coral and *S. kawagutii* appear to share homologs of genes encoding specific nutrient transporters. The findings shed light on how symbiosis is established and maintained between dinoflagellates and corals. — LMZ

*Science*, this issue p. 691

## INFECTIOUS DISEASE

### Outflanking RSV could we add one more line?

Respiratory syncytial virus (RSV) infection can cause a severe respiratory illness in young children. Researchers are working to fashion a live attenuated vaccine, which would mimic the natural course of infection, but blocking viral replication also stems the immune response. Now Karron *et al.* report on a version of RSV that induced a protective immune response with decreased viral shedding in humans. Children who received the vaccine produced antibodies to RSV without symptoms in the subsequent RSV season. — ACC

*Sci. Transl. Med.* **7**, 312ra175 (2015).

## IN OTHER JOURNALS

Edited by Kristen Mueller and Jesse Smith



Ocean-dwelling *Synechococcus* cyanobacteria can produce hydrocarbons

## MICROBIOLOGY

### Marine hydrocarbon cycling revealed

Up to 4 million tons of crude oil leak into the oceans every year as a result of human activities and natural seepage. But hydrocarbons and hydrocarbon-degrading bacteria abound even in waters minimally polluted by oil. Knowing that cyanobacteria have the capacity to produce long-chain alkanes and are abundant in surface waters, Lea-Smith *et al.* set out to determine whether these bacteria are a significant source of hydrocarbons. It turns out that together, the cyanobacteria *Prochlorococcus* and *Synechococcus* produce up to 700 million tons of hydrocarbons per year via their alkane biosynthetic pathways. These cyanobacteria may help to sustain hydrocarbon-degrading bacteria and thus unwittingly help to mitigate some fraction of anthropogenic pollution in the ocean. — CA

*Proc. Natl. Acad. Sci. U.S.A.* 10.1073/pnas.1507274112 (2015).

## IMMUNOGENETICS

### How heritable is autoimmunity?

For many complex diseases, a mix of a person’s genes and their environment determines their susceptibility, with genetic influences often playing a greater role in children. Li *et al.* investigated how genes contribute to the development of autoimmune diseases such

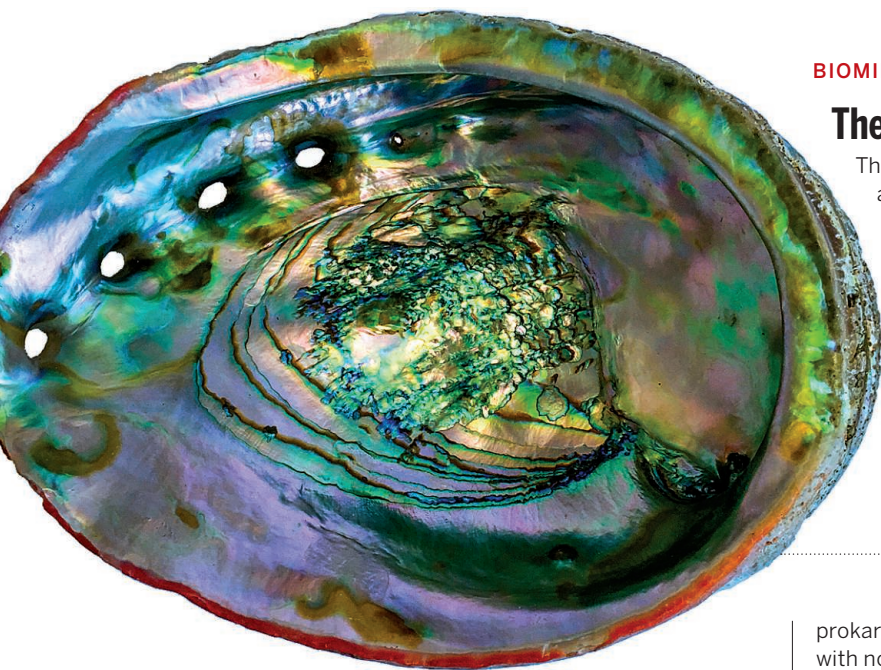
as type I diabetes and ulcerative colitis in children. By comparing 5000 pediatric autoimmune pediatric cases with over 36,000 healthy controls, the authors determined that genetics contributes substantially to susceptibility to autoimmune diseases. The highest heritability was observed for type I diabetes and juvenile idiopathic arthritis, whereas the environment played a greater role in



The genome-sequenced coral *Acropora digitifera* harbors the *Symbiodinium kawagutii* endosymbiont

PHOTOS: (FROM LEFT) MDC SEAMARC, MALDIVES/WIKICOMMONS; EYE OF SCIENCE/SCIENCE SOURCE

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#### Abalone shells grow from amorphous calcium carbonate precursors

susceptibility to lupus. Similar to autoimmunity in adults, heritability correlated highly with genetic variation in the major histocompatibility region. — LMZ

*Nat. Commun.* **6**, 8442 (2015).

#### DNA REPAIR

### A membrane scaffold for repairing DNA

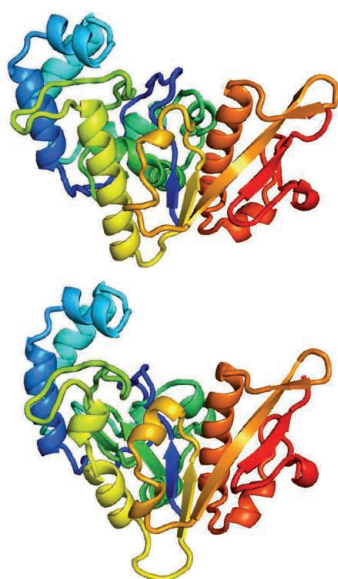
Many cellular processes inadvertently cause DNA damage, so cell survival critically depends on high-fidelity DNA repair. In *Escherichia coli*, the protein RecA plays a central role in repairing damaged DNA. RecA forms filaments on the ends of broken DNA, which allow the DNA repair machinery to search the genome for homologous sequences for accurate repair of the DNA break. Rajendram *et al.* now show that RecA interacts with specific lipids in the inner plasma membrane of *E. coli*. This membrane scaffolding acts to store RecA in the absence of DNA breaks. It also helps to nucleate and stabilize RecA filament bundles when breaks form, promoting DNA repair. — GR

*Mol. Cell.* 10.1016/j.molcel.2015.09.009 (2015).

#### STRUCTURAL BIOLOGY

### Filling the structural landscape

Despite an ever-increasing number of high-resolution protein structures, as of 2013, about 40% of protein families had no representative structures, hindering understanding of their function. Ovchinnikov *et al.* take a step toward filling in this landscape by predicting structures for 58 of the 121



Authors' predicted protein structure (top) compared to the x-ray crystal structure (bottom)

#### BIOMINERALIZATION

### The pathway to mother of pearl

The material inside mollusk shells, nacre, is remarkably tough and also gives the shells their sheen. Nacre is a hybrid of aragonitic calcium carbonate and an organic matrix, but it's unclear how it starts growing. Using synchrotron-based microscopy and spectroscopy, DeVol *et al.* identified amorphous calcium carbonate from nacre growth fronts in sea snails. The amorphous precursors, which had previously been observed in calcitic biominerals such as sea urchin spicules, more closely resembled calcite than aragonite. Yet coral, which is also aragonitic, grows via an aragonite-like precursor. How nacre transforms calcite-like precursors into aragonite crystals remains unresolved. — NW

*J. Am. Chem. Soc.* 10.1021/jacs.5b07931 (2015).

prokaryotic protein families with no known structures. They combined a recent version of Rosetta, which computes structures on the basis of an energy function, with amino acid residue contacts inferred from coevolution patterns in related protein sequences. The authors validated their methods by accurately predicting the structures of two proteins whose structures had previously been solved experimentally. — VV

*eLife* 10.7554/eLife.09248 (2015).

#### EDUCATION

### MOOCs: Retention versus achievement

Massive open online courses (MOOC) open up higher education to citizens across the globe. As MOOCs continue to rapidly expand, the empirical research surrounding them strives to keep pace. Through examination of input characteristics, including learner demographics, prior experience, and self-reported commitment (data points that can be collected before the MOOC begins), Greene *et al.* provide insight into student retention and performance within the same MOOC. Coupled with survivor analysis, results showed that considerations such as intent to earn a certificate predicted

retention, whereas the prior level of schooling predicted achievement. Depending on the goals of institutions interested in using MOOCs, data from this study can be used to determine whether any specific interventions should be implemented. — MM

*Am. Educ. Res. J.* **52**, 925 (2015).

#### MATERIALS SCIENCE

### Grafting olefin polymers for stretchiness

Thermoplastic elastomers (TPEs) are stretchy rubber-like polymers that can be melt-processed, do not require cross-linking, and, unlike rubbers, can be recycled. Ohtaki *et al.* set out to create TPEs based solely on olefin polymers that would not require or be limited by the need for living polymerization processes. They grafted either isotactic or syndiotactic polypropylene segments to a backbone made from ethylene and  $\alpha$ -olefins. The polypropylene is crystalline and imparts stiffness and a physical networks structure to the polymer, whereas the noncrystallizing backbone lets the polymer stretch. Samples showed up to 85% elastic recovery when stretched up to 1000%, rivaling the best linear block polyolefin TPEs. — MSL

*Macromolecules* 10.1021/acs.macromol.5b01975 (2015).

## MOOCs: Retention versus achievement

Melissa McCartney

*Science* **350** (6261), 647-648.  
DOI: 10.1126/science.350.6261.647-f

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