IN OTHER JOURNALS

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EXOPLANET ATMOSPHERE

Sunny side hot for tidally locked world

Most planets in our solar system spread their heat evenly across their surfaces in the course of a day. They accomplish this with relatively fast rotations and a generous distance from the Sun. Some exoplanets, however, aren't so well balanced. Stevenson *et al*. show that planets like the Jupiter-sized WASP-43b whirl closely around their star in less than 24 hours, which leaves them tidally locked with little chance for heat redistribution. — MMM

Science, this issue p. 838

CILIA AND FLAGELLA

Molecular ruler rules cilia and flagella length

Cilia and flagella contain within their ultrastructure repeating structures at regularly spaced intervals. How does the cell measure length with nanometer precision? Oda *et al*. identify a flagella protein complex in *Chlamydomonas* that appears to act as a sort of molecular ruler to define repeat length. Genetic changes that would change the length of this protein led to corresponding changes in the length of repeats within the resulting flagella. — SMH

Science, this issue p. 857

PHOTOS: (LEFT TO RIGHT) ANDREW SYRED/SCIENCE SOURCE; © BLEND IMAGES/ALAMY

NANOPHOTONICS

Gold nanoparticles form potential plasmons

Plasmons—the collective light-induced electronic excitations that occur at the surface of a metal—may form the basis for a new technology for harvesting solar energy. Currently, solar energy is converted into useful energy either by solar-thermal and photovoltaic conversion systems seen on rooftops, or, in some niche applications, by thermoelectric devices. Sheldon *et al*. observed electric potentials induced in gold nanospheres by optical irradiation. The effect may be useful in the design of a new generation of energy conversion devices based on plasmonics. — ISO

Science, this issue p. 828

IMMUNOLOGY

A step toward better vaccine adjuvants

The receptor TLR4 stimulates immune signaling pathways. It can do so through two adaptor proteins: MyD88, which can trigger undesirable inflammatory responses; and TRIF, which stimulates immune responses. Currently, adjuvants to boost immune responses to vaccines are developed with the idea that their structure determines the adaptor protein that TLR4 will use. However, Kolb *et al.* suggest that TLR4 signaling is inherently biased toward the TRIF-dependent pathway, particularly in the context of type I interferon signaling. The findings may help in the development of more effective vaccine adjuvants that enhance immune responses without triggering potentially harmful inflammatory reactions. — JFF

Sci. Signal. **7**, ra108 (2014).

CIRCADIAN RHYTHMS

One clock for you and your microbes

Disrupting our circadian rhythms increases the risk of developing diabetes, obesity, cancer, and cardiovascular disease, but scientists do not fully understand why. Thaiss *et al*. now report that conditions that cause jet lag change the composition and activities of gut microbes in mice, which can lead to metabolic disease. Gut microbe composition no longer fluctuated diurnally in mice with disrupted circadian rhythms, but normal rhythmic feeding or the transplantation of gut microbes from normal mice restored this oscillation. Normal mice that received gut microbial transplants from jet-lagged humans or mice that experienced a change in their day-night schedule gained weight and developed symptoms of metabolic disease. — LC

Cell **159**, 514 (2014).

BIOTECHNOLOGY

Aiming for a better carbon fix in plants

Enhancing the output of Rubisco, an enzyme that converts atmospheric CO_2 into energy-rich molecules, could improve photosynthetic efficiency, and therefore crop yield, in plants. Maize is a C4 grass, which uses four-carbon compounds to carry CO_2 into an interior compartment; subsequent release of CO_2 increases its local concentration and favors efficient activity of Rubisco. Rice, however, is a C3 grass and lacks this pathway. Wang *et al.* compared transcripts and metabolites in developing maize and rice plants as a step toward understanding the biochemical and anatomical bases of C4 photosynthesis. Furthermore, Lin *et al.* transplanted Rubisco from a cyanobacterium, which also relies on a CO_2-concentrating apparatus, into tobacco (a C3 plant) chloroplasts. — GJC

Nat. Biotech. **32**, 10.1038/nbt.3019 (2014); *Nature* **513**, 547 (2014).

Experiment site in a mixed-grass prairie near Cheyenne, Wyoming.

CLIMATE CHANGE ECOLOGY

How elevated CO_2 affects grassland

Even after two decades, experiments to study the ecological effects of climate change continue to yield instructive results. Zelikova *et al*. studied the effects of elevated CO_2 on grassland in in Wyoming over 8 years and found that the plant productivity stabilized over time. The abundance of two dominant plant species (western wheat grass and blue grama grass) decreased with elevated CO_2, which led to the increased presence of subdominant species and hence greater evenness in community composition. Plant productivity stabilized as a result of such alterations community structure. This research highlights the potential for plant communities to change in the face of changing climates. — AMS

Proc. Natl. Acad. Sci. U.S.A. **111**, 15456 (2014).

SUPERCONDUCTIVITY

Describing iron-based superconductors

In a superconducting material, pairs of electrons (the so-called Cooper pairs) flow effortlessly through the material without encountering any resistance. The energy needed to break up a Cooper pair is called the superconducting gap. Since their discovery several years ago, iron-based superconductors (IBSs) have puzzled researchers because different IBS families appear to have different gap symmetries. Yin *et al*. used first-principles calculations to explore the nature of superconductivity in a large number of IBS compounds. They found that three related types of symmetry occurred in different IBS families, including a variant that hadn't been discussed previously. A comparison with experimental data for the compound LiFeAs suggests that the gap in this material has this particular symmetry. — JS

Nat. Phys. **10**, 845 (2014).

OPEN INNOVATION

Sharing results midway or at the end

Technological innovation depends on striking a balance between sharing discoveries to spur follow-on development and ensuring that too much sharing does not undercut incentives to participate. Boudreau and Lakhani randomized an online bioinformatics algorithm contest in order to examine the consequences of intermediate and final disclosure. Final-disclosure (FD) solvers had no in-group communication, whereas intermediate-disclosure (ID) solvers could share intermediate solutions. Fewer people opted to participate in ID, they submitted fewer solutions per person, and they tried fewer unique approaches. However, ID approaches clustered together conceptually and smoothly improved more quickly over time, whereas FD had much more variable quality and didn't achieve the mean or peak performance levels shown in ID. — BW

Res. Policy 10.1016/j.respol.2014.08.001 (2014).

BIOFUELS

A team effort to get more out of lignin

You've probably heard about cellulosic biofuels—fuels manufactured from the sugars trapped in plants' cellulose, which is largely inedible (for humans anyway). As commercial efforts in this arena get off the ground, chemists are rushing to solve a related problem: how to transform and market the woody lignin material that comes along with the cellulose. Linger *et al.* demonstrate the advantages of combining chemical and microbial protocols. First, treatment with base breaks the lignin down into a diverse set of molecules. Then *Pseudomonas putida* bacteria are put to work channeling these molecules into a more uniform product stream of (poly)-hydroxyalkanoates. After that, synthetic chemistry transforms this stream into plastics, liquid fuels, and commodity compounds. — JSY

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1410657111 (2014).

TISSUE REPAIR

A conserved response for tissue repair

Upon injury or infection, the body releases chemicals that trigger tissue repair and pathogen clearance. Because the medical community needs new therapeutic leads in this era of growing antibiotic resistance, identifying these molecules is a high priority. Dalli *et al*. looked for these factors in mice infected with self-resolving *Escherichia coli,* in human breast milk, and in regenerating planaria. They identified two related molecules, conserved across these organisms, which promoted pathogen clearance, reduced inflammation, and accelerated tissue regeneration. Scientists will need to carry out further studies to determine whether these chemicals have similar properties in humans. — BAP

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1415006111 (2014).

PHOTO: JULIE KRAY/USDA ARS IN FORT COLLINS

Sharing results midway or at the end

Brad Wible

Science **346** (6211), 823-824.
DOI: 10.1126/science.346.6211.823-e