the complexity of the structure imprinted onto the photons. — ISO

Science, this issue p. 857; see also p. 828

GALAXY EVOLUTION

Finding the necessary negative feedback

The evolution of galaxies seems to be tied to the growth of the supermassive black holes at their centers, but it's not entirely clear why. Models have suggested a mechanism in which the growth of the black hole results in an outflow of gas that interrupts star formation. However, evidence for enough of this negative feedback has been lacking. Nardini *et al*. now see a signature in x-ray spectra of a strong persistent outflow in the quasar PDS 456. They estimate a broad solid angle spanned by the wind that enables a far greater impact on the host galaxy than narrower jet outflows. — MMM

Science, this issue p. 860

PHOTOCHEMISTRY

The dark side of melanin exposed

Sun worshippers may have more to worry about than the DNA damage that occurs while they're relaxing on the beach. It seems that the DNA photoproducts responsible for cancer-causing mutations in skin cells continue to be generated for hours after sunlight exposure. Premi *et al*. find that a key mediator of this delayed damage is melanin, a pigment thought to protect against cancer (see the Perspective by Taylor). They propose a "chemiexcitation" model in which reactive oxygen and nitrogen species induced by ultraviolet light excite an electron in melanin fragments. This energy is then transferred to DNA, inducing the same damage as ultraviolet light, but in the dark. Conceivably, this energy could be dissipated by adding quenchers to sunscreens. — PAK

Science, this issue p. 842; see also p. 824

TRANSITION STATES

A transition state holds a pose

The transition state of a chemical transformation is inherently fleeting because the structure is high in energy. Nonetheless, Pearson *et al*. trapped a classical example of a bond rotation transition state using a modified protein (see the Perspective by Romney and Miller). The biphenyl molecule passes through an energy maximum when its rings rotate through a parallel position. A pocket within the editing domain of threonyl–transfer RNA synthetase was modified to stabilize parallel biphenyl rings, allowing further characterization of this normally transient structure. — PDS

Science, this issue p. 863; see also p. 829

CANCER

How Pez dispenses with metastasis

Tumor cells have greater numbers of growth-promoting receptors on their surface and release factors that promote metastasis. Belle *et al*. found that the protein tyrosine phosphatase PTPN14 (also called Pez) prevented receptors from moving to the cell surface and pro-metastatic factors from being released. Mice with breast cancer xenografts that lacked Pez had larger tumors and more metastases. — LKF

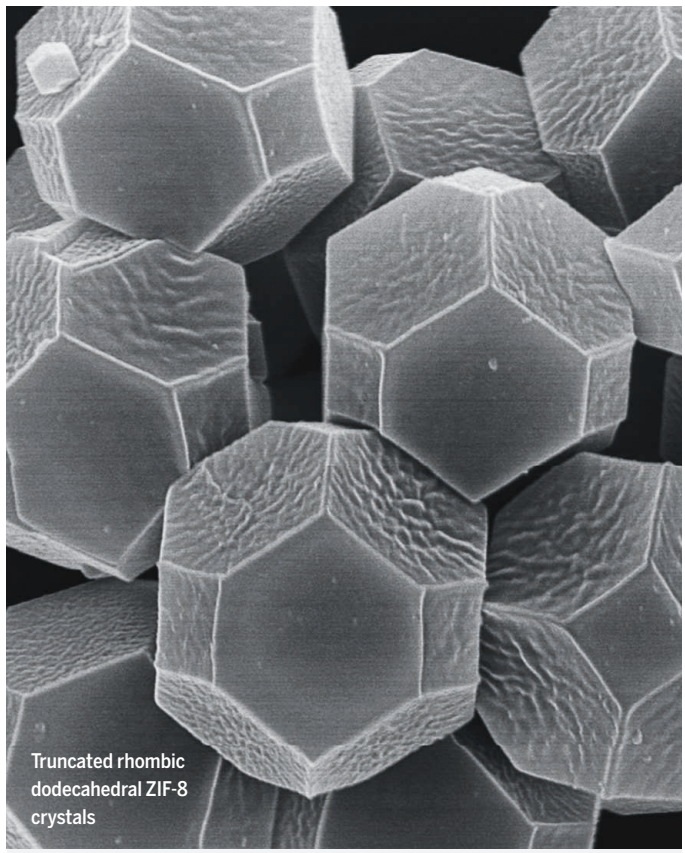
Sci. Signal. **8**, ra18 (2015).

DNA damage can continue after sun exposure has ended

PHOTOS: (LEFT TO RIGHT) © KUTTIG - PEOPLE - 2/ALAMY; SU *ET AL*. *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY* **137**, 5 (29 JANUARY 2015) © 2015 AMERICAN CHEMICAL SOCIETY

IN OTHER JOURNALS

Edited by **Sacha Vignieri** *and* **Jesse Smith**



Truncated rhombic dodecahedral ZIF-8 crystals

MATERIALS SCIENCE

Microporous mechanics

Metal-organic framework (MOF) materials, in which metal ions or inorganic clusters are linked together by organic ligands to form cages, are highly porous and potentially useful for gas storage. However, repeated cycles of adsorption and desorption mechanically stress these materials and reduce their functionality. With transmission electron microscopy, Su *et al*. examined the effects of compression on individual micrometer- and submicrometer-scale crystals of a zinc zeolitic-imidazolate framework compound. The presence of methanol in the pores made the crystals much more rigid; they shattered when similar forces would have caused only plastic deformation of the empty framework. — PDS

J. Am. Chem. Soc. 10.1021/ja5113436 (2015).

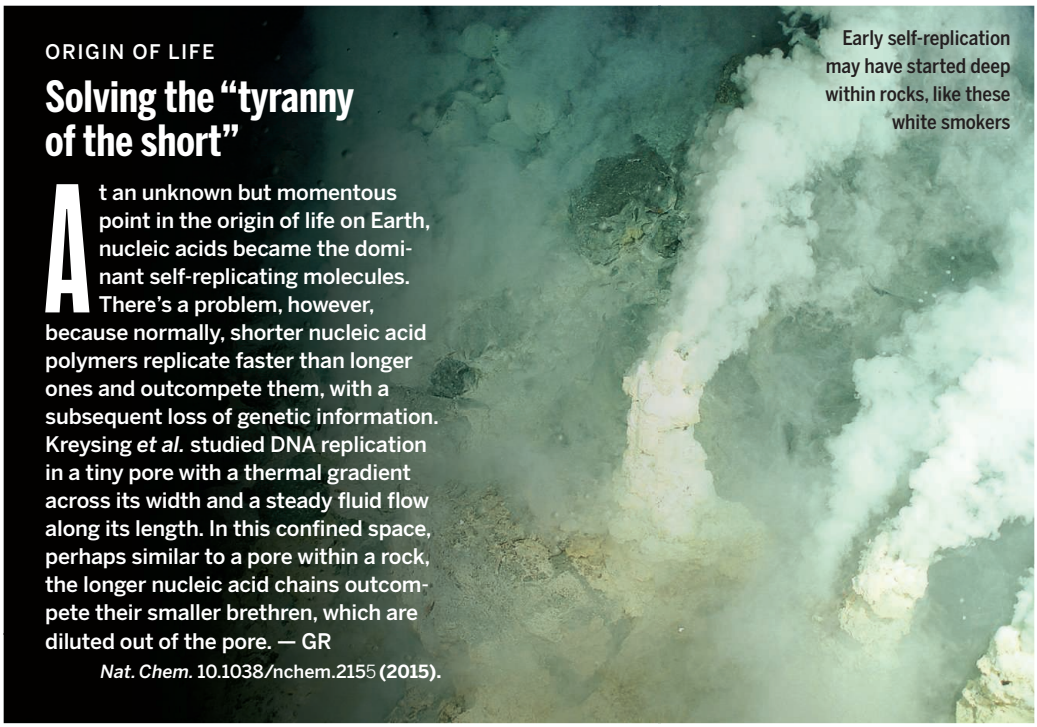
T CELL METABOLISM

Flexibility lets activated T cells thrive

For T cells, fighting infections is demanding work. They must proliferate many times over and quickly produce a myriad of antimicrobial factors. T cells do this by switching from mitochondrial to glycolytic metabolism, but what happens when nutrients are scarce, such as in infected tissues or tumors? Blagih *et al*. examined this question by starving

ORIGIN OF LIFE

Solving the "tyranny of the short"



Early self-replication may have started deep within rocks, like these white smokers

At an unknown but momentous point in the origin of life on Earth, nucleic acids became the dominant self-replicating molecules. There's a problem, however, because normally, shorter nucleic acid polymers replicate faster than longer ones and outcompete them, with a subsequent loss of genetic information. Kreysing *et al.* studied DNA replication in a tiny pore with a thermal gradient across its width and a steady fluid flow along its length. In this confined space, perhaps similar to a pore within a rock, the longer nucleic acid chains outcompete their smaller brethren, which are diluted out of the pore. — GR

***Nat. Chem.* 10.1038/nchem.2155 (2015).**

mouse T cells of glucose. They found that T cells are highly adaptable—they pulled back on protein translation, used glutamine as an energy source, and relied more on mitochondrial metabolism. The enzyme AMPK, an evolutionarily conserved energy sensor, facilitated these changes. — KLM

Immunity **42**, 41 (2015).

GENOMICS

What are the genomic requirements for life?

To promote identification and understanding of the minimal set of genomic elements required for life, Lluch-Senar *et al*. studied *M. pneumonia*. This small bacterium has an 816-kb genome with about 700 open reading frames; about a third of the genome appeared to be essential. Small open reading frames, of less than 100 residues, made up slightly more than half of the essential components, and they appeared to encode components of larger protein, DNA, or RNA complexes. Protein domains, rather than complete proteins, were often the essential elements of larger proteins, whereas regulatory elements—5′ untranslated regions and noncoding RNAs—were also fundamental components. — LBR

Mol. Syst. Biol. 10.15252/msb.20145558 (2015).

CROWD SCIENCE

Wisdom of the crowd, waning

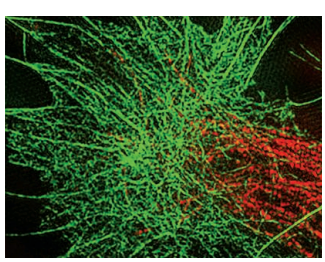
Many researchers, agencies, and companies are turning to "the crowd" for help with data collection and analysis, but we lack systematic understanding of who those volunteers are and how they perform. Such insights might help expand and improve crowd sourcing for research. Sauermann and Franzoni draw on over 12 million daily observations of more than 100,000 users across seven projects on the Zooniverse platform. They estimate that the average project received volunteer labor worth roughly $220,000 during the first 180 days. But 79% of the effort, on average, was provided by the most productive 10% of users. Roughly 75% of users failed to participate in a project after their first session, and even those who returned multiple times did so with increasingly long breaks between visits. Significant effort is expended by new users who join over time, but this does not offset the loss of effort from original users. — BW

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1408907112 (2014).

NEURODEVELOPMENT

Growth cones carve a path through tissues

A growth cone leading a neuron's development needs more than muscle to push its way through tissues and across boundaries. Santiago-Medina *et al.* found features on neuronal growth cones that are like the invadosomes of immune and metastatic cancer cells, which themselves have a knack for squeezing through existing tissues. These invadosomes, fingers that poke out into the surrounding tissue, are packed with cytoskeleton and exude proteases that degrade the extracellular matrix. The invadosomes were key for Xenopus motoneurons trying to find a path out of the spinal cord and into the developing musculature. — PJH



Neural growth cones use invadopodia-like fingers to push through tissues

Development 10.1242/dev.108266 (2015).

PLANETARY SCIENCE

Why the "Y" in the Venusian sky?

Venus has its own version of Jupiter's Great Red Spot, an enormous Y-shaped feature which comes and goes on a monthly cycle. The origin and stability of the atmospheric feature, visible only in ultraviolet photographs, have perplexed observers for decades. Peralta *et al*. take a fresh look at this persistent structure with an updated analytic atmospheric model. A wind-distorted equatorial wave reproduces the morphology, darkness, and time evolution of the "Y." The model should be applicable to the atmospheres of other slowly rotating bodies, in our solar system and beyond. — BG

Geophys. Res. Lett. 10.1002/2014GL062280 (2014).

EVOLUTIONARY BIOLOGY

Finch genomes and human face shapes

The beak shapes of 15 Galápagos finch species, each optimized for its island's most ample food source, helped shape Charles Darwin's ideas on evolution. Now, scientists have a genetic link: Lamichhaney ***et al.*** sequenced the genomes of 120 individual birds and found a gene, *ALX1*, which varies between species with large or small, pointy or dull beaks. In humans, mutations in this gene are linked to frontonasal dysplasia, a birth defect ranging in severity from a cleft palate to skull malformations. Smaller variations in *ALX1* could be behind the diversity of our face shapes. — SW

Nature 10.1038/nature14181 (2015).

PHOTOS: (TOP TO BOTTOM) NOAA; TIMOTHY GOMEZ

Microporous mechanics

Phil Szuromi

Science **347** (6224), 837.
DOI: 10.1126/science.347.6224.837-a