biosynthesis of geraniol, a monoterpene alcohol in rose scent (see the Perspective by Tholl and Gershenzon). Enzymes known for geraniol synthesis in other plants, such as basil, did not seem to provide that function for roses. Instead, a diphosphohydrolase, which functions in the cytoplasm of cells in rose petals, generates the geraniol emitted by fragrant roses. Identification of the enzyme and its gene enables marker-assisted breeding to put the perfume back into beauty. — PJH

Science, this issue p. 81; see also p. 28

PLANT GENOMICS

Signatures of adaptation in the field

Adaptation to the environment is critical for the survival of all species. For crops, this can be confounded or enhanced by farmers and breeders selecting for particular traits. To determine the associations between genes and local environments, Lasky *et al.* performed a global genetic survey of nearly 2000 regional varieties of domesticated sorghum. Regional environmental stresses such as climate and soil type were major determinants of adaptation. Enhancing sorghum (a staple crop for 500 million people in sub-Saharan Africa and Asia) and other crops may be possible based on marker-assisted selection of adaptive traits. — BJP

Sci. Adv. 10.1126/sciadv.1400218 (2015).

Sorghum genomes show signs of adaptation

CONSERVATION

Focused on protecting a few

The illegal ivory trade threatens the persistence of stable wild elephant populations. The underground and covert nature of poaching makes it difficult to police. Wasser *et al.* used genetic tools to identify the origins of elephant tusks seized during transit (see the Perspective by Hoelzel). The majority of source animals were part of just a few wild elephant populations in Africa—and just two areas since 2006. Increased focus on enforcement in a few such areas could help interrupt poaching activities and restore wild elephant populations. — SNV

Science, this issue p. 84; see also p. 34

POROUS MATERIALS

Laser patterning polymer membranes

Porous materials are useful for membranes, filters, energy conversion, and catalysis. Their utility often depends on the ability to finely control both the pore sizes and their connectivity. Tan *et al*. prepared porous thin films of block copolymers mixed with phenol-formaldehyde resins (resols) on silicon substrates using a simple laser process. On exposure to ultraviolet light, rapid heating of the substrate causes polymerization of the resols and decomposition of the block copolymer. This method allows direct patterning of the films on a local scale, with tunable pore sizes and size distributions. — MSL

Science, this issue p. 54

IN OTHER JOURNALS

Edited by **Kristen Mueller** *and* **Jesse Smith**

Many *Dictyostelium discoideum* band together to form a stalk and fruiting body

EVOLUTION

Trench warfare keeps cheaters rare

When starving, thousands of normally solitary *Dictyostelium discoideum* amoebae band together to form a slug, which then differentiates into a stalk and fruiting body. The cells of the stalk die, allowing the cells at the top of the fruiting body to form spores and disperse. "Cheater" amoebae avoid forming the stalk and dying. To determine whether cheating provides amoebae with a selective advantage in nature, Ostrowski *et al*. studied ~150 positions in amoebae genomes that influence cheating. The genomes maintained a balanced mixture of sequence variation at many of these positions. This indicates that cheaters remain rare because they are engaged in a form of evolutionary "trench warfare" with cooperator amoebae, which results in a stalemate between the two. — GR

Curr. Biol. 10.1016/j.cub.2015.04.059 (2015).

PHYSICS

Probing beyond the Standard Model

The Standard Model of physics presents an inventory of the known fundamental particles and how they interact in order to describe the world around us. But observations, such as that of the preponderance of matter over antimatter, suggest that the Standard Model is incomplete. Experiments with large particle colliders and measurements using smaller-scale precision atom-based techniques are under way in attempts to fill in the holes of the picture. Parker *et al.* describe one such cold

PHOTOS: (LEFT TO RIGHT) DSZC/ISTOCKPHOTO; ALEX WILD

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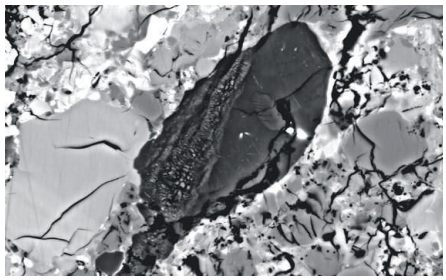
atom experiment, the search for an elusive permanent electric dipole moment in a cloud of laser-trapped radium atoms. Their initial results show promise for detecting such an effect, which should then provide constraints on establishing new physics beyond the Standard Model. — ISO

Phys. Rev. Lett. **114**, 233002 (2015).

MINERALOGY

The shocking history of the Moon

The mineral stishovite helps us determine the size of past meteorite impacts, because it forms only at the high pressure and temperature possible only in the most energetic meteorite strikes. Silica also needs to be present for it to form, which helps constrain what type of rock the meteorite hit. This rare mineral was first discovered in Arizona's Meteor Crater in 1962. Now, Kaneko *et al.* have found a small grain of stishovite in a Moon rock collected by the Apollo 15 mission. A more complete search for stishovite in lunar samples will provide a new path for reconstructing the impact history of the Moon. — BG



A lunar silica grain including stishovite

Am. Mineral. 10.2138/am-2015-5290 (2015)

CELL SIGNALING

Protein kinase C shapes calcium signals

The activation of hormone receptors on cells causes the concentration of free calcium in the cytoplasm to oscillate. Cells can encode information in the frequency, amplitude, and duration of such calcium oscillations, which may modulate the activation of downstream signaling pathways. Bartlett *et al.* compared calcium signals generated by hormone receptors or by a simpler mechanism that bypasses these receptors in rat hepatocytes, a type of liver cell. This allowed the authors to isolate the effects of the enzyme protein kinase C (PKC) on calcium oscillations, because PKC is only activated downstream of the receptor. PKC regulated both the shape and propagation rates of calcium waves — LBR

J. Biol. Chem. 10.1074/jbc.M115.657767 (2015).

T CELL METABOLISM

Complementing metabolic demands

For T cells, fighting infections is taxing work. T cells must proliferate and produce inflammatory mediators that help rid the body of infection. Doing so requires that they change their metabolism; for instance, by increasing their glycolytic capacity. How T cells do this at a molecular level, however, remains incompletely understood. Kolev *et al.* studied how this occurs in human T helper 1 (T_H1) cells, which are important for clearing intracellular infections. When activated, T_H1 cells produced complement C3b, an ancient innate immune mediator, which signaled in an autocrine manner to drive increases in nutrient uptake, glycolysis, and oxidative phosphorylation. These data highlight how the immune system can repurpose its components for evolutionary advantage. — KLM

Immunity **42**, 1033 (2015).

The rise of agriculture fundamentally changed human mobility

HUMAN ANATOMY

How agriculture shaped our bones

Human mobility declined after the Pleistocene, affecting human health and social organization—but what caused this decline? To find out, Ruff *et al.* examined skeletal remains from nearly 2000 individuals spanning a 33,000-year period from the Upper Paleolithic to the 20th century. They found that a decrease in the bending strength of leg bones accompanied the shift to an increasingly sedentary lifestyle that occurred in Europe during the Neolithic to Roman eras (approx. 7000 to 2000 years before the present). This implies a decline of mobility as agriculture came to dominate how people produced food. The remains did not reveal any further declines in the past 2000 years, even after agriculture became more mechanized. — AMS

Proc. Natl. Acad. Sci. U.S.A. **112**, 7147 (2015).

MATERIALS SCIENCE

From solution to a solid bright idea

Semiconducting quantum dots are ideal for down-converting light, so that a single blue source can be partly changed into other colors to give an overall white emission. Hanson *et al.* note that the conversion efficiency seen for quantum dots in solution is rarely matched when they are put into solid-state devices. This is particularly true for the red part of the spectrum, for which the best converters depend on expensive rare earth materials. Using low-cost materials, they grew CdSe/CdS core/shell particles so that the particles were mostly shell material. Conversion efficiencies in solid-state devices approached unity. At high driving currents, thermal quenching was a problem but was partly solved by adding a spacer between the light source and quantum dot layer. — MSL

ACS Appl. Mat. Inter. 10.1021/acsami.5b02818 (2015).

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Science

How agriculture shaped our bones

Andrew M. Sugden

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