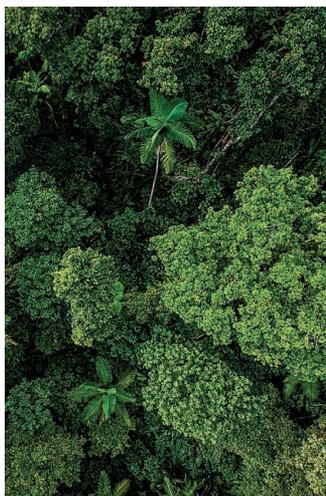


effects of DNA damage and defects in DNA repair processes. Knowledge of how specific signatures originate could have a major impact on cancer diagnosis and prevention. One approach to address this question is to reproduce the signatures in experimental systems by genetic engineering and then match the signatures to those found in naturally occurring cancers. Drost *et al.* used CRISPR-Cas9 to delete certain DNA repair enzymes from human colon organoids. In a proof-of-concept study, they show that deficiency in base excision repair is responsible for a mutational signature previously identified in cancer genome sequencing projects. —PAK

*Science*, this issue p. 234

## CARBON CYCLE Forests out of balance

Are tropical forests a net source or net sink of atmospheric carbon dioxide? As fundamental a question as that is, there still is no agreement about the answer, with different studies suggesting that it is anything from a sizable sink to a modest source. Baccini *et al.* used 12 years of MODIS satellite data to determine how the aboveground carbon density of woody, live vegetation has changed throughout the entire tropics on an annual basis. They



Twelve years of data show that tropical forests are a net carbon source.

find that the tropics are a net carbon source, with losses owing to deforestation and reductions in carbon density within standing forests being double that of gains resulting from forest growth. —HJS

*Science*, this issue p. 230

## REPRODUCTIVE BIOLOGY Fevers, TRPV channels, and birth defects

Cardiac and craniofacial birth defects are common, but many cannot be attributed to specific mutations. An environmental trigger associated with these birth defects is maternal fever during the first trimester. Using chick and zebrafish embryos, Hutson *et al.* found that hyperthermia activated temperature-sensitive TRPV1 and TRPV4 ion channels in neural crest cells, which give rise to the tissues affected by the birth defects. Transiently activating either of these channels in neural crest cells in chick embryos resulted in cardiac and craniofacial birth defects similar to those induced by fever. —WW

*Sci. Signal.* **10**, eaal4055 (2017).

## BRAIN IMAGING Newborn brain imaging made easier

Electroencephalography (EEG) and functional neuroimaging can be used to elucidate brain functions and reveal abnormalities. However, it is challenging to use these technologies at the bedside, owing to their size, lack of portability, and cost. Demene *et al.* developed a portable, customized, and noninvasive system called fUSI (functional ultrasound imaging) that is capable of continuous video-EEG recording and fast ultrasound imaging of the brain microvasculature of newborn babies. They demonstrated the value of fUSI for bedside monitoring by applying it to observe brain activity and neurovascular changes in two neonates with abnormal cortical development. —MM

*Sci. Transl. Med.* **9**, eaah6756 (2017).

## IN OTHER JOURNALS

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

### ECOLOGY

## Coffee plants benefit from ant dung

Ants and the plants on which they live have evolved to benefit from their close relationship. Plants provide nesting space and food for the ants, which in turn defend the plant against herbivory. In coffee plants, Pinkalski *et al.* show a previously undescribed aboveground uptake of nutrients provided by weaver ants. Nitrogen in the ants' food was traced using isotopic labeling, allowing the authors to observe that nitrogen in the ants' excretion was absorbed through leaves and translocated throughout the plant. Leaves from plants that hosted ants contained more nitrogen than those that did not. It is not yet known how widespread this phenomenon is, but it may be that canopy fertilization, as well as protection from herbivory, earns ants their keep in relationships with plants. —ECM

*J. Ecol.* **10**, 1111/1365-2745.12841 (2017).



## HEALTH DISPARITIES For diabetes screening, race matters

Type 2 diabetes is diagnosed and monitored by a blood test for HbA1c, a modified form of hemoglobin produced when blood glucose is high. HbA1c levels can be influenced by genetic variants unrelated to glucose homeostasis. To examine whether such variants affect the reliability of the HbA1c test, Wheeler *et al.* studied 60 genetic variants in nearly 160,000 people of different ancestries. They identified a specific variant that, by shortening the lifespan of red blood cells, reduced HbA1c levels irrespective of blood glucose. This variant occurs almost exclusively in individuals of African ancestry. The results suggest that about 650,000 African Americans with type 2 diabetes may be misdiagnosed as healthy if they are screened solely by the HbA1c test. —PAK

*PLOS Med.* **10**, 1371/journal.pmed.1002383 (2017).

## CANCER Blood test for early-stage cancer

Cancer cells release circulating tumor DNA into the bloodstream, which can sometimes be used to measure tumor progression and treatment response. Chan *et al.* sought to address whether so-called "liquid biopsies" could be used to diagnose cancer before an individual had symptoms. They used nasopharyngeal cancer as a model, which is known to be associated with Epstein-Barr virus (EBV) infection. By screening EBV DNA in the plasma from more than 20,000 Chinese men, the researchers were able to accurately detect early-stage nasopharyngeal cancer in this high-risk population. In a 3-year study, the blood test increased the patient survival rate to 97%, compared with around 70% in a historical cohort. —PNK

*N. Engl. J. Med.* **10**, 1056/NEJMoa1701717 (2017).



Weaver ants earn their keep on coffee plants by providing extra fertilization.

final products can be challenging, even for well-studied systems. This is particularly true for iron sulfides, for which there exist numerous phase variations with only small differences in stoichiometry. Rhodes *et al.* found that the formation of sulfur-rich phases correlated with lower C–S bond strength in the organosulfur precursors. However, phases also were affected by the decomposition pathway of the precursor, which could be influenced by using oleylamine as a solvent, because it can also act as a coordinating ligand and a reducing agent. FeS<sub>2</sub> or pyrite only formed when using the weakest precursor, diallyl disulfide, and it formed directly, without requiring a FeS intermediate. —MSL

*Chem. Mater.* 10.1021/acs.chemmater.7b03550 (2017).

## PHOTOSWITCHES

### Aqueous azobenzene switching

Photoswitching molecules can enable targeted delivery of drugs in the body, but the body is best penetrated by near-infrared radiation (wavelengths between 700 and 900 nanometers). Most photoswitching processes in molecules require shorter wavelengths, and high light intensities are needed to trigger two-photon processes. Dong *et al.* extensively substituted azobenzene molecules so that they were soluble in water and could photoswitch from the trans isomer after single-photon irradiation at 720 nanometers. The

half-life of the resulting cis isomer was 1 second. The benzene rings were substituted with methoxy and pyrrolidine groups, as well as a fused dioxane ring, so that the molecule remained protonated at physiological pH while exhibiting good stability in water. —PDS

*J. Am. Chem. Soc.* 10.1021/jacs.7b06471 (2017).

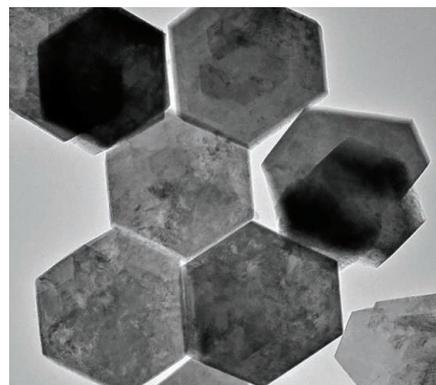
that undergraduates can be successful participants in their laboratories. —MMc

*CBE Life Sci. Educ.* 10.1187/cbe.16-11-0326 (2017).

## NANOMATERIALS

### Subtleties of growing iron sulfides

Many recipes for growing colloidal nanoparticles exist, but achieving full control over the



Pyrrhotite (Fe<sub>7</sub>S<sub>8</sub>) prepared from the precursor phenyl disulfide

## EVOLUTIONARY GENOMICS

### Not missing the origins of lncRNAs

Long noncoding RNAs (lncRNAs) are RNA transcripts within the human genome that do not encode proteins. Some lncRNAs have important regulatory functions, such as in silencing the extra X chromosome in females. However, little is known about the origin and maintenance of lncRNAs that are conserved across many mammalian lineages. Hezroni *et al.* used computational methods to determine that less than 5% of lncRNAs originated from RNA transcripts that once could be translated into proteins. Although they make up a relatively small amount of the genome, these lncRNAs show persistence: Some appear to have lost their protein-coding function more than 200 million years ago but are still maintained as conserved transcripts within mammalian genomes. —LMZ

*Genome Biol.* 18, 62 (2017).

## EDUCATION

### More undergraduates, more publications

The benefits to students of undergraduate research experience have been well documented, but what are the benefits for the faculty mentors? One possibility is faculty-student publications, an important outcome both for students' scientific development and for faculty promotion. Morales *et al.* examined predictors of faculty-student publications, including measures of faculty-student collaboration, faculty commitment to undergraduate students, and faculty characteristics. Results show that faculty who were productive in publishing with undergraduates worked with students for more than 1 year, enjoyed teaching students about research, had mentored black students, and had received more grant funding. Results from this study can be used to promote faculty awareness