

and Bachan developed a model of seawater chemistry and pH over time scales exceeding ~100 million years. Their highly robust probabilistic history of seawater pH and chemistry reflects evolving properties of Earth's atmosphere, oceans, and crust. Seawater pH increased from early Archean values of ~6.5 to 7.0 to more recent values of ~7.5 to 9.0 mostly as a result of solar brightening and decreasing interaction between seawater and oceanic crust. —HJS

Science, this issue p. 1069

MOSQUITO BEHAVIOR

Siren molecule calls loudly to mosquitoes

People infected by malaria become more attractive to the mosquito vectors of the disease, which facilitates the spread of malaria. Emami *et al.* found that red blood cells of the host respond to a parasite-derived isoprenoid called HMBPP by increasing the production of carbon dioxide and several monoterpenes and aldehydes. Mosquitoes fed HMBPP-spiked blood displayed malaria parasite-specific changes in gene transcription, which reinforced attractiveness for the mosquito. HMBPP also stimulates mosquito feeding and malaria parasite reproduction. Thus, the parasite manipulates its mammalian host to make it more attractive to the insect vector and exploits the same molecule to amplify transmission. —CA

Science, this issue p. 1076



Malaria parasites increase humans' attractiveness to mosquitoes.

IMMUNOLOGY

Flexible control of T cell activation

Compared with effector T cells, which have previously encountered antigen, naïve T cells require a stronger stimulus to become activated, which prevents spurious activation. Thauland *et al.* showed that naïve cells were stiffer than effector cells and formed smaller immune synapses with antigen-presenting cells. The decreased flexibility of the naïve cells depended on the decreased activation of cofilin, which leads to the formation of a stiffer actin cytoskeleton. Thus, pharmacological modulation of T cell stiffness could change the threshold for activation. —JFF

Sci. Signal. **10**, eaah3737 (2017).

VACCINATION

Time for a booster shot? Open wide!

No one likes to be on the receiving end of a needle, which can make routine childhood vaccinations especially problematic. Aran *et al.* developed a needle-free drug delivery device that works orally. The MucoJet device uses a simple chemical reaction to deliver a jet of vaccine—in this case, ovalbumin—that penetrates the buccal mucosa when placed against the inside of a rabbit's cheek. The rabbits showed evidence of antibodies against ovalbumin in cheek tissue and ear vein blood samples 6 weeks after vaccination. —CC

Sci. Transl. Med. **9**, eaaf6413 (2017).

IN OTHER JOURNALS

Edited by **Caroline Ash**
and **Jesse Smith**



Ebola virus isolated from patient blood samples

CANCER THERAPY

Exploiting cancer metabolism

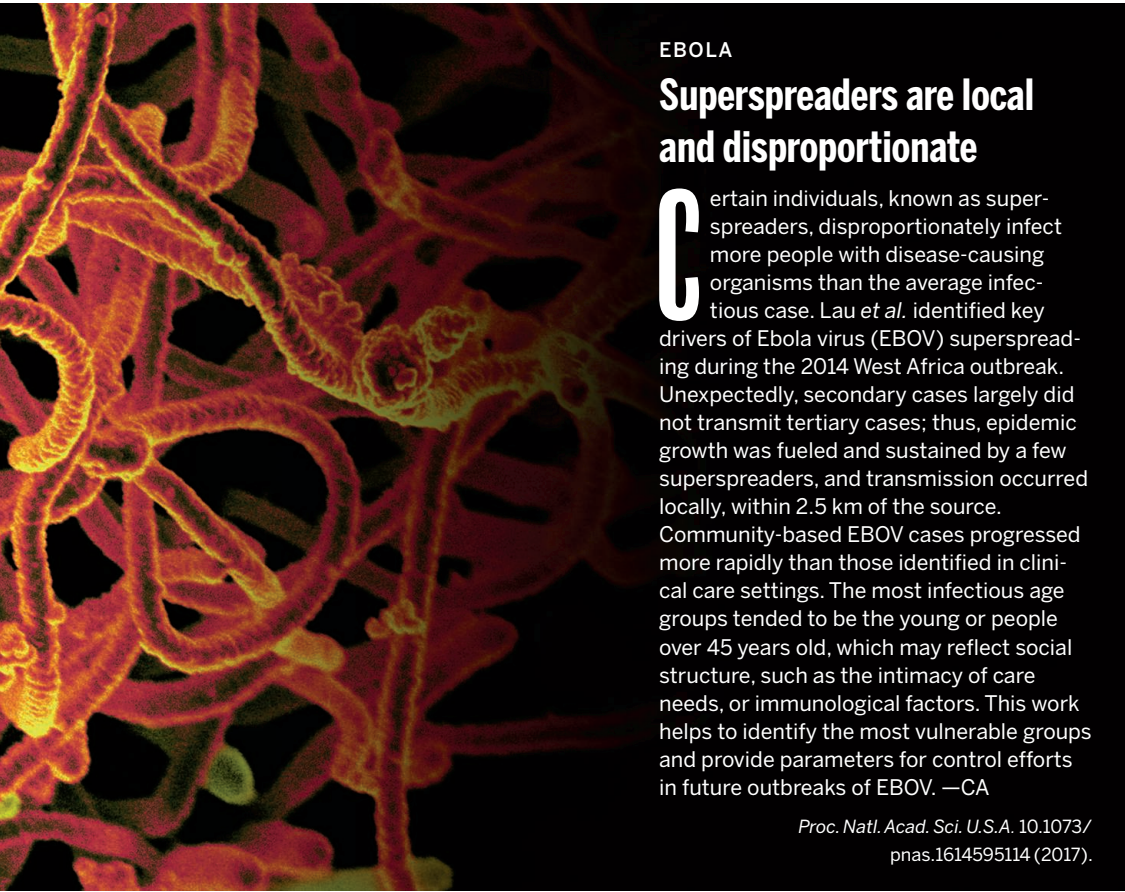
Cancer-specific cell surface proteins can be targeted for the delivery of therapeutic agents. However, specific proteins may not always be expressed by a tumor. Wang *et al.* overcome this challenge by designing sugars to selectively label cancer cells. Small-molecule sugars (azides) can be metabolized by enzymes that are highly expressed in some tumors, including colon and breast cancer cells. Metabolized azides labeled endogenous cell surface proteins in cultured cancer cells and tumor-bearing mice. The azide moiety on the labeled proteins was subsequently recognized by another molecule carrying a drug, which was taken up by the cancer cells. Tumor growth was reduced, and animal survival improved by 86%. —LDC

Nat. Chem. Biol. **10**, 1038/nchembio.2297 (2017).

DIVERSITY

STEM = masculine + feminine

Gender inequalities in science, technology, engineering, and mathematics (STEM) are well documented, but the underlying causes leading to these inequalities are less studied. To test the association between masculinity or femininity and choosing a STEM major, Simon *et al.* surveyed students at a major public university, using questions regarding academic climate and occupational values coupled with the Bem sex-role inventory, a widely used measure of gendered personality types. Resulting data suggest that the conventional model that men like science because it is "masculine," whereas women do not like science because it is "anti-feminine," is flawed. Instead, results show that women pay a femininity penalty in STEM majors, whereas more abundant feminine personality traits



EBOLA

Superspreaders are local and disproportionate

Certain individuals, known as superspreaders, disproportionately infect more people with disease-causing organisms than the average infectious case. Lau *et al.* identified key drivers of Ebola virus (EBOV) superspreading during the 2014 West Africa outbreak. Unexpectedly, secondary cases largely did not transmit tertiary cases; thus, epidemic growth was fueled and sustained by a few superspreaders, and transmission occurred locally, within 2.5 km of the source. Community-based EBOV cases progressed more rapidly than those identified in clinical care settings. The most infectious age groups tended to be the young or people over 45 years old, which may reflect social structure, such as the intimacy of care needs, or immunological factors. This work helps to identify the most vulnerable groups and provide parameters for control efforts in future outbreaks of EBOV. —CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1614595114 (2017).

BIOPHYSICS

The benefits of being young

In addition to chemical cues, the differentiation of stem cells can be influenced by mechanical forces, such as the stiffness of the underlying substrate, but these effects diminish with age. Barreto *et al.* compared the differentiation of mesenchymal stromal cells from donors aged 11 to 12 years and from young adults aged 20 to 30 years, when the skeleton has fully matured. The juvenile cells showed greater mechanosensitivity and enhanced angiogenesis and osteogenesis. From an examination of a number of growth factors, the authors found a key role for the protein JNK3, which might serve as a target for restoring the potential for regeneration in adults suffering from bone degeneration to that found in youth. —MSL

Acta Biomater. 10.1016/j.actbio.2017.02.031 (2017).

OPTICS

A time to polarize the unpolarized

Wavelength, intensity, and polarization are several parameters that define a light field. Light from most natural and many artificial light sources is unpolarized. However, an instantaneous snapshot of a propagating light field shows that it may be completely polarized. Shevchenko *et al.* propose and demonstrate experimentally that there is a finite window of time for that snapshot in which the unpolarized light is polarized. Using a Michelson interferometer with polarization-sensitive components combined with two-photon absorption detectors, they show for two different unpolarized light sources that the polarization time window varies from 10 to 100 fs. The effect of a finite polarization time could be exploited in a number of applications such as communication and sensing. —ISO

Optica 4, 64 (2017).

in men render them more likely to major in a STEM field. —MM

J. Res. Sci. Teach. 10.1002/tea.21345 (2017).

PSYCHOLOGY

Sampling online workers globally

Historically, experimental psychologists have relied heavily on undergraduates for their subject pool; over the past decade, they have recruited subjects online, employing people colloquially termed MTurkers through the Amazon Mechanical Turk website. Over the years, MTurkers have become so familiar with online surveys that there are concerns about the representativeness and reliability of these participants. Peer *et al.* compared MTurk with two other crowdsourcing sites, CrowdFlower and Prolific Academic. The latter two sites produced participants who were less familiar with the kinds of tasks assigned (good) but also less attentive to instructions

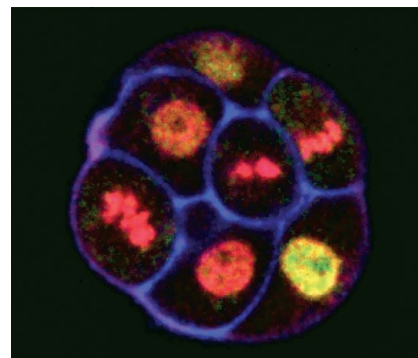
(bad), and they had more European participants. In terms of reliability and reproducibility, Prolific Academic scored higher than CrowdFlower and about the same as MTurk. —GJC

J. Exp. Soc. Psychol. 70, 153 (2017).

EMBRYOGENESIS

Breaking embryo symmetry

For the first few cleavages, cells of the mammalian embryo are considered identical.



Loss of cleavage symmetry in the early embryo

Subsequently, symmetry is broken to generate the inner cell mass, which specifies the embryo proper, or the extra-embryonic trophoctoderm. Korotkevich *et al.* used live imaging to visualize mini-blastocysts generated from single 8-cell-stage blastomeres. The mitotic spindles of mini-blastocysts aligned along the apico-basal axis. The polar cell containing the apical domain, which expresses Cdx2, enveloped the apolar sister to adopt a trophectoderm fate.

Transplantation of the apical domain showed that it is required and sufficient for the first lineage segregation. It is not yet known whether surface adhesion molecules or mechanical differences affect the assembly of the apical domain for subsequent lineage segregation. —BAP

Dev. Cell. 40, 235 (2017).

Science

Superspreaders are local and disproportionate

Caroline Ash

Science **355** (6329), 1036.

DOI: 10.1126/science.355.6329.1036-a

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