

efficiencies. Using mixed-cation lead mixed-halide perovskite and a solution-processed secondary growth method, Luo *et al.* created a surface region in the perovskite film that inhibited nonradiative charge-carrier recombination. This kind of solar cell had comparable performance to that of conventional cells. —PDS

Science, this issue p.1442

CONDENSED MATTER

Golden ultrafast melting

Understanding fast melting of metals is important for applications such as welding and micromachining. However, fast melting leaves simulation as the only option for probing the process. Mo *et al.* performed ultrafast electron diffraction experiments on laser-pulsed gold films. This allowed detailed mapping of the melting process, which proceeds through two distinct regimes while the bonding behavior changes in unexpected ways. The results require adding new physical processes to high-energy melting models. —BG

Science, this issue p.1451

SEX DETERMINATION

Sox9 regulation during sex determination

Sex determination is regulated by the Sox9 gene. During testis differentiation, this gene is directly targeted by the product of the Y chromosome–encoded gene Sry. The regulatory region of Sox9 is complex, which is typical of genes with multiple



If Sox9 is not up-regulated, XY mice develop as females.

roles in development. Gonen *et al.* find that a single far-upstream 557–base pair element is critical for up-regulating Sox9. Without it, XY mice develop as females instead of males. The 557–base pair enhancer is conserved, likely to be relevant to human disorders of sex differentiation, and probably essential because it acts early in a time-critical process, and any failure allows ovary-specific factors to dominate. —BAP

Science, this issue p.1469

EVOLUTIONARY BIOLOGY

Human influence on orangutans

The numbers of orangutans and their geographic distribution declined dramatically after the late Pleistocene. Experts have proposed climate change and human activities as possible causes. Synthesizing available archaeological, genetic, and behavioral data, Spehar *et al.* concluded that over the past 70,000 years, hunting especially played a role. Some adaptable orangutan populations continue to live in human-dominated environments, which challenges the long-held belief that orangutans require pristine habitats. —PJB

Sci. Adv. 10.1126/sciadv.1701422 (2018).

T CELL ACTIVATION

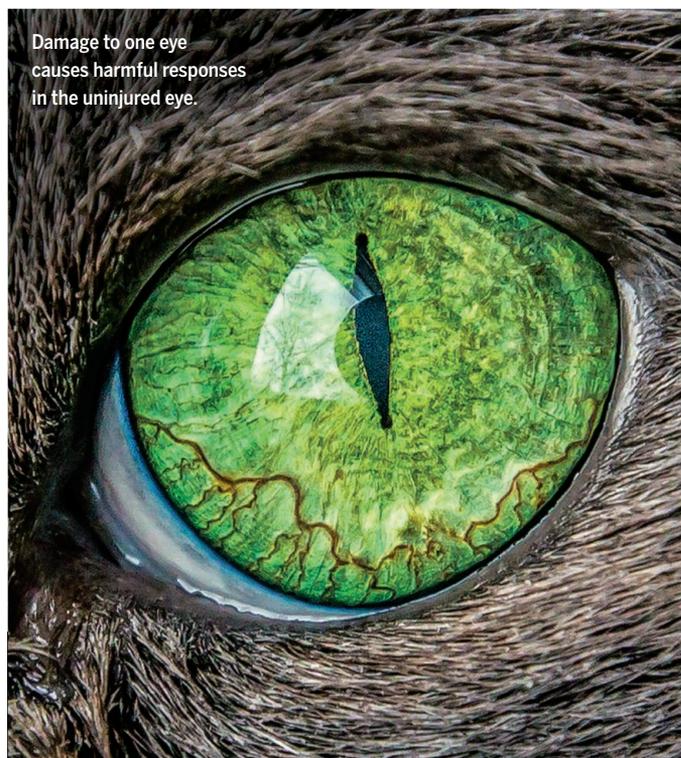
Controlled activation

At the intestinal barrier, lymphocyte activation is a tightly regulated process that enables rapid responses to pathogens but avoids destructive inflammation. Konjar *et al.* examined how intraepithelial lymphocytes (IELs) maintain a controlled activation state, which is influenced by the composition of the mitochondrial membrane. Inflammation triggers changes in the mitochondrial membranes of IELs, particularly the cardiolipin composition, and these changes support rapid proliferation and effector functions. —CNF

Sci. Immunol. 3, eaan2543 (2018).

IN OTHER JOURNALS

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



Damage to one eye causes harmful responses in the uninjured eye.

IMMUNOLOGY

A site for sore eyes

Mucosal tolerance arises when exposure to foreign antigens at mucosal sites results in suppressed immune responses mediated by regulatory T cells and tolerogenic antigen-presenting cells (APCs). In mammals, immune responses of the retina and cornea in both eyes are interdependent: Damage in one eye causes a response in the uninjured eye, too. Using a mouse model of ocular injury, Guzmán *et al.* show that damage to the conjunctival mucosa in one eye also leads to a loss of mucosal tolerance in the opposite, undamaged conjunctiva. TRPV1 channels in the injured eye signal via the central nervous system, which leads to the neuropeptide substance P being released in the uninjured eye. Consequently, epithelial nuclear factor κ B signaling and APC maturation direct antigen-specific T cells to an effector phenotype and potentially damaging inflammation in the intact eye. —STS

Mucosal Immunol. 10.1038/s41385-018-0040-5 (2018).

CELL BIOLOGY

Memories: Just a phase

Recently, several proteins have been shown to phase-separate into liquid droplets within the cell. Dine *et al.* found that such protein droplets exhibit a robust form of spatial memory. The

droplets maintained the spatial pattern of an inhibitor of droplet formation long after the inhibitor had been removed. Despite this persistence, individual droplets were highly dynamic, continuously exchanging their constituents with the cytosolic phase. The authors exploited



Sibon nebulatus, one of a tribe of diverse South and Central American snakes

HERPETOLOGY

Snail-snacking snakes

Dipsadini are snakes that consume snails by sucking them out of their shells. They constitute a diverse tribe of more than 70 recognized species of tree-living snakes with striking skin patterns. Arteaga *et al.* have sampled nuclear and mitochondrial genes from a new collection of snakes from Central and South America to reexamine their taxonomy. It appears that these snakes' specialized lifestyle has resulted in a large adaptive radiation. Unfortunately, the five species newly discovered in this analysis are all vulnerable or endangered owing to habitat fragmentation. —CA

Zookeys 10.3897/zookeys.766.24523 (2018).

their system to drive persistent, local regulation of cytoskeletal activity via dynamic clusters of receptor tyrosine kinases. Thus, protein phase separation may underlie the persistent polarization observed in many cellular and developmental processes. —SMH

Cell Syst. 10.1016/j.cels.2018.05.002 (2018).

MOLECULAR BIOLOGY

Inactivating sex chromosomes

To compensate for sex chromosome dosage, XX females undergo epigenetic inactivation (XCI) of one X chromosome. Using a mouse embryonic stem cell culture system, Sousa *et al.* investigated this process

in vitro. Surprisingly, they found that male cells also undergo XCI, albeit transiently, at the onset of stem cell differentiation. In addition, both X chromosomes are ephemerally inactivated in female cells before one X is randomly inactivated permanently. Although it remains to be shown in vivo, these results suggest gender-independent XCI initiation and additional, unknown female-specific mechanisms to maintain XCI. —SYM

Cell Stem Cell 10.1016/j.stem.2018.05.001 (2018).

MATERIALS SCIENCE

Growing compound semiconductors

Epitaxial growth is the main technique used for depositing

nonsilicon integrated electronic and photonic devices. However, methods for growing devices on amorphous and nonepitaxial substrates are limited. Sarkar *et al.* overcome this by using standing evaporation or sputtering techniques to deposit a metal, such as indium, with a capping oxide layer. The metal is heated in a hydrogen environment, and a precursor is added to convert the metal to the desired target, such as InP, under conditions where only a single nucleation site forms in each patterned site. The versatility of the method is demonstrated through the growth of InP, GaP, InAs, InGaP, SnP, and Sn₄P₃ crystals directly on SiO₂, Si₃N₄, TiO₂, Al₂O₃, Gd₂O₃, SrTiO₃, and graphene. —MSL

ACS Nano 10.1021/acsnano.8b01819 (2018).

EDUCATION

A CURE for undergraduate research

Course-based undergraduate research experiences (CUREs) are designed to engage an entire class in a research question within the context of the course itself. Current research suggests that five distinct core components come together to define a CURE. Ballen *et al.* used a backward-elimination experimental design to test the importance of two CURE components for non-biology majors: experience of discovery and the production of data. They did not find significant impacts of either component on nonmajors' academic performance, science self-efficacy, sense of project ownership, or perceived value of the CURE. These findings challenge the current definition of what constitutes a CURE and suggest future studies aimed at understanding why different laboratory environments can be effective for both major and nonmajor populations. —MMC

J. Microbiol. Biol. Educ. 10.1128/jmbe.v19i2.1515 (2018).

SURFACE SCIENCE

Tipping the vibrational spectrum

Scanning tunneling microscopy can be used to measure the vibrational spectrum of adsorbed molecules as loss features in the inelastic tunneling of electrons. Okabayashi *et al.* explored perturbations caused by the close proximity of the microscope tip to the adsorbed molecule—in this case, CO adsorbed on the Cu(111) surface. From a series of force-sensing and frequency-shift scans, they could determine the changes in frequency arising from the force exerted by the tip by modeling the surface, molecule, and tip as a mechanical system. The tip weakened and lengthened the C–O bond and shifted the frustrated translational mode of CO to higher energies. —PDS

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1721498115 (2018).

PHOTO: SIBONS PHOTOGRAPHY/ALAMY STOCK PHOTO