

CANCER IMMUNOLOGY

FAK directs tumor immune evasion

Tumors are adept at escaping immune system surveillance or suppressing immune system activity. Serrels *et al.* found that focal adhesion kinase (FAK), which is implicated in immune escape mechanisms, activated a transcriptional network that increased interleukin-33 (IL-33) levels in tumor cells. In a mouse model of squamous cell carcinoma, FAK–IL-33 complexes boosted the production and secretion of key immunosuppressive factors. Blocking these FAK-mediated signals may help the immune system find and kill tumors. —LKF

Sci. Signal. **10**, eaan8355 (2017).

MOLECULAR BIOLOGY

Understanding splicing from the 3' end

The spliceosome removes introns from eukaryotic mRNA precursors and yields mature transcripts by joining exons. Despite decades of functional studies and recent progress in understanding the spliceosome structure, the mechanism by which the 3' splice site (SS) is recognized by the spliceosome has remained unclear. Liu *et al.* and Wilkinson *et al.* report the high-resolution cryo-electron microscopy structures of the yeast postcatalytic spliceosome. The structures reveal that the 3'SS is recognized through non-Watson-Crick base pairing with the 5'SS and the branch point, stabilized by the intron region and protein factors. —SYM

Science, this issue p. 1278, p. 1283

SUSTAINABLE CHEMISTRY

A sweet source to make acrylonitrile

Much of the attention directed toward displacing petroleum feedstocks with biomass has focused on fuels. However, there are also numerous opportunities in commodity chemical production. One such candidate is acrylonitrile, a precursor to

a wide variety of plastics and fibers that is currently derived from propylene. Karp *et al.* efficiently manufactured this compound from an ester (ethyl 3-hydroxypropanoate) that can be sourced renewably from sugars. The process relies on inexpensive titania as a catalyst and avoids the side production of cyanide that accompanies propylene oxidation. —JSY

Science, this issue p. 1307

HEALTH ECONOMICS

One cause of accidental deaths

The number of accidental deaths involving a firearm might be expected to correlate with the number of firearms, but claims that a causal relationship exists have not been persuasive (see the Policy Forum by Cook and Donahue). The 2012 mass shooting at an elementary school in the eastern United States resulted in the deaths of 20 children. Levine and McKnight used the random timing of this event and the subsequent increase in gun purchases (as recorded by an increased number of background checks) to show that the increased exposure to guns resulted in ~60 accidental deaths. —GJC

Science, this issue p. 1324 4; see also p. 1259

HEALTH AND MEDICINE

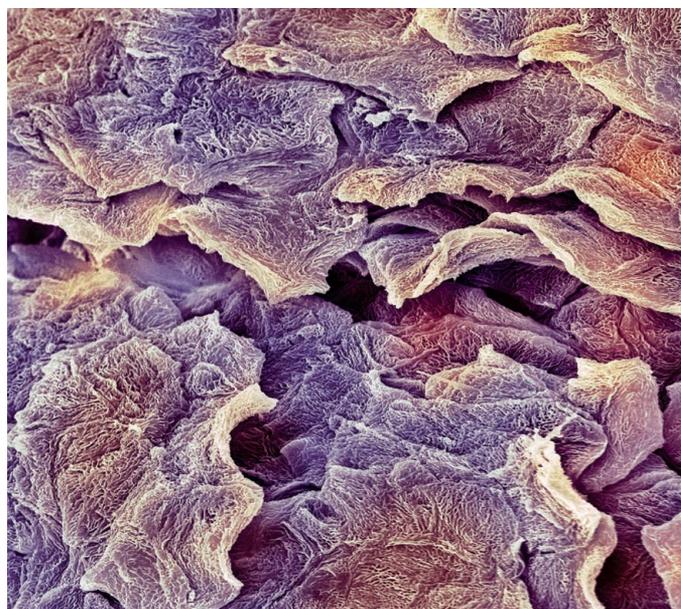
Taking a direct route to the brain

Hematopoietic stem and progenitor cells (HSPCs) rapidly generated myeloid and microglial cells in diseased mice when injected directly into the brain. To circumvent the blood-brain barrier, Capotondo *et al.* injected human HSPCs into cerebral lateral ventricles in a mouse model of neurodegenerative disease. The approach resulted in the rapid and robust production of HSPC-derived myeloid and microglia cells at the site where they are needed most. —JAP

Sci. Adv. **10**, 1126/ sciadv.1701211 (2017).

IN OTHER JOURNALS

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



Skin stem cells have been successfully used in life-saving therapy.

STEM CELLS

Skin stem cells regenerate a human epidermis

In a landmark study, Hirsch *et al.* used engineered autologous skin stem cells to replace more than 80% of the epidermis of a critically ill 7-year-old boy. The child suffered from junctional epidermolysis bullosa (JEB), a rare skin condition affecting fewer than 1 in 1 million people. Affected individuals have fragile skin that is prone to blisters and erosions, making them susceptible to life-threatening infections. The researchers obtained a small biopsy from a nonblistering skin section, which was used to grow keratinocyte cultures in the laboratory. Cells were engineered to express a skin protein called LAMB3 (which is defective in JEB), and grafts were transplanted onto the boy's denuded surfaces during multiple surgeries. At the 21-month follow-up stage, the boy's skin had healed normally, was blister-free, and was deemed fully functional with normal elasticity. —PNK

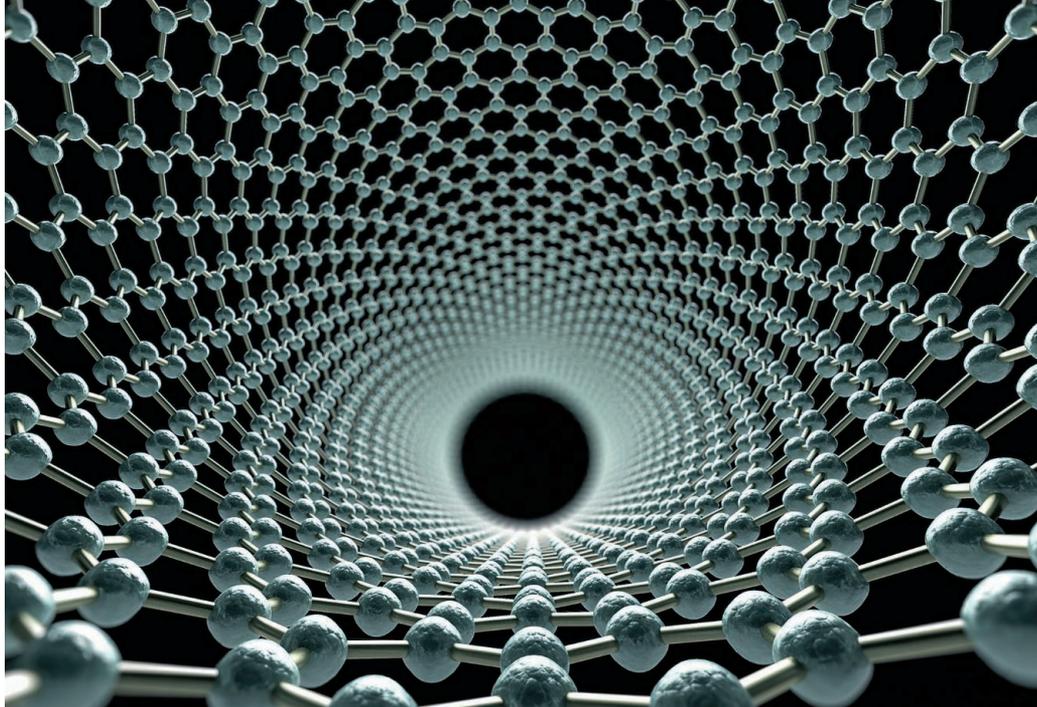
Nature **10.1038/nature24487** (2017).

PLANT SCIENCE

Multifactorial response to drought

Drought is not just characteristic of the desert, but also occurs as transient dry spells in agricultural settings. Plants respond to drought by waterproofing their surfaces, closing pores, and adjusting internally, largely in response to the hormone

abscisic acid. The hormones strigolactone, which triggers germination of parasitic plants, and karrikin, a component of smoke that triggers seed germination after fire, also promote tolerance to drought. The signaling pathways for strigolactone and karrikin converge on MAX2, which functions as part of the ubiquitin-regulated protein degradation system. Studying



Carbon nanotube fibers cause mesothelioma in mice.

CANCER

The health hazards of fiber intake

Carbon nanotubes (CNTs) are used in a variety of commercial applications, from automotive parts to computers. Increased human exposure to these nanomaterials has sparked concerns about possible health risks because CNTs have structural similarities to asbestos, which causes the incurable cancer mesothelioma. A new study in mice does not alleviate these concerns. Chernova *et al.* delivered either long-fiber asbestos or long-fiber CNTs into the pleural cavity of mice and found that the treatments both induced chronic inflammation and activated the same signaling pathways. By 12 to 20 months after exposure, at least 10% of the mice in each group had developed mesothelioma. These results suggest that CNTs pose health risks similar to those of asbestos and that human exposure to them should be monitored. —PAK

Curr. Biol. **27**, 3302 (2017).

the small mustard relative *Arabidopsis*, Li *et al.* analyzed the cross-talk between signaling pathways for these three hormones that allow thirsty plants to survive. —PJH

PLOS Gen. 10.1371/journal.pgen.1007076 (2017).

DIVERSITY

Downplaying versus embracing differences

Inclusive teaching practices are often taught during workshops aimed at increasing student diversity. Aragón *et al.* analyzed data from an intensive workshop on inclusive teaching practices held by the National Academies of Sciences Summer Institutes on Undergraduate Education to model how educators

adopt such practices. Two ideologies were considered: colorblindness, which downplays differences based on gender or color, and multiculturalism, which embraces differences. Overall, participants reported implementing more inclusive teaching practices than they had before attending the Summer Institute. However, stronger endorsements by participants of multicultural ideology predicted higher reports of inclusive teaching practices, whereas stronger endorsements of colorblind ideology predicted lower reports. Results from this study will help bridge basic theory and application in the implementation of future inclusive teaching workshops. —MMc

J. Divers. High. Educ. 10.1037/dhe0000026 (2017).

IMMUNOLOGY

The metabolic needs of migrating T_{regs}

Regulatory T cells (T_{regs}) are thought to rely primarily on oxidative metabolism, in contrast to CD4⁺ T helper subsets (T_H1, T_H2, and T_H17 cells), which are highly glycolytic. However, Kishore *et al.* find that integrins (LFA-1) and costimulatory molecules (CD28) can enhance T_{reg} glycolysis, whereas the coinhibitory receptor CTLA-4 can block it. Glycolysis is required for T_{reg} migration and depends on the enzyme glucokinase, which is induced by the PI3K-mTORC2 signaling pathway. T_{regs} lacking elements of this pathway are unable to migrate effectively to sites of inflammation. Likewise, T_{regs} from patients

with a polymorphism endowing increased glucokinase activity showed enhanced chemokine-induced motility. This work opens the possibility of targeting specific glycolytic enzymes to selectively manipulate the migration of different T cell subsets. —STS

Immunity **47**, 875–889 (2017).

ROBOTICS

Softly getting a grip

For delicate work, our fingers can softly grasp an object such as an egg, whereas when precision is called for, we can hold something like a pencil or fine tool with a stiff grasp. In robotic arms, soft pneumatic actuation allows for dexterity and flexibility, but the stiffness of the arm cannot be decoupled from the position of the device at its end. Giannaccini *et al.* used a combination of contracting and expanding muscles that increased the bending angle that the arm could achieve while also decoupling the stiffness of the manipulator at the end of the arm from its position in space. Further, increasing the payload on the arm had minimal effect on its bending. —MSL

Soft Robot. 10.1089/soro.2016.0066 (2017).

MECHANOCHEMISTRY

Pulling versus heating

Mechanical force can activate and break bonds in ways that differ from thermal mechanisms or photoactivation. Stevenson and De Bo studied the effects of substituent positions on retro-Diels-Alder reactions in which a bridged ring opened to form substituted furans and maleimides. Thermal activation depended on stereochemistry (endo or exo configurations), but mechanochemistry (activating the molecule with ultrasound) depended instead on regiochemistry (proximal or distal geometries). The thermally reactive distal-exo adduct was unreactive in the ultrasound experiments. —PDS

J. Am. Chem. Soc. 10.1021/jacs.7b08895 (2017).