including V(D)J recombination and Cas9-induced genome engineering, two "DNA" polymerases specific to NHEJ preferentially added RNA in cells. These RNA additions facilitated the critical step of ligation and were later replaced by DNA to complete the NHEJ repair process. —SYM

Science, this issue p. 1126; see also p. 1069

METAMATERIALS

Going quantum with metamaterials

Metasurfaces should allow wafer-thin surfaces to replace bulk optical components. Two reports now demonstrate that metasurfaces can be extended into the quantum optical regime. Wang *et al*. determined the quantum state of multiple photons by simply passing them through a dielectric metasurface, scattering them into single-photon detectors. Stav *et al*. used a dielectric metasurface to generate entanglement between spin and orbital angular momentum of single photons. The results should aid the development of integrated quantum optic circuits operating on a nanophotonic platform. —ISO

Science, this issue p. 1104, p. 1101

ORGANISMAL BIOLOGY

Teasing apart ant venom

Ant venoms are primarily made up of poorly characterized polypeptides. Robinson *et al*. combined transcriptomics and mass spectrometry–based proteomics to determine the mechanism of action of giant red bull ant venoms. Most of the venom peptides stemmed from a diverse hymenopteran toxin gene superfamily. Two peptides were responsible for causing pain in mammals, but by two different mechanisms. One peptide had both pain-causing activity and incapacitated crickets, a food for these ants, thereby functioning in both defense and predation. —PJB

Sci. Adv. 10.1126/sciadv.aau4640 (2018).

HUNTINGTON'S DISEASE

Improving Huntington's disease detection

Early detection of Huntington's disease (HD) could help the development of therapeutic strategies to block or delay disease progression. Byrne *et al*. found that blood and cerebrospinal fluid concentrations of mutant huntingtin (mHTT) and neurofilament light (NfL) proteins correlated with disease severity in HD patients. Alterations in circulating mHTT and NfL concentrations were among the earliest detectable changes in HD. Thus, concentrations of these proteins in biofluids might be used in combination with other clinical measures for improving the accuracy and efficiency of early HD detection. —MM

Sci. Transl. Med. **10**, eaat7108 (2018).

The giant red bull ant has complex multifunctional venom.

IN OTHER JOURNALS

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

PHOTO: KAAREL OLESK/GETTY IMAGES

CANCER

The benefits of marginal brain therapy

Diffuse gliomas are among the most common brain tumors in adults. Surgery is often successful, but, in many patients, the tumor eventually recurs at the surgical margins. A promising drug targets certain mutationally altered metabolic enzymes in gliomas but is toxic when delivered systemically. Shankar *et al*. hypothesized that both problems could be addressed by applying the drug directly to the surgical margins immediately after tumor resection. They developed a diagnostic tool that can be used in the operating room to determine tumor mutation status and, hence, drug sensitivity. By studying mouse models, they found that when they injected a sustained-release formulation of the drug directly into gliomas of the appropriate genotype, the mice survived considerably longer than control mice. —PAK

Proc. Natl. Acad. Sci. U.S.A. **115**, E8388 (2018).

DEVELOPMENTAL BIOLOGY

Unraveling the mystery of thalidomide

Off-label use of thalidomide became a worldwide trend in the 1950s and early 1960s to alleviate morning sickness. It resulted in a historical tragedy, as thousands of babies were born with severe birth defects. Donovan *et al*. may have found a missing link to explain how the drug affects fetal development. The researchers show that thalidomide and closely related drugs rapidly degrade the transcription factor Sal-like protein 4 (SALL4), which is necessary for fetal limb and organ formation. Adding further weight to their findings, certain individuals with mutations in the *SALL4*

ECOLOGY AND CLIMATE

Organic-matter flow in kelp forest

As the global climate warms, there are shifts in the geographical distribution of organisms, which can be accompanied by changes in ecosystem functioning. Pessarrodona *et al.* have been investigating the ecosystem consequences of the climate-driven arrival of warm-temperate kelp forest communities to the northwestern coastlines of Europe. Cycling of organic matter in the ecosystem—through kelp growth, herbivory, and decomposition—was faster in the new communities relative to cycling in native cold-temperate kelp communities. Notably, decomposition of plant detritus occurred 6.5 times faster. The continued northward expansion of warm-temperate kelp can be expected to lead to shifts in the flow of organic matter through these ecosystems and to further changes in associated communities of consumer organisms. —AMS

J. Ecol. 10.1111/1365-2745.13053 (2018).

Laminaria ochroleuca is moving north as the climate warms.

gene develop abnormalities that resemble thalidomide-induced birth defects. —PNK

eLife **7**, e38430 (2018).

PHOSPHATASE DRUGS

Drugging the undruggable

The reversible phosphorylation of proteins controls all aspects of life. Targeting phosphorylation offers a broad range of therapeutic opportunities. Although kinases are among the most prevalent drug targets, phosphatases have traditionally been overlooked. Krzyzosiak *et al.* used surface plasmon resonance to develop a method to enable target-based discovery of serine/threonine phosphatases. The method identified Raphin1, a selective inhibitor of the regulatory subunit of protein phosphatase 1, PPP1R15B, a negative regulator of protein quality control. Raphin1 boosted protein quality control in cells and slowed down disease progression in a mouse model of Huntington's disease. —SMH

Cell **174**, 1216 (2018).

PHYSICS

The entropy of a few

Mesoscopic structures have been predicted to host topologically nontrivial quantum states that could form the basis of fault-tolerant quantum computing. Distinguishing these states from more mundane ones is tricky; one potentially distinguishing characteristic is the entropy of the state, which would have to be measured to high precision in a system of only a few particles. Hartman *et al.* demonstrate such a technique and validate it using a well-understood GaAs quantum dot system. The method is based on the relationship between changes in the chemical potential and changes in temperature, entropy, and the number of particles residing on the dot. Its precision suggests that it could be used in more exotic settings. —JS

Nat. Phys. 10.1038/s41567-018-0250-5 (2018).

ENVIRONMENT

Following plastic through the economy

Over the past 50 years, plastic production and pollution have surged. Efforts to better handle plastic waste require detailed knowledge of the life cycles of different plastic types. Kawecki *et al.* report a probabilistic study of the life cycles of seven polymers that together make up 80% of the plastics used by manufacturers in Europe. The authors provide a detailed picture of the production, manufacturing, consumption, waste collection, and recycling, including trade flows, for each polymer, with a particular focus on textiles. The results can be used to predict how much plastic is likely to be released into the environment at different stages of each plastic's life cycle, thus informing strategies for preventing plastic pollution. —JFU

Environ. Sci. Technol. **52**, 9874 (2018).

PROTEIN FOLDING

Specialized chaperones required

Although some proteins can reach a properly folded state without assistance, many require help to adopt the correct topology and avoid kinetic trapping in nonnative states. Chaperones encapsulate guest proteins and use adenosine triphosphate (ATP)–driven conformational changes to help them fold, but not all chaperones work for all substrates. Balchin *et al.* compared the folding pathway of the cytoskeleton protein actin with its proper chaperone, TRiC, to the incorrect folding that occurs with the bacterial chaperone GroEL. TRiC functions by stabilizing an extended form of actin with the proper secondary structure and topology. ATP binding and hydrolysis drives release of this partially folded intermediate into the chaperone where it can successfully fold. GroEL fails to bind the intermediate properly and thus is not able to successfully fold actin, even after ATP binding and hydrolysis. —MAF

Cell **174**, 1507 (2018).

Reducing plastic pollution requires better knowledge of its entire life cycle.

PHOTOS: (TOP TO BOTTOM) AGE FOTOSTOCK/ALAMY STOCK PHOTO; MOODBOARD/GETTY IMAGES