

exposure by acquiring new mutations, a process called stress-induced mutagenesis. Cipponi *et al.* investigated whether similar programs of mutagenesis play a role in the response of cancer cells to targeted therapies. Using *in vitro* models of intense drug selection and genome-wide functional screens, the authors found evidence for an analogous process in cancer and showed that it is regulated by the mammalian target of rapamycin (mTOR) signaling pathway. This pathway appears to mediate a stress-related switch to error-prone DNA repair, resulting in the generation of mutations that facilitate the emergence of drug resistance. —PAK

*Science*, this issue p. 1127

## ARCHAEOLOGY Timing the rise of maize in Mesoamerica

Many lines of evidence suggest that maize (*Zea mays*) became a dietary staple across ancient Mesoamerica. However, there has been little direct evidence of its consumption, and the timing of how it came to dominate the diet of the peoples of the region is unknown. Using stable isotopic evidence from human skeletons excavated from two rock shelter sites in Belize, Kennett *et al.* show that there is no clear evidence of

maize consumption by the sites' inhabitants before 4700 years ago. However, isotopes from more recent individuals show the increasing importance of maize in the diet, such that by 4000 years ago, maize had become a persistent dietary staple. —MSA

*Sci. Adv.* 10.1126/sciadv.aba3245 (2020).

## ANALYTICAL CHEMISTRY Perfluorocarbons' path into soils

Covering carbon chains with fluorines has produced a variety of useful nonstick coatings. However, growing concern about the toxicity and extraordinary environmental persistence of the underlying compounds is spurring a search for alternatives. The precise structure of these next-generation alternatives often remains a trade secret. Washington *et al.* sampled soils in New Jersey and then used mass spectrometry to assign plausible structures—incorporating chlorine and ether segments into the CF<sub>2</sub> chain—to compounds that appear to have emanated from their manufacture (see the Policy Forum by Gold and Wagner). The data can inform in-depth studies of these compounds' environmental transport and persistence. —JSY

*Science*, this issue p. 1103; see also p. 1066

## IN OTHER JOURNALS

Edited by **Caroline Ash**  
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## MATERIALS SCIENCE

### Better food preservation

Fresh fruits and vegetables are a key part of a healthy diet but there can be considerable waste caused by spoilage after harvest. Shelf life can be extended by preventing microbial growth, dehydration, or storage at higher temperatures, but adding a wax coating, creating a reduced oxygen environment, or using refrigeration can be expensive and/or time consuming and may alter the taste of the food. Jung *et al.* developed an egg-sourced albumin coating reinforced with nanocrystalline cellulose that can be made from waste materials. When coated onto banana, avocado, papaya, and strawberry, shelf life was extended by a week, with reduced external browning and internal ripening. The coatings are safe to ingest but are also easily removed through washing. —MSL

*Adv. Mater.* 10.1002/adma.201908291 (2020).

Postharvest spoilage of fresh fruits and vegetables is reduced by a safe and easily removed coating made with egg albumin.

## DEVELOPMENT Making cartilage throughout life

The skeletons of newborn mammals are soft and pliable because they are composed primarily of cartilage. During

growth to adulthood, most cartilage is replaced by bone. The remaining cartilage, such as that found in the joints, does not readily regenerate, so joints deteriorate with age. By contrast, elasmobranch fish make cartilage throughout their



Maize, a global staple crop seen here growing in a field in El Salvador, rose to dominate diets in Mesoamerica by 4000 years before present.

PHOTOS (FROM LEFT): DBIMAGES/ALAMY STOCK PHOTO; LILLY TROTT/SHUTTERSTOCK



## FOOD SECURITY

## Scarcity in times of abundance

**A** cornerstone of food security is stability of access to the food supply. In a pioneering study of fishing communities in Amazonian seasonally flooded forest, Tregidgo *et al.* show how seasonal fluctuations in access can lead to scarcity even when the resource is abundant. Fishing becomes more challenging in the high-water season, leading to severe food insecurity for the more deprived households in the community. Communities such as these that depend on a wildlife resource for a substantial proportion of their diet may become further disadvantaged as seasonal fluctuations in access to food become further exacerbated by climate change. —AMS *People Nat.* 10.1002/pan3.10086 (2020).

**For communities living along the Amazon, greater seasonal fluctuations in water levels brought by climate change are likely to make access to fish resources more challenging.**

lives. Marconi *et al.* studied the cartilaginous fish *Leucoraja erinacea*, or little skate, from embryo to adult and observed that progenitor cells that surround the cartilage skeleton are also present in the adult. These cells are induced to transform into chondrocytes after injury. Understanding cartilage repair in skates may offer inspiration for research into human joint repair. —BAP

*eLife* **9**, e53414 (2020).

## PARASITOLOGY

## How helminths trump diabetes

The prevalence of type 2 diabetes mellitus (T2DM) is inversely correlated with helminth infections in Asia. This may be because helminths have an immunomodulatory effect and thus dampen the type 1 (allergic type) immune responses underlying the proinflammatory state of T2DM. To test this idea, Rajamanickam *et al.* measured plasma levels of cytokines in 60 individuals living in rural India infected with *Strongyloides stercoralis*, a persistent nematode gut parasite, which in most people is symptomless. They compared these results with

plasma cytokine concentrations from 58 T2DM patients showing no worm infection. Parasitized individuals showed significantly increased levels of interleukin-1 receptor alpha (IL-1R $\alpha$ ), which is typical of type 2 immune responses, and low levels of a wide range of proinflammatory cytokines and chemokines. When diabetic subjects were treated for parasites, their proinflammatory state, typically marked by increased IL-1 $\beta$  and IL-6, partially rebounded. —CA

*PLoS Neg. Trop. Dis.* **14**, e0008101 (2020).

## IMMUNOLOGY

## Neutrophils avoid a traffic jam

Neutrophils are the most abundant immune cell in the circulation and are typically the first responders to sites of infection or injury. How large numbers of neutrophils can efficiently travel through capillary networks is a mystery. Wang *et al.* investigated neutrophil trafficking in mouse liver using intravital microscopy and found that groups of neutrophils diverged at capillary bifurcations by traveling in an alternating pattern. This

phenomenon was then studied in a controlled fashion using microfluidic chips connected to a chemoattractant chamber. Neutrophils were able to bias the decisions made by their companions at bifurcations by altering both hydraulic resistance and chemoattractant gradients. It is likely that similar mechanisms are widely used to coordinate complex immune responses. —STS

*Nat. Commun.* **11**, 2385 (2020).

## EXOPLANET ATMOSPHERES

## Different as night and day

The atmospheric compositions of exoplanets are usually determined by the technique of transit spectroscopy: When the planet transits between its host star and Earth, starlight passes through its atmosphere close to local dawn and dusk, imprinting additional absorption lines on the stellar spectrum. Pluriel *et al.* considered how the results are affected if the star heats the planet enough for atmospheric molecules to be dissociated on the planet's day side and recombine on the night side. They found that transit spectroscopy then produces highly biased atmospheric compositions differing from the true values by

up to three orders of magnitude. More sophisticated methods are needed to determine the atmospheric compositions of hot exoplanets. —KTS

*Astron. Astrophys.* **636**, A66 (2020).

## SCIENTIFIC WORKFORCE

## To a postdoc and beyond

To be a postdoctoral fellow today is to exist between a short-term research position and the reality of the academic job market. Nowell *et al.* sought to identify professional development (PD) opportunities used by postdocs to navigate a changing career landscape. Using quantitative and qualitative data collected from more than 500 current postdocs, the authors show that although postdocs engaged in diverse PD opportunities, these strategies were not always useful or career enhancing. By describing postdoc perceptions of PD, in parallel with their perceived usefulness, this study provides a comprehensive understanding of the misalignment of postdoc needs with available opportunities and can serve as a manual for helping academic institutions direct valuable resources toward the most effective postdoc PD strategies. —MMc

*Palgrave Commun.* **6**, 95 (2020).