May

Cell biology

Phosphate-storing organelle discovered in fruit flies

Without inorganic phosphate (P_i), our cells would have no DNA, no ATP molecules to store energy and no phospholipids to form membranes. However, researchers do not fully understand how phosphate is metabolized or stored in animal cells. Xu *et al*. made the intriguing observation that, if they prevented P_i intake into the gut cells of fruit flies (*Drosophila melanogaster*), there was a large increase in the proliferation of gut-progenitor cells. They therefore looked for a gene that might encode a phosphate sensor or transporter, and thereby couple P_i deficit to proliferation. The researchers identified one such gene, which they named P_i-sensitive XPR1 orthologue (*PXo*), and demonstrated that the PXo protein is present in previously uncharacterized organelles found in absorptive cells and some progenitors. When P_i is low, these 'PXo bodies' are engulfed by organelles called lysosomes that contain degradative enzymes, allowing P_i to be released and used by the cell.

Emily Strachan & **Irene Miguel-Aliaga** writing in *Nature* **617**, 677–678 (2023).
Original research: *Nature* **617**, 798–806 (2023).

June

Ancient DNA

Onset of farming in northwest Africa traced

The shift in human cultures from hunter-gatherer lifestyles to those based on the cultivation and husbandry of domesticated plants and animals is known as the Neolithic or agricultural transition. How Neolithic lifestyles spread into northwest Africa has been unclear. Simões *et al*. describe human genomic data from three previously unsampled archaeological sites in Morocco, dated to between 7,600 and 5,700 years ago — around the time when farming became established in the region. The research points to a more complex and dynamic pattern of human migration and admixture than previously recognized in Morocco. After a prolonged period of at least 7,000 years of continuity and isolation, the genetic and cultural landscape of Morocco changed drastically between 7,500 and 5,700 years ago, with the arrival of Neolithic groups and lifestyles from both Europe and the Levant (an area bordering the eastern Mediterranean that encompasses the land bridge between western Africa and Eurasia).

Louise Humphrey & **Abdeljalil Bouzouggar** writing in *Nature* **618**, 460–461 (2023).
Original research: *Nature* **618**, 550–556 (2023).

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July

Environmental science

Collaborations uncover extent of plastic pollution

Plastic pollution evokes powerful images of injured marine life tangled in plastic ropes (pictured). Researchers report global evidence that plastics contaminate coral reefs and freshwater lakes — some of which are far away from the human populations that create such pollution. Nava *et al*. looked specifically at plastics that were larger than 250 micrometres by sampling the surface-water outflow of 38 lakes and reservoirs in 23 countries. Plastics were found in all water bodies sampled by the authors, and 94% of these plastics were smaller than 5 millimetres — making them microplastics. Pinheiro *et al*. compiled data to quantify debris larger than 5 centimetres on coral reefs in 84 distinct ecosystems in both coastal and offshore regions around the globe. The authors documented widespread contamination by debris (in 92% of ecosystems), most of which (88%) was composed of plastic.

Kara Lavender Law & **Chelsea M. Rochman** writing in *Nature* **619**, 254–255 (2023).
Original research: *Nature* **619**, 317–322 (2023); *Nature* **619**, 311–316 (2023).

August

Ecology

A drowned future for coastal ecosystems

Humans have gravitated towards coastlines for millennia and depend on coastal ecosystems such as tidal marshes, mangroves and coral reefs for fisheries, storm protection and recreation. Saintilan *et al*. shed light on what the future under climate change might mean for these ecosystems. The authors find that the thresholds beyond which sea-level rise would lead to widespread 'drowning' of coastal ecosystems might be much lower than were previously thought. The boundaries of the safe operating space of coastal ecosystems — in which the risk of catastrophic ecosystem collapse remains low — might be rapidly approaching. Saintilan and colleagues' findings remind us how profoundly necessary it is to achieve the Paris climate agreement's goals through global actions. In a warming world with rapidly rising seas, combining local and global efforts and taking immediate actions would be our best hope to save coastal ecosystems.

Qiang He writing in *Nature* **621**, 44–45 (2023).
Original research: *Nature* **621**, 112–119 (2023).

September

Neuroscience

Pups' cries shape neural circuits in mothers

We have all probably been on a flight with a crying baby. Most passengers would probably put on headphones and hope that the baby will fall asleep, but the parents' reaction is to try to attend to the infant's needs. Why is there a difference? In the case of mothers, pregnancy induces major alterations in the brain that we are only now starting to understand. Valtcheva *et al.* report the discovery of a neural circuit in mice that is active only in the brains of mothers. The circuit involves neurons that release the neuropeptide molecule oxytocin, and promotes sustained and efficient maternal care in response to their pups' distress calls. Only continued or prolonged cries, such as those that might happen before and during maternal care (pictured), are able to activate oxytocin neurons in the paraventricular nucleus — part of the hypothalamus, a brain region that regulates various fundamental functions that ensure survival.

Flavia Ricciardi & **Cristina Márquez** writing in *Nature* **621**, 693–694 (2023).
Original research: *Nature* **621**, 788–795 (2023).

October

Virology

Anti-COVID drug accelerates viral evolution

Molnupiravir is an anti-COVID drug that is intended to prevent SARS-CoV-2 from replicating by inducing large numbers of mutations in the viral genome. There is a danger, however, that drugs that work in this way could occasionally yield heavily mutated yet viable viral variants. This is precisely what Sanderson *et al.* found. Using genomic 'fingerprinting' to scan millions of SARS-CoV-2 genome sequences, they identified thousands of viruses with telltale signs of molnupiravir-induced mutations that had apparently survived treatment and been transmitted on. Many recurring mutations were found in the gene that encodes the spike protein — the protein that enables the virus to enter host cells. Although there is no evidence that any SARS-CoV-2 variant arose as a result of molnupiravir treatment, public-health authorities should exercise caution when considering the therapeutic use of this and other mutation-driving antiviral drugs.

Sergei L. Kosakovsky Pond & **Darren Martin** writing in *Nature* **623**, 486–487 (2023).
Original research: *Nature* **623**, 594–600 (2023).

November

Engineering

Multi-material 3D printing guided by machine vision

Material jetting is a class of 3D printing that works by ejecting a liquid resin through hundreds to thousands of individually controlled nozzles. A limitation is that the thickness of each printed layer is not perfectly uniform. A process known as mechanical planarization is therefore required, in which a blade or roller levels the printed feature before the next layer is deposited. Buchner *et al.* report a material-jetting 3D printer that integrates machine vision to scan the profile of printed layers. The scanned profile is compared with a computer model of the desired construct, and the ink volume of the subsequent layer is adjusted to compensate for any deviations from the model. This eliminates the need for mechanical planarization, allowing the use of resins that would otherwise be incompatible with material jetting. Impressively, structurally complex multi-material constructs (see example, pictured) can be printed with both resolution and throughput that are on a par with current commercially available inkjet 3D printers.

Yong Lin Kong writing in *Nature* **623**, 488–490 (2023).
Original research: *Nature* **623**, 522–530 (2023).

December

Cancer

Harmful tumour–kidney interactions identified

Kidney dysfunction is commonly found in people who have cancer, contributing to illness and mortality. Xu *et al.* report a study in flies and mice that provides key advances in our understanding of tumour-associated renal dysfunction. Tumours of the adult fly gut induce syndromes associated with an accumulation of abdominal fluid, called bloating, which is a sign of impaired fluid excretion. The authors identified an antidiuretic hormone (one that reduces urine output) as a potent inducer of tumour-associated bloating. A version of the protein, called ITP_F, is produced by stem-like cells in the gut that are distant from the tumour. TkR99D is a receptor for ITP_F and is functionally equivalent to the mammalian protein neurokinin B receptor (NK3R), which is highly expressed in mouse renal tubules. Fezolinetant is an inhibitor of TkR99D and NK3R that abolishes tumour-induced renal failure in both animal models. This finding raises the prospects of new therapeutic opportunities.

Pierre Leopold writing in *Nature* **624**, 261–262 (2023).
Original research: *Nature* **624**, 425–432 (2023).

ZOONAR/ALAMY; T. J. K. BUCHNER *ET AL. NATURE* **623**, 522–530 (2023).