POPULATION GENETICS

Genomics of the Iberian Peninsula

Ancient DNA studies have begun to help us understand the genetic history and movements of people across the globe. Focusing on the Iberian Peninsula, Olalde *et al*. report genome-wide data from 271 ancient individuals from Iberia (see the Perspective by Vander Linden). The findings provide a comprehensive genetic time transect of the region. Linguistics analysis and genetic analysis of archaeological human remains dating from about 7000 years ago to the present elucidate the genetic impact of prehistoric and historic migrations from Europe and North Africa. —LMZ

Science, this issue p. 1230; see also p. 1153

TRANSPLANTATION

Transplanted memories

Parabiosis experiments in mice have shaped our understanding of the tissue-retention properties of tissue-resident memory T cells (T_{RM}). Snyder *et al.* studied donor and recipient T cells in human lung transplant patients. Their results provide a rare glimpse into the generation and maintenance of human T_{RM}. Whereas donor T cells were barely detectable in blood within 10 weeks after transplantation, donor T_{RM} were abundant and persisted in transplanted lungs for more than a year. Recipient T cells infiltrating the lung gradually acquired T_{RM} profiles over time. In this 20-patient cohort, persistence of donor lung T_{RM} correlated with improved clinical outcome. —AB

Sci. Immunol. **4**, eaav5581 (2019).

NEURODEGENERATION

Manganese spreads neurodegeneration

Chronic exposure to high amounts of manganese, such as that experienced by welders, is associated with symptoms of Parkinson's disease. A hallmark of the disease is aggregation of the protein α-synuclein, which is toxic to neurons. Harischandra *et al*. found that exosomes isolated from serum collected from welders contained misfolded α-synuclein. In cultured cells and mouse models, exposure to manganese or isolated manganese-induced exosomes promoted the transfer of α-synuclein between neurons and microglia, which induced inflammation and neuronal cell death. —LKF

Sci. Signal. **12**, eaau4543 (2019).

QUANTUM DOTS

Superefficient light emission

A challenge to improving synthesis methods for superefficient light-emitting semiconductor nanoparticles is that current analytical methods cannot measure efficiencies above 99%. Hanifi *et al*. used photothermal deflection spectroscopy to measure very small nonradiative decay components in quantum dot photoluminescence. The method allowed them to tune the synthesis of CdSe/CdS quantum dots so that the external luminescent efficiencies exceeded 99.5%. This is important for applications that require an absolute minimum amount of photon energy to be lost as heat, such as photovoltaic luminescent concentrators. —MSL

Science, this issue p. 1199

REPRODUCTIVE BIOLOGY

Mysterious males

In parthenogenetic species, females produce female offspring, generally without the input of males. Given this, the production of males would seem to be a waste of resources. Grosmaire *et al*. report that in a particular soil nematode, males are regularly produced at a rate of about 9%. They found that the male sperm was required for egg activation, yet the sperm DNA never transmitted on to the subsequent female generation. Male DNA was only passed on through sibling mating, which allows for male production to be evolutionarily stable. —SNV

Science, this issue p.1210

IN OTHER JOURNALS

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

PATHOGEN METABOLISM

Equal opportunity nitrogen sourcing

Mycobacterium tuberculosis (Mtb) has an unusual growth profile and metabolism, requiring around 20 hours to double in rich culture medium. A better understanding of Mtb metabolic requirements, particularly fundamental transformations such as nitrogen assimilation, may reveal weaknesses that can be exploited in drug design or other therapies. Agapova *et al.* cultured Mtb with each of the 20 proteinogenic amino acids, looking for differences in how nitrogen was incorporated into metabolites in the growing cells. Intracellular pools of amino acids varied in every case, suggesting a complex and flexible metabolism in which nitrogen is ideally obtained from amino acids rather than free ammonium. The enzyme alanine dehydrogenase exclusively liberated ammonium from alanine, suggesting a possible role for this enzyme and amino acid in nitrogen storage in Mtb. —MAF

eLife **8**, e41129 (2019).

Color-enhanced scanning electron micrograph of *Mycobacterium tuberculosis*, which multiplies slowly and evades immune detection.

PALEOECOLOGY

Disturbance and diversity through deep time

Sedimentary pollen records are reliable indicators of patterns of plant diversity through time. Kuneš *et al.* show that they can also be used to track patterns of habitat disturbance. Known niche preferences of plant species can often be associated with different disturbance regimes. Pollen records from central Europe throughout the 12,000 years of the Holocene show a consistent increase in species diversity over time in this region. The greatest levels of disturbance occurred during the earliest and most recent millennia, and the least in between.

PHOTO: EYE OF SCIENCE/SCIENCE SOURCE

Early Holocene high disturbance and low diversity were associated with rapid postglacial climate change, whereas more recent disturbance and greater diversity reflected the increasing habitat diversity and patchiness caused by the spread of human influence. —AMS

J. Ecol. 10.1111/1365-2745.13136 (2019).

CIRCADIAN RHYTHM

Circadian muscle mastery

Circadian rhythms exist in almost all mammalian cells. The molecular clock is composed of transcriptional and translational components that show oscillatory behavior and are entrained by external cues, such as mealtimes, and thus keep time and regulate gene expression downstream. Core molecular-clock components can also be expressed in a tissue-specific way. For instance, the transcription factor MYOD1 serves as the muscle master gene regulator. It mediates gene-expression responses to external cues, such as nutrient surges after mealtimes. Hodge *et al.* observed that MYOD1 can also bind to an enhancer within the clock gene *Bmal1* to regulate its expression. In turn, BMAL1 protein interacts with molecular-clock components to increase muscle-specific gene expression in a daily cyclical manner. Hence, MYOD1 also acts as a "clock amplifier" in muscle to increase gene expression at particular times during the diurnal cycle. —BAP

eLife **8**, e43017 (2019).

CANCER

Modeling a pediatric brain tumor

Childhood cancers often harbor somatic mutations in genes encoding epigenetic regulators such as histones. For example, about 80% of diffuse intrinsic pontine gliomas (DIPGs), which are aggressive pediatric brainstem tumors, have a specific mutation (lysine-27 substituted with methionine, or K27M) in histone H3.3. This mutation impairs the repressive effect of the histone on transcription, but how it contributes to tumor development has been unclear. By analyzing mouse models, Larson *et al.* found that the H3.3 K27M mutation transiently stimulated self-renewal of neural stem cells on its own. When this mutation was combined with two other cancer genes, mice developed brainstem gliomas resembling human DIPG. These tumors showed increased expression of genes associated with neural development, supporting the hypothesis that pediatric gliomas are developmental disorders. —PAK

Cancer Cell **35**, 140 (2019).

HYDROGEN BONDING

Right in the middle

Hydrogen bonding is a deceptively subtle concept. Typically, there is a donor with a strong covalent bond to hydrogen and an acceptor that attracts the hydrogen much more weakly. But what if the donor and acceptor are equivalent? Is equal sharing possible? Perrin and Wu explored this question in the intramolecular hydrogen bonds of keto-enol tautomers by nuclear magnetic resonance spectroscopy of oxygen-18 isotopologues. Whereas hydrogen typically seems to oscillate in its affinity for competing sites, nitromalonamide trapped it right in between both oxygens. —JSY

J. Am. Chem. Soc. **141**, 4103 (2019).

SPACE PHYSICS

Earth's extensive hydrogen corona

Dissociation of water in Earth's atmosphere produces hydrogen atoms, which escape into space through a combination of thermal and nonthermal processes. These hydrogen atoms resonantly scatter light from the Sun, producing an ultraviolet glow around Earth called the geocorona. Baliukin *et al.* analyzed ultraviolet observations taken by the Solar and Heliospheric Observatory spacecraft. They found that the geocoronal emission extends to at least 100 Earth radii, almost twice the distance to the Moon. This greater-than-expected extent of the geocorona indicates that nonthermal processes are launching hydrogen atoms from Earth's upper atmosphere at high speeds. —KTS

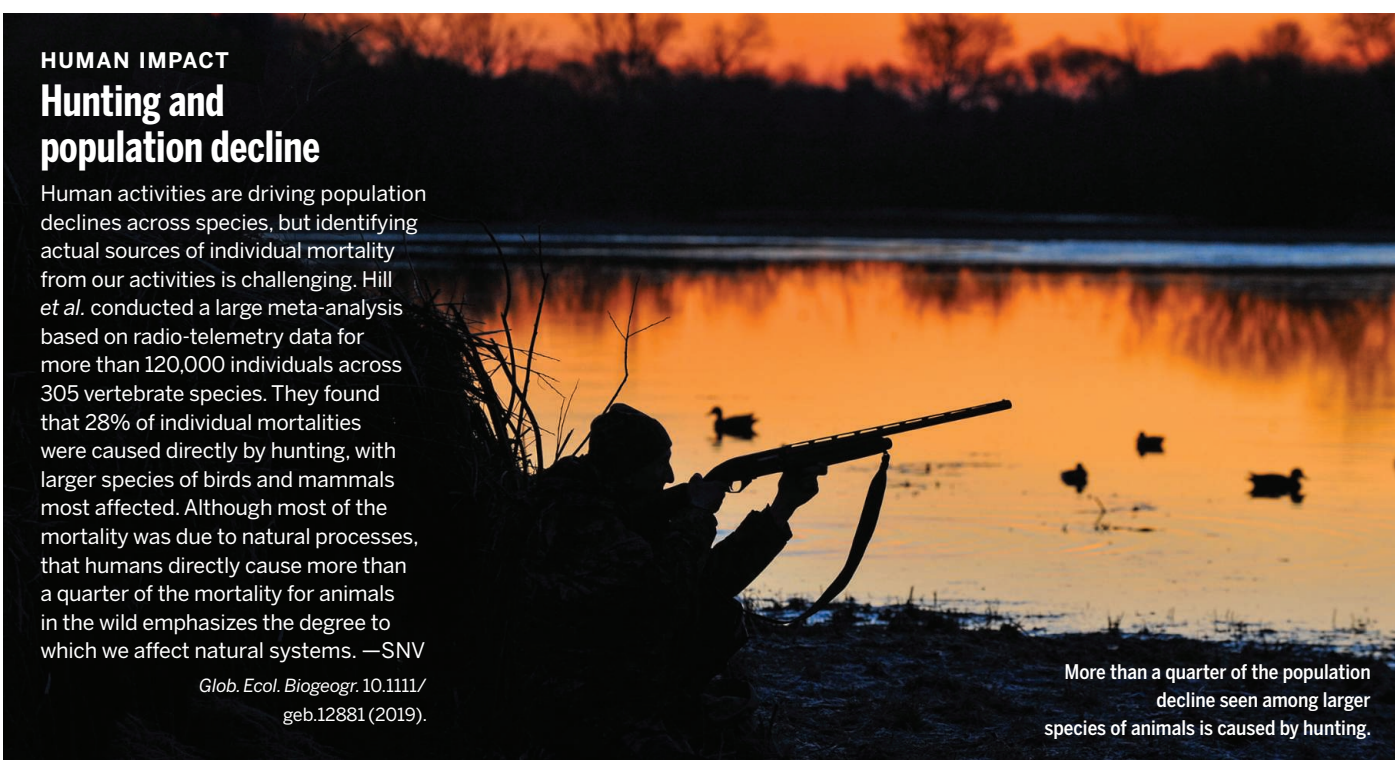
J. Geophys. Res. Space Phys. 10.1029/2018JA026136 (2019).

HUMAN IMPACT

Hunting and population decline

Human activities are driving population declines across species, but identifying actual sources of individual mortality from our activities is challenging. Hill *et al.* conducted a large meta-analysis based on radio-telemetry data for more than 120,000 individuals across 305 vertebrate species. They found that 28% of individual mortalities were caused directly by hunting, with larger species of birds and mammals most affected. Although most of the mortality was due to natural processes, that humans directly cause more than a quarter of the mortality for animals in the wild emphasizes the degree to which we affect natural systems. —SNV

Glob. Ecol. Biogeogr. 10.1111/geb.12881 (2019).



More than a quarter of the population decline seen among larger species of animals is caused by hunting.

PHOTO: VIKTOR DRACHEV/GETTY IMAGES

Right in the middle

Jake Yeston

Science **363** (6432), 1188-1189.
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