These cells matured into a mature astrocyte phenotype and had a therapeutic effect on axonal damage, demyelination, and cognitive impairments greater than that of hIPSC-derived neuronal precursor cells. —MM

Sci. Transl. Med. **13**, eaaz6747 (2021).

ORGANIC CHEMISTRY

Adding methyl groups with good timing

In pharmaceutical research, swapping out hydrogens for methyl groups is a frequent strategy to optimize small-molecule properties. Vasilopoulos *et al.* report a versatile, convenient, and comparatively safe method for methylation of carbon centers adjacent to nitrogen or aryl rings. Under carefully optimized conditions, di-*tert*-butyl peroxide plays a dual role as oxidant and methyl source. Cleaving the O–O bond through photosensitization produces butoxyl radicals, some of which cleave substrate C–H bonds, whereas others release methyl radicals that a nickel catalyst delivers to those activated substrates. —JSY

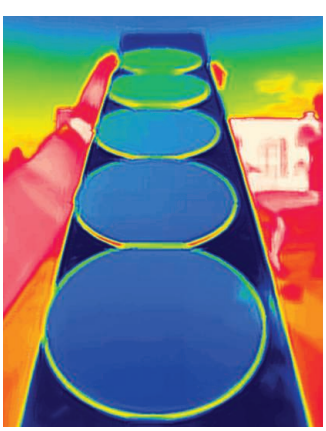
Science, this issue p. 398

HEAT TRANSPORT

Broadband thermal beaming

Thermal radiation emits over a wide range of wavelengths and over a wide range of angles. Xu *et al.* constructed a material that allows a range of wavelengths to emit over a much narrower range of angles. This property allowed the authors to beam thermal energy preferentially in one direction. The strategy requires carefully exploiting stacks of epsilon-near-zero films in which the angular range of thermal emission is controlled by the film thickness. This design could be useful in thermal camouflage and passive radiative cooling applications. —BG

Science, this issue p. 393



Thermal camera image revealing changes in apparent temperature at different angles for a material with directional emissivity.

IMAGES: (LEFT TO RIGHT) XU *ET AL.*; NASA/JPL-CALTECH/ASU

IMMUNOLOGY

Systemically inflamed from afar

The spleen is thought to be the major source of the proinflammatory cytokine tumor necrosis factor (TNF) during systemic inflammation. However, Fonseca *et al.* found that the liver and lungs produced more TNF than did the spleen in response to systemic inflammation induced by the bacterial cell wall component lipopolysaccharide (LPS) in rats. In addition, much of the spleen-dependent, LPS-induced increase in circulating TNF depended on the production of TNF by Kupffer cells, the resident macrophages of the liver. —AMV

Sci. Signal. **14**, eabb0969 (2021)

NEURODEVELOPMENT

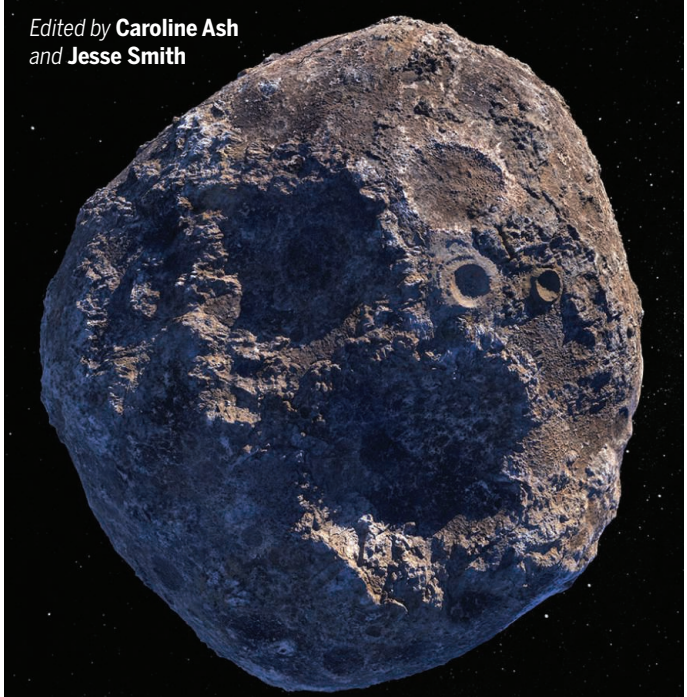
Neuronal identities

Neurons of the mouse spinal cord can be identified by any of several metrics, including what neurotransmitters they use, what cells they connect to, where they are located, and what neuroprogenitor gave rise to them. Osseward *et al.* generated a different metric, genetic signatures, and identified classes of local and projection neurons that were otherwise heterogeneous by other classification systems. With this focus on a cell's genetic signature, its neurotransmitter phenotype, which is accessible by a variety of transcriptional routes, can be seen as a parallel to convergent evolution in development. —PJH

Science, this issue p. 385

IN OTHER JOURNALS

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



Artist's conception of the metal-rich asteroid Psyche

ASTEROIDS

Weighing Psyche

Remote observations have shown that the asteroid (16) Psyche has a metallic surface, usually interpreted as being the exposed iron core of a protoplanet that was disrupted by a past giant impact. Siltala and Granvik analyzed astrometric observations of 10 smaller asteroids that experienced close encounters with Psyche between 1974 and 2019. The gravitational perturbations of these asteroids' orbits allowed the authors to derive the mass of Psyche. Combined with its known diameter, this leads to a bulk density that is far too low for a solid iron body. The results support an alternative interpretation: that Psyche's surface formed by volcanic eruptions of liquid iron sulfide. The asteroid is due to be visited by a spacecraft (also named Psyche) in 2026. —KTS *Astrophys. J.* **909**, L14 (2021).

HEMATOLOGY

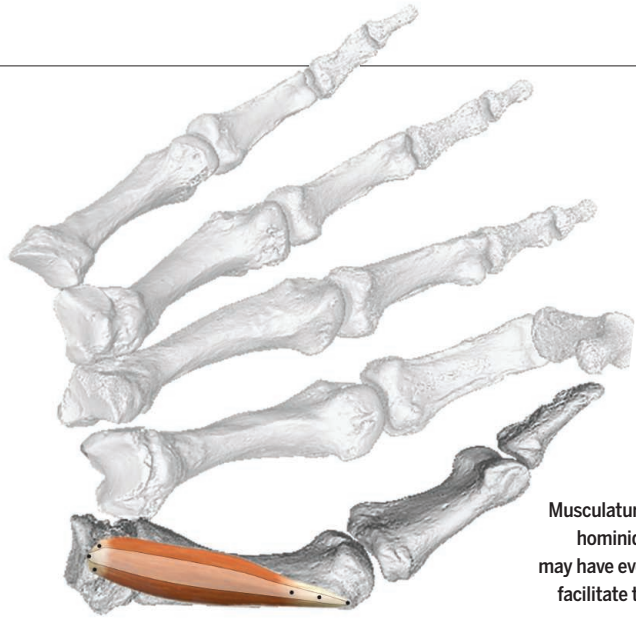
Hemoglobin in the balance

The inherited blood disorder β-thalassemia is caused by loss-of-function mutations in β-globin, a key component of adult hemoglobin. In addition to impaired oxygen delivery caused by the deficiency of β-globin, patients with severe forms of β-thalassemia suffer from a toxic buildup of excess α-globin, which normally pairs with β-globin. Cromer *et al.* developed a gene-editing strategy that addresses both problems at once by replacing one of the two α-globin genes with β-globin, allowing cells to produce fully functional adult hemoglobin and maintain a balance between the key globin types. The authors applied their gene-editing technique to hematopoietic stem cells from human

EVOLUTION

The opposable thumb

Hand bones of australopithecine hominid fossils dated to over 2 million years ago have a long, slender thumb that may have added dexterity. Karakostis *et al.* add muscle to the story of hand evolution with their analysis of torque at the thumb joint. A model validated on the hand movements of modern humans and chimpanzees was used to estimate the opposable thumb strength of fossil hominins. Torque at the thumb joint of early australopithecines, reflecting biomechanical efficiency, was comparatively low, but around 2 million years ago, the efficiency of the thumb joint began to increase. Further dexterity and thumb strength may have facilitated greater complexity in tool use and food acquisition as the genus *Homo* evolved. Tool-using skills could have evolved not so much in conjunction with big brains as much as with stronger, more dexterous hands. —PJH *Curr. Biol.* **31**, 1317 (2021).



Musculature of the hominid thumb may have evolved to facilitate tool use.

patients with β-thalassemia, and then successfully engrafted the edited cells into mouse models. —YN

Nat. Med. 10.1038/s41591-021-01284-y (2021).

NEUROSCIENCE

Unlearning reward responses

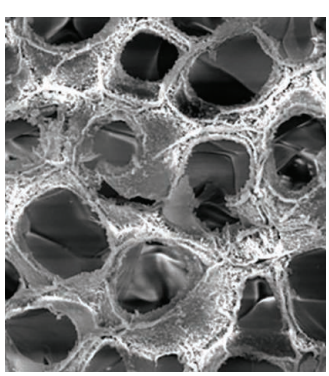
We continually update associations between new stimuli and behavioral responses, but this also requires that old information is subject to a complementary process called extinction learning. We do not fully understand whether this means that an old response is suppressed before a new one can be established, or if a new behavior has to compete with old associations. The rodent medial prefrontal cortex (mPFC) is involved in extinguishing reward-seeking behavior. By means of mPFC recordings, Russo *et al.* examined the temporal relation between neural activity and behavior in response to alcohol. Even when experimental conditions and behavioral responses were stable, recordings in the mPFC were not. However, shortly before the previously learned reward memory was suppressed, the authors found that changes in mPFC activity were highly coordinated across the whole reward network. This pushed the network into a new internal state that drove the extinction of the previous reward-seeking behavior. —PRS

J. Neurosci. **41**, 2406 (2021).

HYDROGELS

Pufferfish-inspired water purification

Water purification is an energy-intensive, multistep process used to remove contaminants such as salt, heavy metals, oils, or biological pathogens. Xu *et al.* designed a hydrogel that purifies water using nothing more than sunlight. Polydopamine, a melanin-based polymer, was added to sodium alginate on top of a microporous poly(N-isopropylacrylamide) (PNIPAm) hydrogel. Upon immersion in water, the hydrogel swells up with water while rejecting the contaminants, in part enhanced by the sodium alginate. Sunlight absorbed by the polydopamine forces the PNIPAm to heat up above its lower critical solution temperature, causing it to collapse, become hydrophobic, and expel the clean water. The process can be cycled, as the authors showed in a field test using lake water. —MSL



Scanning electron microscopy image showing the macroporous architecture of a bioinspired elastic hydrogel.

Adv. Mater. 10.1002/adma.202007833 (2021).

PHYSICS

Muons against the standard model

The standard model (SM) of particle physics has remained frustratingly reliable when tested in experiments. One exception is a 15-year-old measurement of the anomalous magnetic moment of the muon, which shows a discrepancy of 3.7 SDs with respect to the current SM prediction. Abi *et al.* (the Muon *g*–2 Collaboration) set out to verify this result using positive muons. Measuring the anomalous precession frequency of the muons in a magnetic field, they indeed found agreement with the previous result. Together, these two measurements deviate even more from the SM prediction, with a combined discrepancy of 4.2 SDs. Future experiments and calculations of the SM prediction will further test the discrepancy and determine what it means for theoretical extensions of the SM. —JS

Phys. Rev. Lett. **126**, 141801 (2021).

NEURODEGENERATION

How missing APOE4 protects

The apolipoprotein E (*APOE*) gene is the strongest genetic risk factor for Alzheimer's disease. Alzheimer's pathology involves both β-amyloid aggregation and phosphorylated tau–dependent neurodegeneration. The APOE4 variant is associated with worse tauopathy and neurodegeneration. In the brain, apoE is produced and secreted primarily by astrocytes and activated microglia. Wang *et al.* produced a transgenic tauopathy mouse model in which APOE4 (or APOE3 as a control) could be specifically down-regulated in astrocytes after disease onset. Removing astrocytic apoE4 reduced tau-mediated neurodegeneration and suppressed disease-associated gene expression in neurons, oligodendrocytes, astrocytes, and microglia. Furthermore, removal of astrocytic apoE4 decreased tau-induced synaptic loss and phagocytosis of synaptic elements by microglia. These findings shed light on the potential mechanisms underlying how and why APOE4 exacerbates Alzheimer's disease. —SMH

Neuron 10.1016/j.neuron.2021.03.024 (2021).

IMAGES (LEFT TO RIGHT): X. XU *ET AL., ADV. MATER.* 10.1002/ADMA.202007833 (2021); F. A. KARAKOSTIS *ET AL., CURR. BIOL.* **31**, 1318 (2021)

Unlearning reward responses

Peter Stern

Science **372** (6540), 357-358.
DOI: 10.1126/science.372.6540.357-d