PHOTO: EDGARD GARRIDO/REUTERS

CONTENTS

28 AUGUST 2025 | VOLUME 389 | ISSUE 6763



EDITORIAL

859 Taking nuclear energy to the Moon

–K. Huff

NEWS

862 Supreme Court quashes restoration of NIH grants

Emergency ruling may prompt Trump administration to again cancel research it dislikes —M. Wadman and J. Travis

864 Gaps remain in college sports' 15-year-old sickle cell policy

Report recommends education, genetic counseling with NCAA screening —R. Pérez Ortega

865 Al hypotheses lag human ones when put to the test

Machines still face hurdles in identifying fresh research paths, study suggests —J. Brainard

866 New clues found about the assembly of life's first proteins

Lab study shows how RNA could have helped amino acids join up—without preexisting protein machinery—R. F. Service

868 Europe's biggest quake may foretell Atlantic 'ring of fire'

Earth's mantle is peeling from the crust in the eastern Atlantic, a possible sign of the ocean's eventual closure—E. Howell

FEATURES

870 Bones beneath the runway

How a military megaproject led to Mexico's biggest paleontological discovery—and is reshaping what we know about mammoths

—R. Pérez Ortega PODCAST

COMMENTARY

PERSPECTIVES

874 The rise of rideable horses

Early horse riders selected a rare mutation in a single gene to enhance rideability —L. Frantz RESEARCH ARTICLE p. 925

875 Mapping the anatomy of placebo analgesia

The identification of somatotopy in brainstem pain modulatory pathways could help treat chronic pain —M. Moayedi and L. Y. Atlas

RESEARCH SUMMARY p. 893

877 Sustainable personal cooling in a warming world

Advanced textiles and intelligent wearable devices can provide cooling under extreme heat —D. Shou and Z. Li

879 Vegetation steers a river's path

Evolution of plants could have modified ancient river trajectories —J. Pizzuto RESEARCH ARTICLE p. 915

880 Penetrance and variant consequences— Two sides of the same coin?

To get more out of genome sequences, the effects of variants need to be quantified —H. Raiken and A. Stein RESEARCH SUMMARY p. 894

BOOKS ET AL.

882 Academic leadership in uncertain times

A former college president offers advice for administrators navigating unprecedented challenges —S. Elrod

Science 28 AUGUST 2025 855

Twentieth-century speculation about martian life shed light on the interplay of science and culture —D. Greenbaum

LETTERS

884 Copper threatens marine ecosystems —L. Yang *et al.*

884 Curtail North Korea's illegal wildlife trade

-J. Elves-Powell et al.

885 Outside the Tower: Creating connection with wings and strings

-C. H. Elliott and E. J. Justus

ANALYSIS

POLICY ARTICLE

886 Supply-chain vulnerabilities in critical medicines: A persistent risk to pharmaceutical security

Asymmetries in the global supply chain expose countries to systemic vulnerabilities that require investment in visibility, coordination, and resilience —G. Casiraghi et al.

REVIEWS

REVIEW SUMMARY

889 Air pollution

Secondary organic aerosol in urban China: A distinct chemical regime for air pollution studies —R.-J. Huang et al.

RESEARCH

HIGHLIGHTS

890 From *Science* and other journals

RESEARCH SUMMARIES

893 Pain

Somatotopic organization of brainstem analgesic circuitry —L. S. Crawford *et al.*PERSPECTIVE p. 875

894 Medical genomics

Machine learning-based penetrance of genetic variants —I. S. Forrest *et al.*PERSPECTIVE p. 880

895 Cell biology

A hypoxia-responsive tRNA-derived small RNA confers renal protection through RNA autophagy

—G. Li *et al.*

896 Cell biology

Transcription factors SP5 and SP8 drive primary cilia formation in mammalian embryos —Y. Liang *et al.*

897 Air pollution

Heavily polluted Tijuana River drives regional air quality crisis

—B. Rico *et al.*

PODCAST

898 Tissue immunology

Septal LYVE1⁺ macrophages control adipocyte stem cell adipogenic potential —X. Yu *et al.*

RESEARCH ARTICLES

899 Planetary science

Seismic evidence for a highly heterogeneous martian mantle —C. Charalambous *et al.*

904 Restoration ecology

Yellowstone's free-moving large bison herds provide a glimpse of their past ecosystem function

—C. Geremia et al.

909 Proteostasis

Architecture of the UBR4 complex, a giant E4 ligase central to eukaryotic protein quality control

—D. B. Grabarczyk et al.

915 River dynamics

Vegetation changes the trajectory of river bends —M. Hasson *et al.* PERSPECTIVE p. 879

921 Nanomaterials

Deciphering icosahedra structural evolution with atomically precise silver nanoclusters

—F. Hu *et al.*

925 Horse evolution

Selection at the *GSDMC* locus in horses and its implications for human mobility —X. Liu *et al.* PERSPECTIVE p. 874

931 Climate mitigation

Land availability and policy commitments limit global climate mitigation from forestation —Y. Wang *et al.*

ON THE COVER



Bison move through Yellowstone's Lamar Valley at sunrise. Their movements and grazing accelerate the nitrogen cycle, increasing the annual nutrition that plants provide to herbivores. After decades of recovery, bison now add heterogeneity that sustains soil nutrient storage and plant productivity while allowing plant communities to become more diverse. highlighting the importance of restoring native grazers in large numbers and with freedom to move. See page 904. Photo: NPS/Jacob W. Frank

935 Robotics

Launching by cavitation —D. Wang et al.

940 Quantum networks

Classical-decisive quantum internet by integrated photonics
—Y. Zhang et al.

WORKING LIFE

946 Growing into mentorship

-J. G. Hughes

858 Science Staff **945** Science Careers

899 High-frequency mantle waveforms reflect Mars' turbulent start

Science serves as a forum for discussion of important issues related to the advancement of science by publishing material on which a consensus has been reached as well as including the presentation of minority or conflicting points of view. Accordingly, all articles published in Science—including editorials, news, commentary, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by AAAS or the institutions with which the authors are affiliated. Science (ISSN 0036-8675) is published weekly on Thursday, except last week in December, by the American Association for the Advancement of Science 1200 New York Avenue, NW, Washington, DC 20005. Periodicals mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 2025 by the American Association for the Advancement of Science. The title Science is a registered trademark of the AAAS. Domestic individual membership, including subscription (Q1 months): \$165 (\$74 allocated to subscription). Domestic institutional subscription (\$51 issues): \$22865; Foreign postage extra: Air assist edileviry: \$135. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, \$GT #125488122. Publications Mail Agreement Number 1069624. Printed in the U.S.A. Change of address: Allow 4 weeks, giving old and new addresses and 8-digit account number. Postmaster: Send change of address to AAAS, PO. Box 96178, Washington, DC 20090–6178. Single-copy sales: \$15 each plus shipping and handling available from backissues.science.org; bulk rate on request. Authorization to reproduce material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act can be obtained through the Copyright Clearance Center (CCC), www.copyright.com. The identification code for Science is indexed in the Reader's Guide to Periodical Literature and in several specialized indexes.