

CONTENTS

22 JANUARY 2016 • VOLUME 351 • ISSUE 6271

NEWS

IN BRIEF

320 News at a glance

IN DEPTH

323 SHELL TRADE PUSHES GIANT CLAMS TO THE BRINK

With elephant tusks harder to obtain, the “jade of the sea” is the new ivory in China *By C. Larson*

324 DEBATE SHARPENS OVER U.K. THREAT TO LEAVE EUROPE

Many researchers worry about a loss of funds and influence, but some say the fears are overblown *By E. Stokstad and T. Rabesandratana*

325 BIDEN SEEKS CLEAR COURSE FOR HIS CANCER MOONSHOT

Researchers have plenty of ideas for the vice president’s bid to boost collaboration and improve treatments *By J. Kaiser and J. Couzin-Frankel*

326 STANDOFF IMPERILS OREGON REFUGE

Takeover disrupts what observers call a model public-private restoration effort *By R. F. Service*

328 DATA CHECK: TRACKING FIRST JOBS TO MEASURE THE IMPACT OF RESEARCH FUNDING

Study of recent Ph.D.s at eight Midwestern universities demonstrates value of the new science of science policy *By J. Mervis*

329 MONTREAL INSTITUTE GOING ‘OPEN’ TO ACCELERATE SCIENCE

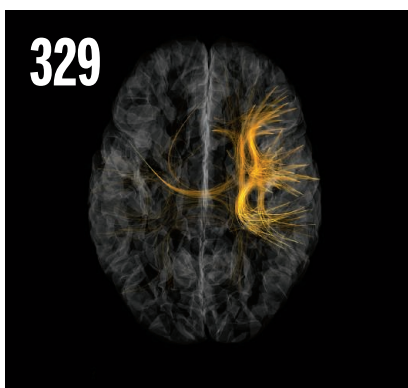
Experiment aims to show whether forgoing patents and freeing up data can boost neuroscience research *By B. Owens*

FEATURE

330 NUMBER 9

A new giant planet, still unseen, appears to be shaping the orbits of objects beyond Neptune *By E. Hand*

► PODCAST



INSIGHTS

PERSPECTIVES

334 PLASMONICS—TURNING LOSS INTO GAIN

The optical losses usually associated with plasmonic materials could be used in applications *By J. C. Ndukaiife et al.*

330

The solar system gains a planet

336 INTERLACING MOLECULAR THREADS

Materials with a fabric-like microstructure are highly elastic *By E. Gutierrez-Puebla*

► REPORT P. 365

337 EDITING POLICY TO FIT THE GENOME?

Framing genome editing policy requires setting thresholds of acceptability *By R. Isasi et al.*

340 HOW CHERENKOV RADIATIVE LOSSES CAN IMPROVE OPTICAL FREQUENCY COMBS

Broader optical frequency combs on a photonic chip can help refine time standards *By N. Akhmediev and N. Devine*

► REPORT P. 357

341 OLIGODENDROCYTES FOLLOW BLOOD VESSEL TRAILS IN THE BRAIN

Brain microvasculature is a scaffold for neuroglial migration *By E. Dejana and C. Betsholtz*

► REPORT P. 379

342 THE DO-IT-ALL NITRIFIER

The discovery of bacteria that can oxidize both ammonia and nitrite upends a long-held dogma *By A. E. Santoro*

344 KNOWLEDGE CAPITAL, GROWTH, AND THE EAST ASIAN MIRACLE

Access to schools achieves only so much if quality is poor *By E. A. Hanushek and L. Woessmann*

BOOKS ET AL.

346 THE CABARET OF PLANTS

By R. Mabey, reviewed by H. A. Curry

347 TRAUMA

Reviewed by G. Frazzetto

LETTERS

348 EDITORIAL EXPRESSION OF CONCERN

By M. McNutt

348 ERADICATING POLIO: A BALANCING ACT

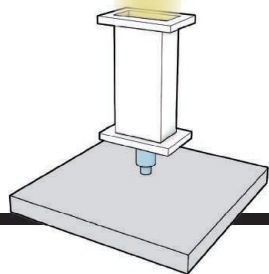
By V. Agol et al.

348 PRACTICALITIES OF POLITICAL AGENCY

By I. Kelman

349 RESPONSE

By K. O'Brien



334

Plasmonics applications heat up



341 & 379

Neuroglia follow vascular paths

RESEARCH

IN BRIEF

350 From *Science* and other journals

REVIEW

353 SOLAR ENERGY

Research opportunities to advance solar energy utilization *N. S. Lewis*

REVIEW SUMMARY; FOR FULL TEXT: dx.doi.org/10.1126/science.aad1920

REPORTS

354 RADIO ASTRONOMY

Real-time detection of an extreme scattering event: Constraints on Galactic plasma lenses
K. W. Bannister et al.

357 APPLIED OPTICS

Photonic chip-based optical frequency comb using soliton Cherenkov radiation
V. Brasch et al.

► PERSPECTIVE P. 340

361 ELECTROCHEMISTRY

Active sites of nitrogen-doped carbon materials for oxygen reduction reaction clarified using model catalysts
D. Guo et al.

365 MOLECULAR FRAMEWORKS

Weaving of organic threads into a crystalline covalent organic framework
Y. Liu et al.

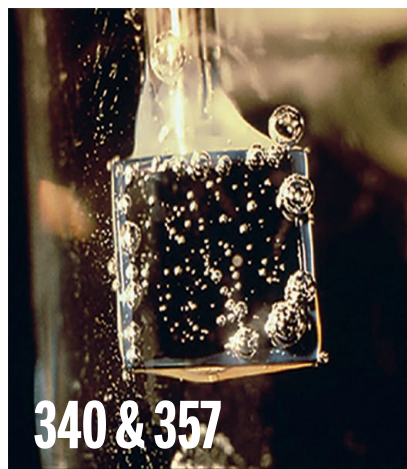
► PERSPECTIVE P. 336

369 PHOTOPHYSICS

Direct observation of triplet energy transfer from semiconductor nanocrystals
C. Mongin et al.

372 GEOCHEMISTRY

Archean upper crust transition from mafic to felsic marks the onset of plate tectonics
M. Tang et al.



375 COMPARATIVE BEHAVIOR

Oxytocin-dependent consolation behavior in rodents
J. P. Burkett et al.

379 NEURODEVELOPMENT

Oligodendrocyte precursors migrate along vasculature in the developing nervous system
H.-H. Tsai et al.

► PERSPECTIVE P. 341

384 PLANT DEVELOPMENT

Cyclic programmed cell death stimulates hormone signaling and root development in *Arabidopsis*
W. Xuan et al.

387 POLLINATOR DIVERSITY

Mutually beneficial pollinator diversity and crop yield outcomes in small and large farms
L. A. Garibaldi et al.

SMALL RNAS

391 Biogenesis and function of tRNA fragments during sperm maturation and fertilization in mammals
U. Sharma et al.

397 Sperm tRNAs contribute to intergenerational inheritance of an acquired metabolic disorder
Q. Chen et al.

GENE EDITING

400 Postnatal genome editing partially restores dystrophin expression in a mouse model of muscular dystrophy
C. Long et al.

403 In vivo genome editing improves muscle function in a mouse model of Duchenne muscular dystrophy
C. E. Nelson et al.

407 In vivo gene editing in dystrophic mouse muscle and muscle stem cells
M. Tabebordbar et al.

DEPARTMENTS

319 EDITORIAL

Future Earth
By Johan Rockström

418 WORKING LIFE

Disability is not a disqualification
By Jesse Shanahan

ON THE COVER



Illustration of woven molecular fabric. Interlacing threads to create woven patterns is among the oldest methods of making fabric, but until now, this technique has not

been duplicated in complex chemical structures. Liu *et al.* used threads made from organic molecules linked together by strong covalent bonds to weave a three-dimensional covalent organic framework with unusual dynamical and mechanical properties. This molecular weaving method will enable the production of materials with increased precision and functionality. See pages 336 and 365. *Illustration: C. Bickel/Science*

Science Staff	318
New Products	412
Science Careers	414

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the 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 © 2016 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$165 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1522. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$89. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #R1254 88122. 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, P.O. Box 96178, Washington, DC 20090-6178. Single-copy sales: \$15.00 current issue, \$20.00 back issue prepaid includes surface postage; bulk rates on request. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$35.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for Science is 0036-8075. Science is indexed in the Reader's Guide to Periodical Literature and in several specialized indexes.

Science

351 (6271)

Science **351** (6271), 319-418.

ARTICLE TOOLS

<http://science.sciencemag.org/content/351/6271>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.