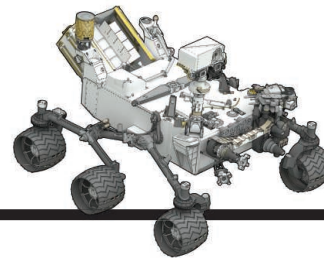


CONTENTS



444

Curiosity's hunt for Mars biosignatures

3 FEBRUARY 2017 • VOLUME 355 • ISSUE 6324

SPECIAL SECTION

Prediction

INTRODUCTION

468 Prediction and its limits

NEWS

470 The pulse of the people

By J. Bohannon

ESSAYS

474 Predicting armed conflict: Time to adjust our expectations?

L.-E. Cederman and N. B. Weidmann

477 Data-driven predictions in the science of science

A. Clauset et al.

481 Bringing probability judgments into policy debates via forecasting tournaments

P. E. Tetlock et al.

483 Beyond prediction: Using big data for policy problems

S. Athey

486 Prediction and explanation in social systems

J. M. Hofman et al.

489 Predicting human behavior: The next frontiers

V. S. Subrahmanian and S. Kumar

SEE ALSO

► REPORT P. 515 ► PODCAST

ON THE COVER



A crystal ball is surrounded by a visual representation of the application of a predictive algorithm's results. Decision-makers at all

levels would love to know about the future effects of current decisions. This special issue focuses on what we currently can (and cannot) predict using the emerging conjunction of machine learning, big data, and human understanding. See page 468. *Illustration: C. Bickel/Science; Data visualization: Mauro Martino/IBM Research and Northeastern University*



446

NEWS

IN BRIEF

436 News at a glance

IN DEPTH

439 IMMIGRATION ORDER THREATENS OVERSEAS TALENT

Trump's rule barring U.S. entry from seven countries hits scientists—and science—hard *By R. Stone and M. Wadman*

440 MEXICAN SCIENTISTS FEEL THE TRUMP EFFECT

Economic crisis, border wall threaten collaborations *By L. Wade*

441 RESEARCHERS CLOSE IN ON ANCIENT DINOSAUR PROTEINS

"Milestone" paper opens door to molecular approach *By R. F. Service*

442 U.S. OBSERVERS SEEK A MORE PERFECT UNION

With an eye to Europe, U.S. astronomers plan national center to oversee three observatories *By D. Clery*

443 GPS SATELLITES YIELD SPACE WEATHER DATA

Newly released radiation measurements fill gap *By P. Voosen*

444 MARS ROVER STEPS UP HUNT FOR MOLECULAR SIGNS OF LIFE

Balky drill could hamper Curiosity's "wet" chemistry test *By P. Voosen*

FEATURE

446 ON MESSAGE

Moderna Therapeutics has raised nearly \$2 billion to turn RNA into a new kind of drug. Can it live up to the hype? *By K. Servick*

INSIGHTS

POLICY FORUM

452 AN ECOSYSTEM-BASED DEEP-OCEAN STRATEGY

Monitoring and assessment must underpin development of a new international agreement *By R. Danovaro et al.*

PERSPECTIVES

455 RESTORING TROPICAL FORESTS FROM THE BOTTOM UP

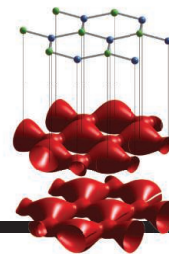
How can ambitious forest restoration targets be implemented on the ground? *By K. D. Holl*

457 SYNAPTIC SCALING IN SLEEP

The structure of synapses changes during sleep *By L. Acsády and K. D. Harris*
► REPORTS PP. 507 & 511

ILLUSTRATION: (TOP) NASA/JPL, ADAPTED BY A. ACUADRA/SCIENCE

Downloaded from <http://science.sciencemag.org/> on July 26, 2017



458 LASER-DRIVEN NANOPARTICLE MOTION IN LIQUIDS

Electron microscopy reveals motion with nanometer and nanosecond resolution *By P. Baum*

► REPORT P. 494

459 ORGANELLE INHERITANCE—WHAT PLAYERS HAVE SKIN IN THE GAME?

Peroxisomes contribute to cell division and differentiation decisions in the mammalian epidermis *By U. Gruneberg and F. Barr*

► RESEARCH ARTICLE P. 493

460 CHROMOSOME STITCH-UP?

Ring-shaped protein machines called SMCs act as molecular zips on bacterial chromosomes *By D. J. Sherratt*

► REPORT P. 524

462 VERA COOPER RUBIN (1928–2016)

An astronomer who changed how we view the universe *By C. M. Urry*

BOOKS ET AL.

463 EBOLA: A POSTMORTEM

Aid workers and experts weigh in on the factors that enabled and exacerbated the West Africa epidemic *By W. F. Pewen*

464 OUR BEST SHOT

A well-researched tome reveals the people who helped make early vaccines possible *By E. C. Jonlin*

LETTERS

465 FOREST CONSERVATION: REMEMBER GRAN CHACO

By T. Kuemmerle et al.

465 RESPONSE

By DRYFLOR et al.

466 FOREST CONSERVATION: HUMANS' HANDPRINTS

By C. Levis et al.

467 RESPONSE

By DRYFLOR et al.



465

RESEARCH

IN BRIEF

490 From *Science* and other journals

RESEARCH ARTICLE

493 CELL BIOLOGY

Coupling organelle inheritance with mitosis to balance growth and differentiation *A. Asare et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: dx.doi.org/10.1126/science.aah4701

► PERSPECTIVE P. 459

REPORTS

494 ELECTRON MICROSCOPY

Imaging rotational dynamics of nanoparticles in liquid by 4D electron microscopy *X. Fu et al.*

► PERSPECTIVE P. 458

499 ASYMMETRIC CATALYSIS

Formation of α -chiral centers by asymmetric β -C(sp³)-H arylation, alkenylation, and alkynylation *Q.-F. Wu et al.*

503 PHYSICS

Magnetic resonance spectroscopy of an atomically thin material using a single-spin qubit *I. Lovchinsky et al.*

SLEEP RESEARCH

507 Ultrastructural evidence for synaptic scaling across the wake/sleep cycle *L. de Vivo et al.*

511 Homer1a drives homeostatic scaling-down of excitatory synapses during sleep *G. H. Diering et al.*

► PERSPECTIVE P. 457

515 POLITICAL SCIENCE

Improving election prediction internationally *R. Kennedy et al.*

► PREDICTION SECTION P. 468

520 DNA REPAIR

DNA-PKcs structure suggests an allosteric mechanism modulating DNA double-strand break repair

B. L. Sibanda et al.

524 CHROMOSOMES

Bacillus subtilis SMC complexes juxtapose chromosome arms as they travel from origin to terminus *X. Wang et al.*

► PERSPECTIVE P. 460

528 RIBOSOME

The structure of the yeast mitochondrial ribosome *N. Desai et al.*

DEPARTMENTS

435 EDITORIAL

Informing policy with science *By Barbara Schaal*

542 WORKING LIFE

A retirement 'hobby' *By John H. Borden*

Science Staff	434
New Products	535
Science Careers	536

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 © 2017 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): \$1659; 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: \$23.00 current issue, \$28.00 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

355 (6324)

Science **355** (6324), 435-542.

ARTICLE TOOLS

<http://science.sciencemag.org/content/355/6324>

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.