

26

NEWS

IN BRIEF

12 Roundup of the week's news

IN DEPTH

16 NEW PROTEINS MAY EXPAND, IMPROVE GENOME EDITING

Mining bacterial immune systems yields two new editing tools and has the potential to contribute many more *By E. Pennisi*

17 TALKING SCIENCE AND GOD WITH THE POPE'S NEW ASTRONOMER

Guy Consolmagno, director of the Vatican Observatory, wants to show the world that religion supports astronomy *By E. Carlidge*

18 EUROPE'S RIFTS OVER TRANSGENIC CROPS DEEPEN AT KEY DEADLINE

Policy differences among 28 E.U. member states come into sharper focus in the wake of major reform *By T. Rabesandratana*

20 HAVE PHYSICISTS SEEN THE DYING FLASH OF DARK MATTER?

Dark particle decays could explain tantalizing x-ray signal seen in multiple galaxies, including our own Milky Way *By E. Carlidge*

21 HOLLAND'S GIANT WAVEMAKER HAS SPLASHY DEBUT

Delta Flume will allow researchers to study how coastal defenses fare against powerful surf *By M. Enserink*

FEATURES

22 THE STORM KING

A mysterious tropical weather pattern called the Madden-Julian oscillation fuels El Niños and triggers rain, heat waves, and hurricanes around the globe *By E. Hand*

25 Taking the pulse of the tropics

By E. Hand

26 POOLING RESOURCES

Ecologist Aram Calhoun forges creative alliances in her quest to protect ephemeral vernal pools *By J. U. Adams*



36

INSIGHTS

LETTERS

30 NEXTGEN VOICES

PERSPECTIVES

32 SAFER FUELS BY INTEGRATING POLYMER THEORY INTO DESIGN

Jet fuels are stabilized with polymers assembling in solution *By M. Jaffe and S. Allam*

► REPORT P. 72

33 LOCKING DOWN THE CORE OF THE PORE

A highly stable heterotrimeric protein complex lines the central channel of the nuclear pore *By K. S. Ullman and M. A. Powers*

► RESEARCH ARTICLE P. 56; REPORT P. 106

34 THE IPCC AT A CROSSROADS: OPPORTUNITIES FOR REFORM

Increase focus on policy-relevant research *By C. Carraro et al.*

36 ADDED VALUE FROM IPCC APPROVAL SESSIONS

Flexible, creative author teams are critical *By C. B. Field and V. R. Barros*

37 A TREE OF THE HUMAN BRAIN

Genomes of single neurons trace the developmental and mutational history of the brain *By S. Linnarsson*

► REPORT P. 94

38 HOW STABLE ARE FOOD WEBS DURING A MASS EXTINCTION?

Fossil data provide a detailed view of how food webs changed across the Permian-Triassic mass extinction *By C. R. Marshall*

► REPORT P. 90

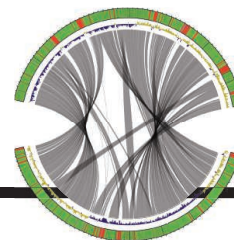
39 EYEING UP A JUPITER-LIKE EXOPLANET

Extreme adaptive optics systems enable the direct imaging of exoplanetary systems *By D. Marwet*

► REPORT P. 64

Science Staff	8
New Products	114
Science Careers	116

CONTENTS



55

An experimental
gut microbiota

2 OCTOBER 2015 • VOLUME 350 • ISSUE 6256

40 CLOUDS RESOLVED

Clouds are puffy to the finest scale

By *E. Bodenschatz*

► REPORT P. 87

42 IT TAKES THE WORLD TO UNDERSTAND THE BRAIN

International brain projects discuss how to coordinate efforts

By *Z. J. Huang and L. Luo*

► EDITORIAL P. 11

SCIENCE PRIZE ESSAY

46 SLOW OR FAST? A TALE OF SYNAPTIC VESICLE RECYCLING

A new model accounts for synaptic transmission speed

By *S. Watanabe*

BOOKS ET AL.

49 THE GRADUATE SCHOOL MESS

By *L. Cassuto*, reviewed by *J. Gutlermer*

50 SECRET

I. Brunswick et al., curators,

reviewed by *G. Frazzetto*



RESEARCH

IN BRIEF

52 From *Science* and other journals

RESEARCH ARTICLES

55 GUT MICROBIOTA

Genetic determinants of in vivo fitness and diet responsiveness in multiple human gut

Bacteroides *M. Wu et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:

dx.doi.org/10.1126/science.aac5992

56 STRUCTURAL BIOLOGY

Architecture of the fungal nuclear pore inner ring complex

T. Stuwe et al.

► PERSPECTIVE P. 33; REPORT P. 106

REPORTS

64 PLANETARY SCIENCE

Discovery and spectroscopy of the young jovian planet 51 Eri b with the Gemini Planet Imager

B. Macintosh et al.

► PERSPECTIVE P. 39

68 NANOELECTRONICS

End-bonded contacts for carbon nanotube transistors with low, size-independent resistance

Q. Cao et al.

72 POLYMER CHEMISTRY

Megasupramolecules for safer, cleaner fuel by end association of long telechelic polymers

M.-H. Wei et al.

► PERSPECTIVE P. 32; PODCAST

76 EARTH HISTORY

State shift in Deccan volcanism at the Cretaceous-Paleogene boundary, possibly induced by impact

P. R. Renne et al.

78 WATER STRUCTURE

Ultrafast 2D IR spectroscopy of the excess proton in liquid water

M. Thämer et al.

82 MEMORY MECHANISMS

Multiple repressive mechanisms in the hippocampus during memory formation

J. Cho et al.

87 CLOUDS

Holographic measurements of inhomogeneous cloud mixing at the centimeter scale

M. J. Beals et al.

► PERSPECTIVE P. 40

90 PALEOECOLOGY

Community stability and selective extinction during the Permian-Triassic mass extinction

P. D. Roopnarine and K. D. Angielczyk

► PERSPECTIVE P. 38

94 NEURODEVELOPMENT

Somatic mutation in single human neurons tracks developmental and transcriptional history

M. A. Lodato et al.

► PERSPECTIVE P. 37

98 INJURY RECOVERY

Function of the nucleus accumbens in motor control during recovery after spinal cord injury

M. Sawada et al.

102 NEUROTRANSMISSION

Aldehyde dehydrogenase 1a1 mediates a GABA synthesis pathway in midbrain dopaminergic neurons

J.-I. Kim et al.

106 STRUCTURAL BIOLOGY

Crystal structure of the metazoan Nup62•Nup58•Nup54 nucleoporin complex

H. Chug et al.

► PERSPECTIVE P. 33; RESEARCH ARTICLE P. 56

DEPARTMENTS

11 EDITORIAL

The promise of neurotechnology

By *Andrew Schwartz*

► PERSPECTIVE P. 42

130 WORKING LIFE

After the bombs

By *Elisabeth Pain*

ON THE COVER



Illustration of projection neurons from the human cerebral cortex, with nuclei colored to reflect distinct sets of somatic DNA mutations. When a mutation occurs in a dividing cell, it marks all of the cell's descendants. Identification of clones marked by mutation enables reconstruction of human brain development. Because developmental defects lie at the heart of many neurological diseases, understanding development is a primary goal of neuroscience. See pages 37 and 94. *Illustration: C. Bickel/Science*

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 © 2015 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): \$153 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1282. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$85. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #1254 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: \$10.00 current issue, \$15.00 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 \$30.00 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

350 (6256)

Science **350** (6256), 11-130.

ARTICLE TOOLS

<http://science.sciencemag.org/content/350/6256>

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.