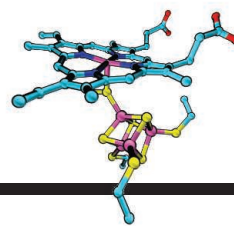


CONTENTS

14 SEPTEMBER 2018 • VOLUME 361 • ISSUE 6407



1071 & 1098

Metals power
designed enzyme



Forest resilience after Hurricane Maria

NEWS

IN BRIEF

1052 News at a glance

IN DEPTH

1054 PHYSICISTS PLAN HUNT FOR HIGGS BOSON PAIRS

Rare double-Higgs events at the Large Hadron Collider could point to new physics *By A. Cho*

1055 STEEP DROP IN ZIKA CASES UNDERMINES VACCINE TRIAL

Controversial strategy of intentionally infecting volunteers to test vaccine candidates is now back on the agenda *By J. Cohen*

► PODCAST

1056 NEW CANCER-FIGHTING CELLS ENTER TRIALS

Engineered natural killer cells and macrophages may be next immunotherapies *By M. Leslie*

1058 NASA SPACE LASER TARGETS MELTING POLES

ICESat-2 is set to reveal disappearing sea ice and retreating glacier beds *By P. Voosen*

1059 SCARRED BIRD BONES REVEAL EARLY SETTLEMENT ON MADAGASCAR

Find reignites debate about megafauna extinctions *By A. Lawler*

► RESEARCH ARTICLE BY J. HANSFORD ET AL. 10.1126/SCIADV.AAT6925

FEATURES

1060 PIERCING THE HAZE

Ammonia, a poorly understood smog ingredient, could be key to limiting deadly particulate pollution

By J. Plautz

1064 WINDFALL

A catastrophic hurricane gave scientists a rare chance to study how tropical forests will fare in a warmer, stormier future

By S. Amandolare

INSIGHTS

PERSPECTIVES

1066 GAIA 2.0

Could humans add some level of self-awareness to Earth's self-regulation?

By T. M. Lenton and B. Latour

► EDITORIAL P. 1051; BOOK REVIEW P. 1079

1068 NERVOUS SYSTEM-LIKE SIGNALING IN PLANT DEFENSE

Herbivory induces rapid long-distance calcium signals through glutamate-like receptors *By G. K. Muday and H. Brown-Harding*

► REPORT P. 1112

1069 A PINCH OF RNA SPICES UP DNA REPAIR

Transient incorporation of RNA precursors helps fix broken DNA *By M. Modesti*

► REPORT P. 1126

1071 REVVING UP AN ARTIFICIAL METALLOENZYME

An engineered metalloenzyme shows promising catalytic activity for sulfite reduction

By K. M. Lancaster

► REPORT P. 1098

1072 ENANTIOSELECTIVE FOUR-COMPONENT UGI REACTIONS

A chiral organocatalyst condenses four reactants with stereochemical control *By R. Riva*

► RESEARCH ARTICLE P. 1087

1073 ROBOTIC-FLAPPER MANEUVERS AND FRUITFLY TURNS

Studies of an aerial robot help explain rapid banked turns in the fruitfly

By F. Ruffier

► REPORT P. 1089

POLICY FORUM

1075 A "TECHNOLOGY-SMART" BATTERY POLICY STRATEGY FOR EUROPE

Batteries' inherent characteristics should inform policies

By M. Beuse et al.

BOOKS ET AL.

1078 SMARTER, STRONGER, LONGER

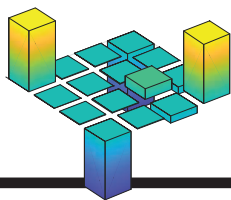
From extreme longevity to photographic memory, unusual individuals push the boundaries of human ability

By C. Kemp

1079 LOOKING AHEAD

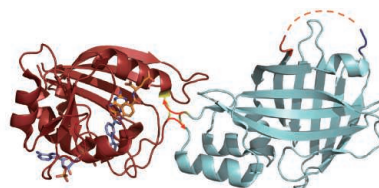
A cosmologist advocates thoughtful deployment of science and technology to address the challenges facing humanity *By A. Robinson*

► EDITORIAL P. 1051; PERSPECTIVE P. 1066



1101 & 1104

Metamaterials go quantum



1122

Sensor proteins monitor metabolites

LETTERS

1081 GRAZING LIMITS BENEFITED BRIDGE CREEK

By R. Demmer and R. L. Beschta

1081 U.S. FAST TEST REACTOR WILL PAY DIVIDENDS

By P. B. Lyons and J. F. Kotek

1082 ONLINE BUZZ PRIORITIZING POPULATION POLICIES

By K. R. Smith et al.

1082 TECHNICAL COMMENT ABSTRACTS

1082 ERRATA

RESEARCH

IN BRIEF

1083 From *Science* and other journals

RESEARCH ARTICLES

1086 IMMUNOLOGY

Differential IL-2 expression defines developmental fates of follicular versus nonfollicular helper T cells
D. DiToro et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aao2933](https://doi.org/10.1126/science.aao2933)

1087 ORGANIC CHEMISTRY

Asymmetric phosphoric acid-catalyzed four-component Ugi reaction
J. Zhang et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aas8707](https://doi.org/10.1126/science.aas8707)

► PERSPECTIVE P. 1072

1088 NEUROSCIENCE

Recurrent cortical circuits implement concentration-invariant odor coding
K. A. Bolding and K. M. Franks

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aat6904](https://doi.org/10.1126/science.aat6904)

REPORTS

1089 ROBOTICS

A tailless aerial robotic flapper reveals that flies use torque coupling in rapid banked turns
M. Karásek et al.

► PERSPECTIVE P. 1073

1094 SOLAR CELLS

Organic and solution-processed tandem solar cells with 17.3% efficiency
L. Meng et al.

1098 ENZYME DESIGN

A designed heme-[4Fe-4S] metalloenzyme catalyzes sulfite reduction like the native enzyme
E. N. Mirts et al.

► PERSPECTIVE P. 1071

METAMATERIALS

1101 Quantum entanglement of the spin and orbital angular momentum of photons using metamaterials
T. Stav et al.

1104 Quantum metasurface for multiphoton interference and state reconstruction
K. Wang et al.

1108 FOREST ECOLOGY

Classifying drivers of global forest loss
P. G. Curtis et al.

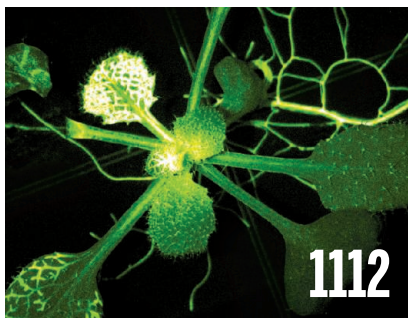
1112 BOTANY

Glutamate triggers long-distance, calcium-based plant defense signaling
M. Toyota et al.

► VIDEO

1115 MIGRATION

A continental system for forecasting bird migration
B. M. Van Doren and K. G. Horton



1118 PROTEIN TARGETING

An ER surface retrieval pathway safeguards the import of mitochondrial membrane proteins in yeast
K. G. Hansen et al.

1122 BIOCHEMISTRY

Semisynthetic sensor proteins enable metabolic assays at the point of care
Q. Yu et al.

1126 MOLECULAR BIOLOGY

Ribonucleotide incorporation enables repair of chromosome breaks by nonhomologous end joining
J. M. Pryor et al.

► PERSPECTIVE P. 1069

DEPARTMENTS

1051 EDITORIAL

Space for nature

By Jonathan Baillie and Ya-Ping Zhang

► PERSPECTIVE P. 1066; BOOK REVIEW P. 1079

1158 WORKING LIFE

Learning to lead
By Lucka Bibic

ON THE COVER



An agile, tailless untethered robot with four flapping wings performs a fruitfly-inspired turning maneuver. The image combines the robot in flight with a time exposure of its flight path. This robot

offers a fresh perspective on insect flight, revealing a passive aerodynamic mechanism that helps fruitflies perform rapid banked turns to avoid dangers. See pages 1073 and 1089. For more on the process behind the cover image, see <https://scim.ag/2N1bbdl>.

Image: Skopei Films/©TU Delft

Science Staff	1050
New Products	1130
Science Careers	1131

SCIENCE (ISSN 0036-8075) is published weekly on Friday, 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 © 2018 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership, including subscription (12 months): \$165 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1808. 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 #R125488122. 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 each plus shipping and handling; 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 is granted by AAAS to libraries and others who use Copyright Clearance Center (CCC) Pay-Per-Use services 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

361 (6407)

Science **361** (6407), 1051-1158.

ARTICLE TOOLS

<http://science.sciencemag.org/content/361/6407>

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.