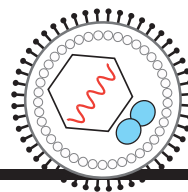


# CONTENTS



## 1166, 1228, & 1232

Antiviral stowaway

11 SEPTEMBER 2015 • VOLUME 349 • ISSUE 6253



### 1158

## NEWS

### IN BRIEF

**1146** Roundup of the week's news

### IN DEPTH

#### **1149** NEW HUMAN SPECIES DISCOVERED

Bizarre skeletons emerge from South African cave *By A. Gibbons*

#### **1150** SPHERICAL NUCLEIC ACIDS START ROLLING

Promise of cancer-seeking nanoparticles wins funding for research center *By R. F. Service*

#### **1152** A COLD, CREEPING MENACE

In Alaska, frozen debris lobes threaten a key lifeline *By E. Kintisch*

#### **1153** FLU STUDY RAISES QUESTIONS ABOUT U.S. BAN

A new viral "backbone" could speed up production of influenza vaccines *By J. Cohen*

### FEATURES

#### **1154** GLOBAL PAYER

As head of the \$29 billion Wellcome Trust, Jeremy Farrar took the stage during the Ebola epidemic. Now, he wants to make the trust a world leader *By K. Kupferschmidt*

#### **1158** TAILPIPE TO TANK

Researchers are vying to use renewable energy to suck carbon dioxide out of the air and turn it back into fuel *By R. F. Service*

#### **1160** Conjuring chemical cornucopias out of thin air

*By R. F. Service*

## INSIGHTS

### PERSPECTIVES

#### **1162** WEAK SUBDUCTION MAKES GREAT QUAKES

Small earthquakes reveal low stress levels at megathrust zones and in surrounding crust *By R. Bürgmann*

► REPORT P. 1213



#### **1163** HOW SINGLE CELLS WORK TOGETHER

Are single-celled symbioses organelle evolution in action? *By J. P. Zehr*

#### **1165** AN INCREASING CARBON SINK?

Southern Ocean carbon uptake may have strengthened between 2002 and 2012, slowing climate change

*By S. E. Mikaloff-Fletcher*

► REPORT P. 1221

#### **1166** VIRUSES CARRY ANTIVIRAL CARGO

Infected cells generate a factor that is incorporated into viruses and transferred to other cells

*By J. W. Schoggins*

► REPORTS PP. 1228 & 1232

#### **1167** FIGHTING CANCER WHILE SAVING THE MAYAPPLE

The genes required for synthesizing a plant-derived anticancer compound are identified *By S. E. O'Connor*

► REPORT P. 1224

#### **1168** INTERFERENCE OF ATOMIC CLOCKS

The time dilation of gravity is mimicked with atomic clocks in magnetic fields

*By M. Arndt and C. Brand*

► REPORT P. 1205

#### **1170** WINNING COALITIONS FOR CLIMATE POLICY

Green industrial policy builds support for carbon regulation *By J. Meckling et al.*

#### **1172** RETHINKING HERITABILITY OF THE MICROBIOME

How should microbiome heritability be measured and interpreted?

*By E. J. van Opstal and S. R. Bordenstein*

► PODCAST

### DEPARTMENTS

#### **1145** EDITORIAL

Puerto Rico's future at stake

*By Jorge Colón*

#### **1254** WORKING LIFE

Nice to know you

*By Malou Henriksen-Lacey and*

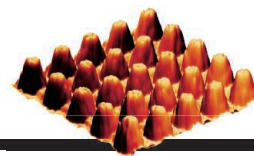
*Juan J. Giner-Casares*

Science Staff .....	1144
New Products .....	1246
Science Careers .....	1247

# CONTENTS

1202

Vortices in an egg crate



11 SEPTEMBER 2015 • VOLUME 349 • ISSUE 6253

## BOOKS ET AL.

### 1174 A BEAUTIFUL QUESTION

By F. Wilczek,

### STRANGE TOOLS

By A. Noë, reviewed by G. Frazzetto

### 1175 CHEMICALS WITHOUT HARM

By K. Geiser, reviewed by M. R. Schwarzman

## LETTERS

### 1176 COMMERCIAL FORESTS: NATIVE ADVANTAGE

By D. A. Peltzer et al.

### 1176 BRINGING SCIENCE TO PRISONS IS NOT ENOUGH

By I. Traniello

### 1176 ILLUMINATING NEXT STEPS FOR NEON

By T. Dawson et al.

## RESEARCH

### IN BRIEF

1178 From *Science* and other journals

### RESEARCH ARTICLES

#### 1181 HUMAN GENOMICS

Global diversity, population stratification, and selection of human copy-number variation P. H. Sudmant et al.

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.aab3761](http://dx.doi.org/10.1126/science.aab3761)

#### STRUCTURAL BIOLOGY

1182 Structure of a yeast spliceosome at 3.6-angstrom resolution C. Yan et al.

1191 Structural basis of pre-mRNA splicing J. Hang et al.

#### REPORTS

#### 1199 MESOSCOPIC PHYSICS

Coherent manipulation of Andreev states in superconducting atomic contacts C. Janvier et al.



#### 1202 CRITICAL PHENOMENA

Critical behavior at a dynamic vortex insulator-to-metal transition N. Poccia et al.

#### 1205 QUANTUM MECHANICS

A self-interfering clock as a “which path” witness Y. Margalit et al.

► PERSPECTIVE P. 1168

#### 1208 ELECTROCHEMISTRY

Covalent organic frameworks comprising cobalt porphyrins for catalytic CO<sub>2</sub> reduction in water S. Lin et al.

#### 1213 GEOPHYSICS

Stress orientations in subduction zones and the strength of subduction megathrust faults J. L. Hardebeck

► PERSPECTIVE P. 1162

#### 1216 NEURONAL IDENTITY

Tuning of fast-spiking interneuron properties by an activity-dependent transcriptional switch N. Deharter et al.

#### 1221 GLOBAL CARBON CYCLE

The reinvigoration of the Southern Ocean carbon sink P. Landschützer et al.

► PERSPECTIVE P. 1165

#### 1224 PLANT SCIENCE

Six enzymes from mayapple that complete the biosynthetic pathway to the etoposide aglycone W. Lau and E. S. Sattely

► PERSPECTIVE P. 1167

#### ANTIVIRAL IMMUNITY

1228 Viruses transfer the antiviral second messenger cGAMP between cells A. Bridgeman et al.

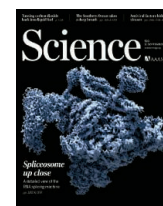
1232 Transmission of innate immune signaling by packaging of cGAMP in viral particles M. Gentili et al.

► PERSPECTIVE P. 1166

#### 1237 CHROMOSOMES

The inner centromere–shugoshin network prevents chromosomal instability Y. Tanno et al.

#### ON THE COVER



Three-dimensional structure of a yeast spliceosome. In eukaryotes, genetic information stored in DNA is transcribed into precursor messenger RNA (pre-mRNA),

which contains protein-coding exons interspersed with noncoding introns. The splicing of pre-mRNA, which entails removal of introns and covalent linkage of exons, is mediated by a multicomponent ribonucleoprotein complex—the spliceosome. See pages 1182 and 1191. *Illustration: C. Bickel/Science; structure based on the cryo-EM map of a yeast spliceosome (EMDB ID EMD-6413)*

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 #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: \$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

**349 (6253)**

*Science* **349** (6253), 1145-1254.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/349/6253>

**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.