

## EDITORIAL

- 9 The New Patrons of Research  
*Marcia McNutt*  
 >> News section p. 24; Policy Forum p. 41

## NEWS OF THE WEEK

- 14 A roundup of the week's top stories

## NEWS & ANALYSIS

- 16 Even for Slide-Prone Region, Landslide Was Off the Chart  
 17 Cassini Plumbs the Depths of the Enceladus Sea  
 >> Report p. 78  
 18 Kurdistan Offers an Open Window on the Ancient Fertile Crescent  
 19 The Morning After, Inflation Result Causes Headaches  
 21 In New Report, IPCC Gets More Specific About Warming Risks  
 22 Court Slams Japan's Scientific Whaling  
 23 RIKEN Panel Finds Misconduct in Controversial Paper

## NEWS FOCUS

- 24 Chasing the Money  
 The Vulnerable: Talene Yacoubian  
 The Veteran: Russ Hille  
 The Adapter: Rachel Brewster  
 The Administrator: Jay Walsh  
 The Well-Heeled: Donald Bowden  
 The Crowd-Funder: Heidi Moretti  
 Anatomy of a Grant: Michael Imperiale  
 >> Editorial p. 9; Policy Forum p. 41; Science Careers features by T. Gura and G. B. S. N. P. Varma at <http://scim.ag/1dUhSB2>; Science Podcast

## LETTERS

- 34 NextGenVOICES

## BOOKS ET AL.

- 39 Reading Darwin in Arabic, 1860–1950  
*M. Elshakry, reviewed by B. H. Küçük*  
 40 Vikings  
*G. Williams et al., curators*

## POLICY FORUM

- 41 Science Funding and Short-Term Economic Activity  
*B. A. Weinberg et al.*  
 >> Editorial p. 9; News section p. 24

## PERSPECTIVES

- 44 Optogenetic Regeneration  
*S. M. Iyer and S. L. Delp*  
 >> Report p. 94  
 45 A CO<sub>2</sub> Cloak for the Cyanide Dagger  
*I. Alabugin and R. K. Mohamed*  
 >> Report p. 75  
 46 To Fence or Not to Fence  
*R. Woodroffe et al.*  
 48 The Michael Jackson Fly  
*R. S. Mann*  
 >> Report p. 97  
 49 Immune Activation with HIV Vaccines  
*A. S. Fauci et al.*  
 51 Inside Earth Runs Hot and Cold  
*K. A. Kelley*  
 >> Report p. 80  
 52 Not So Permanent El Niño  
*D. W. Lea*  
 >> Report p. 84

## REVIEW

- 54 Migratory Animals Couple Biodiversity and Ecosystem Functioning Worldwide  
*S. Bauer and B. J. Hoyer*  
*Review Summary; for full text:*  
<http://dx.doi.org/10.1126/science.1242552>

CONTENTS continued >>



page 22



page 46

## ON THE WEB THIS WEEK

### >> Science Podcast

On this week's show: life under rapid funding change and a news roundup with David Grimm.

### >> Find More Online

Check out *Science Express*, the weekly podcast, videos, daily news, our research journals, and *Science Careers* at [www.sciencemag.org](http://www.sciencemag.org).



## COVER

A lone scientist considers the state of biomedical funding in the United States. As researchers adapt to new constraints, they are reconsidering their strategy and their science, and trying to find a road forward. See pages 9, 24, and 41.

Illustration: Mark Smith, [MarkSmithIllustration.com](http://MarkSmithIllustration.com)

## DEPARTMENTS

- 8 This Week in *Science*  
 10 Editors' Choice  
 12 *Science* Staff  
 105 New Products  
 106 *Science Careers*

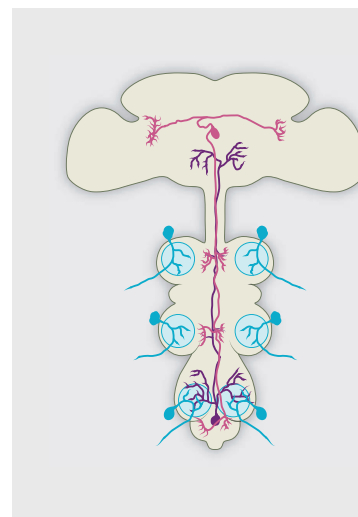
## RESEARCH ARTICLES

- 55 **Total Synthesis of a Functional Designer Eukaryotic Chromosome**  
N. Annaluru et al.  
A synthetic version of yeast chromosome III with every gene tagged can substitute for the original.
- 58 **Structure of a Class C GPCR Metabotropic Glutamate Receptor 1 Bound to an Allosteric Modulator**  
H. Wu et al.  
Insight into the activation mechanism of a human neuronal G protein-coupled receptor.
- 65 **Polyhedra Self-Assembled from DNA Tripods and Characterized with 3D DNA-PAINT**  
R. Iinuma et al.  
Stiff DNA tripod units enabled the assembly of wireframe polyhedra with edges 100 nanometers in length.

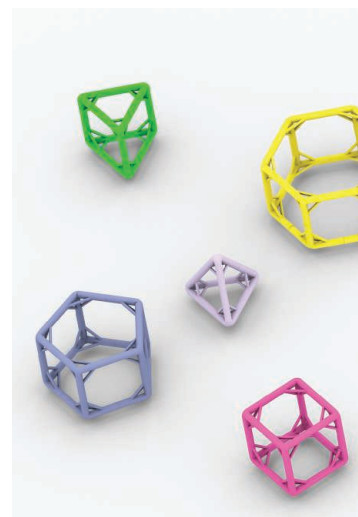
## REPORTS

- 70 **Soft Microfluidic Assemblies of Sensors, Circuits, and Radios for the Skin**  
S. Xu et al.  
Flexible skin-integrated electronic sensors enable continuous, wireless health monitoring.
- 75 **A Simple Complex on the Verge of Breakdown: Isolation of the Elusive Cyanofornate Ion**  
L. J. Murphy et al.  
Characterization of a cyanide-carbon dioxide adduct bolsters its possible role in protecting a plant enzyme from cyanide inhibition.  
>> *Perspective p. 45*
- 78 **The Gravity Field and Interior Structure of Enceladus**  
L. Iess et al.  
The saturnian moon is differentiated and likely hosts a regional subsurface sea at its southern pole.  
>> *News story p. 17*
- 80 **Geophysical and Geochemical Evidence for Deep Temperature Variations Beneath Mid-Ocean Ridges**  
C. A. Dalton et al.  
Temperature variations in the upper mantle drive mantle convection.  
>> *Perspective p. 51*

- 84 **A 12-Million-Year Temperature History of the Tropical Pacific Ocean**  
Y. G. Zhang et al.  
A strong Pacific zonal surface ocean temperature gradient has existed for the past 12 million years.  
>> *Perspective p. 52*
- 87 **Construction of a Vertebrate Embryo from Two Opposing Morphogen Gradients**  
P.-F. Xu et al.  
Opposing gradients of bone morphogenetic protein and Nodal can induce the formation of a zebrafish embryo.
- 90 **Monolignol Ferulate Transferase Introduces Chemically Labile Linkages into the Lignin Backbone**  
C. G. Wilkerson et al.  
Engineered poplar lignin with readily cleavable ester bonds in the polymer backbone improves wood degradability.
- 94 **Optical Control of Muscle Function by Transplantation of Stem Cell-Derived Motor Neurons in Mice**  
J. B. Bryson et al.  
Transplanted neurons controlled by light can drive muscle function in damaged mouse sciatic nerves.  
>> *Perspective p. 44*
- 97 **Neuronal Control of *Drosophila* Walking Direction**  
S. S. Bidaye et al.  
Activation of descending command neurons in *Drosophila* induces flies to walk backward.  
>> *Perspective p. 48*
- 101 **SRP RNA Remodeling by SRP68 Explains Its Role in Protein Translocation**  
J. T. Grotwinkel et al.  
Structures of part of the signal recognition complex help explain how newly synthesized proteins are inserted into membranes.



pages 48 &amp; 97



page 65

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 © 2014 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

**344 (6179)**

*Science* **344** (6179), 8-105.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/344/6179>

**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.