

## EDITORIAL

- 1545 Engage to Excel  
*S. James Gates Jr. and Chad Mirkin*  
 >> *Essays pp. 1588 and 1590*

## NEWS OF THE WEEK

- 1550 A roundup of the week's top stories

## NEWS & ANALYSIS

- 1553 DOE Derails Planning for Major Fermilab Experiment
- 1554 Biomarker Tests Need Closer Scrutiny IOM Concludes
- 1555 Field Research on Bees Raises Concern About Low-Dose Pesticides  
 >> *Science Express Reports by P. R. Whitehorn et al. and M. Henry et al.*
- 1556 U.S. Budget Cuts Threaten to Sink Undersea Research Fleet
- 1557 North Korea Conundrum Overshadows Nuclear Summit

## NEWS FOCUS

- 1558 Psychology's Bold Initiative  
 >> *Science Podcast*
- 1562 New Lens Offers Scientist a Brighter Outlook
- 1564 Partners Prepare to Pick a Site for World's Biggest Telescope

## LETTERS

- 1569 Electronic Textbooks: Why the Rush?  
*D. B. Daniel and D. T. Willingham*
- Protecting Brazil's Coastal Wetlands  
*A. S. Rovai et al.*
- Readers' Poll Results: Bad Advice?
- India's Path to Knowledge  
*K. S. Bawa*
- 1573 CORRECTIONS AND CLARIFICATIONS
- 1573 TECHNICAL COMMENT ABSTRACTS

## BOOKS ET AL.

- 1574 Mushroom  
*N. P. Money;*  
**Mycophilia**  
*E. Bone, reviewed by L. Ostroff*
- 1575 Browsings

## POLICY FORUM

- 1576 To Protect Human Subjects, Review What Was Done, Not Proposed  
*R. Klitzman and P. S. Appelbaum*

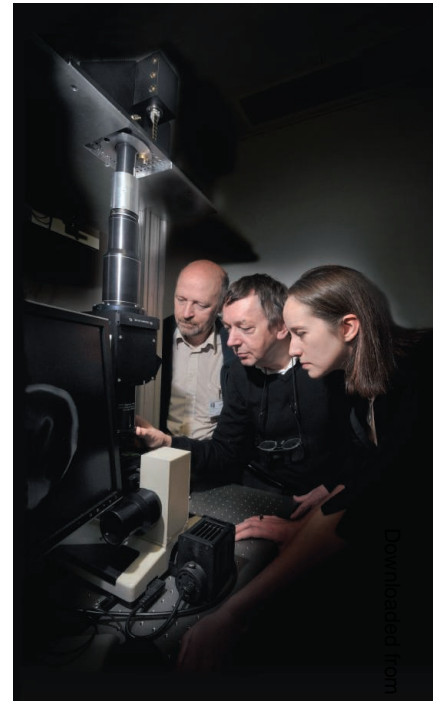
## PERSPECTIVES

- 1578 Rapamycin Paradox Resolved  
*K. J. Hughes and B. K. Kennedy*  
 >> *Report p. 1638*
- 1579 How Smart Is Your Home?  
*D. J. Cook*
- 1581 How Smart Is Your City?  
*M. O'Grady and G. O'Hare*
- 1582 Segregation and Wiring in the Brain  
*K. Zilles and K. Amunts*  
 >> *Reports pp. 1628 and 1634*
- 1584 A Single Spin Feels the Vibrations  
*P. Treutlein*  
 >> *Report p. 1603*
- 1585 Keeping Time with Earth's Heaviest Element  
*C. H. Stirling*  
 >> *Report p. 1610*
- 1587 Retrospective: Renato Dulbecco (1914–2012)  
*D. Baltimore*

## SCIENCE PRIZE ESSAYS

- 1588 Investigating Arabia Mountain: A Molecular Approach  
*N. P. Jacob*  
 >> *Editorial p. 1545*
- 1590 Adapting to Osmotic Stress and the Process of Science  
*B. J. Gasper et al.*  
 >> *Editorial p. 1545*

CONTENTS continued >>



page 1562



pages 1579 & 1581

Downloaded from <http://science.sciencemag.org/> on June 18, 2021



## COVER

Two *Daphnia dentifera*, each ~2 millimeters long. The organism at bottom left is infected with a virulent yeast parasite, causing her bright white appearance. The food web in which the host-parasite interaction is embedded determines the size of the epidemic, which, in turn, determines whether the *Daphnia* population becomes more resistant or more susceptible during the epidemic. See page 1636.

Credit: Meghan A. Duffy

## DEPARTMENTS

- 1542 This Week in *Science*
- 1546 Editors' Choice
- 1548 *Science* Staff
- 1593 AAAS News & Notes
- 1647 New Products
- 1648 *Science* Careers

## BREVIA

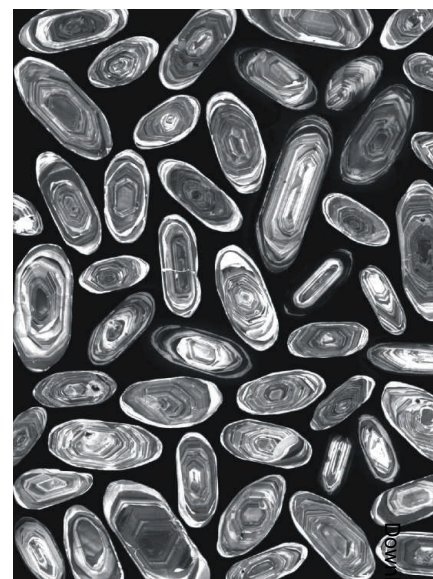
- 1596** Integrated Electromicrobial Conversion of CO<sub>2</sub> to Higher Alcohols  
*H. Li et al.*  
An engineered microbe transforms carbon dioxide into a prospective liquid fuel in tandem with electrical power rather than light.

## REPORTS

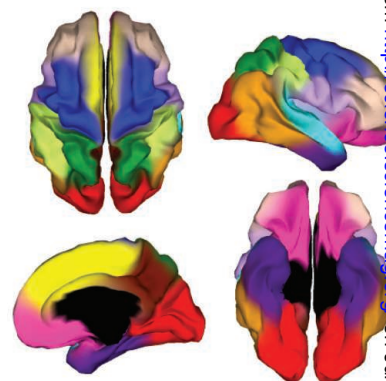
- 1597** Emerging Chirality in Artificial Spin Ice  
*W. R. Branford et al.*  
A nanomagnetic honeycomb structure exhibits an asymmetric response to a magnetic field sweep and an electric current.
- 1600** Disentangling the Electronic and Phononic Glue in a High-*T<sub>c</sub>* Superconductor  
*S. Dal Conte et al.*  
A time-resolved optical technique resolves the influence of lattice dynamics on electron pairing in a cuprate.
- 1603** Coherent Sensing of a Mechanical Resonator with a Single-Spin Qubit  
*S. Kolkowitz et al.*  
The spin of a nitrogen vacancy defect in diamond is used to sense the motion of a magnetized microresonator.  
>> *Perspective p. 1584*
- 1606** Hydrocarbon Separations in a Metal-Organic Framework with Open Iron(II) Coordination Sites  
*E. D. Bloch et al.*  
Tighter binding of olefins to iron centers in a sorbent facilitates their efficient separation from saturated hydrocarbons.
- 1610** <sup>238</sup>U/<sup>235</sup>U Systematics in Terrestrial Uranium-Bearing Minerals  
*J. Hiess et al.*  
Highly variable uranium isotope ratios highlight the need for a revised approach to radiometric dating.  
>> *Perspective p. 1585; Science Podcast*
- 1614** A Shorter <sup>146</sup>Sm Half-Life Measured and Implications for <sup>146</sup>Sm-<sup>142</sup>Nd Chronology in the Solar System  
*N. Kinoshita et al.*  
Mantle differentiation of Earth, the Moon, and Mars occurred earlier and over a shorter time scale than previously estimated.
- 1617** Control of Sleep by Cyclin A and Its Regulator  
*D. Rogulja and M. W. Young*  
Two proteins that regulate cell division also regulate sleep in *Drosophila*.

- 1621** Cotranscriptional Role for *Arabidopsis* DICER-LIKE 4 in Transcription Termination  
*F. Liu et al.*  
An *Arabidopsis* protein that functions in gene silencing is shown to be involved in nascent RNA cleavage as well.
- 1624** Gap Junctions Compensate for Sublinear Dendritic Integration in an Inhibitory Network  
*K. Vervaeke et al.*  
Synaptic charge spreads into the dendrites of neighboring interneurons via dendritic gap junctions.
- 1628** The Geometric Structure of the Brain Fiber Pathways  
*V. J. Wedeen et al.*  
The macroscopic pathways of human brain nerve fibers are organized according to a single, highly curved three-dimensional grid.  
>> *Science Podcast*
- 1634** Hierarchical Genetic Organization of Human Cortical Surface Area  
*C.-H. Chen et al.*  
Human brain structure is genetically controlled in a hierarchical, modular, and symmetric fashion.  
>> *Perspective p. 1582*
- 1636** Ecological Context Influences Epidemic Size and Parasite-Driven Evolution  
*M. A. Duffy et al.*  
When the physiological cost of host resistance to a disease damages reproductive output, disease susceptibility can evolve.
- 1638** Rapamycin-Induced Insulin Resistance Is Mediated by mTORC2 Loss and Uncoupled from Longevity  
*D. W. Lamming et al.*  
The effect of the drug rapamycin on life span can be separated from its effects on metabolism.  
>> *Perspective p. 1578*
- 1643** hnRNP C Tetramer Measures RNA Length to Classify RNA Polymerase II Transcripts for Export  
*A. McCloskey et al.*  
A nuclear protein measures the length of newly made RNAs and sorts them into distinct pathways for export.

CONTENTS continued >>



pages 1585 & 1610



pages 1582, 1628, & 1634

## SCIENCEONLINE

## SCIENCEEXPRESS

[www.sciencexpress.org](http://www.sciencexpress.org)

### Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production

*P. R. Whitehorn et al.*

Bumble bee colonies produce many fewer queens after exposure to a widely used insecticide.  
10.1126/science.1215025

### A Common Pesticide Decreases Foraging Success and Survival in Honey Bees

*M. Henry et al.*

Honey bees cannot find their way home after exposure to sublethal doses of a widely used insecticide.  
10.1126/science.1215039

>> *News story p. 1555*

### GBP5 Promotes NLRP3 Inflammasome Assembly and Immunity in Mammals

*A. R. Shenoy et al.*

A human protein activates the assembly of a cellular complex that detects signs of infection.  
10.1126/science.1217141

### Organic Synthesis via Irradiation and Warming of Ice Grains in the Solar Nebula

*F. J. Ciesla and S. A. Sandford*

A mechanism for production of carbon compounds in the interstellar medium could also operate in protoplanetary disks.  
10.1126/science.1217291

### Complex Protostellar Chemistry

*J. A. Nuth III and N. M. Johnson*

10.1126/science.1219709

### Carbon Isotope Constraints on the Deglacial CO<sub>2</sub> Rise from Ice Cores

*J. Schmitt et al.*

The stable isotopic composition of the carbon in carbon dioxide over the last 24,000 years illuminates past carbon cycle behavior.  
10.1126/science.1217161

### The Ice Age Carbon Puzzle

*E. Brook*

10.1126/science.1219710

## TECHNICAL COMMENTS

Comments and Response on “Disentangling the Drivers of  $\beta$  Diversity Along Latitudinal and Elevational Gradients”

Comment: *H. Qian et al.*

Full text at [www.sciencemag.org/cgi/content/ful/335/6076/1573-b](http://www.sciencemag.org/cgi/content/ful/335/6076/1573-b)

Comment: *H. Tuomisto and K. Ruokolainen*

Full text at [www.sciencemag.org/cgi/content/ful/335/6076/1573-c](http://www.sciencemag.org/cgi/content/ful/335/6076/1573-c)

Response: *N. J. B. Kraft et al.*

Full text at [www.sciencemag.org/cgi/content/ful/335/6076/1573-d](http://www.sciencemag.org/cgi/content/ful/335/6076/1573-d)

## SCIENCE NOW

[www.sciencenow.org](http://www.sciencenow.org)

Highlights From Our Daily News Coverage

### Oil Spill's 'Frothy Gunk' Harming Corals

A 2010 disaster coated deep-sea corals with oil more than 11 kilometers from the well site.  
[http://scim.ag/Frothy\\_Gunk](http://scim.ag/Frothy_Gunk)

### Findings Cast Doubt on Moon Origins

The giant impact hypothesis struggles to explain the similarity between Earth and the Moon's composition.  
[http://scim.ag/Moon\\_Origins](http://scim.ag/Moon_Origins)

Earth Warming Faster Than Expected  
Global temperatures could be 3°C hotter by mid-century.  
[http://scim.ag/Global\\_Temperatures](http://scim.ag/Global_Temperatures)

## SCIENCE SIGNALING

[www.sciencesignaling.org](http://www.sciencesignaling.org)

The Signal Transduction Knowledge Environment

**27 March issue:** <http://scim.ag/ss032712>

### EDITORIAL GUIDE: Focus Issue—TOR Signaling, A Tale of Two Complexes

*N. R. Gough*

This issue highlights developments in the signaling network associated with the kinase TOR.

### RESEARCH ARTICLE: Chronic Activation of mTOR Complex 1 Is Sufficient to Cause Hepatocellular Carcinoma in Mice

*S. Menon et al.*

Aberrant activation of mTORC1 disrupts tissue homeostasis, leading to carcinogenesis.

### RESEARCH ARTICLE: A Dynamic Network Model of mTOR Signaling Reveals TSC-Independent mTORC2 Regulation

*P. Dalle Pezze et al.*

### PERSPECTIVE: Deconvolution of mTORC2

“in Silico”

*D. C. Fingar and K. Inoki*

Modeling and testing network structures reveals a distinct mechanism of mTORC2 activation by insulin.

### RESEARCH RESOURCE: Hyperplexing—A Method for Higher-Order Multiplexed Quantitative Proteomics Provides a Map of the Dynamic Response to Rapamycin in Yeast

*N. Dephoure and S. P. Gygi*

A dual-labeling strategy enables high-throughput analysis of multiple samples by mass spectrometry.

### PERSPECTIVE: Phospholipase D and mTORC1—Nutrients Are What Bring Them Together

*B. M. Wiczler and G. Thomas*

Activation of PLD1 by amino acids enables mTORC1 to respond to nutrient abundance.

## SCIENCE TRANSLATIONAL MEDICINE

[www.sciencetranslationalmedicine.org](http://www.sciencetranslationalmedicine.org)

Integrating Medicine and Science

**28 March issue:** <http://scim.ag/stm032812>

### SPECIAL ISSUE: CONQUERING CANCER, CLOSING THE TRANSLATIONAL GAP

#### EDITORIAL: *Winning the War—Science Parkour*

*B. Vogelstein and K. W. Kinzler*

Experts pinpoint blocks to conquering cancer and highlight state-of-the-art science and strategies to sidestep these obstacles.

### PERSPECTIVE: Raising the Bar—The Curative Potential of Human Cancer Immunotherapy

*S. A. Rosenberg*

### PERSPECTIVE: Pluripotent Stem Cell–Based Cancer Therapy—Promise and Challenges

*S. J. Sharkis et al.*

### PERSPECTIVE: Intratumor Heterogeneity—Seeing the Wood for the Trees

*T. A. Yap et al.*

### REVIEW: Improving Treatment of HER2-Positive Cancers—Opportunities and Challenges

*H. M. Stern*

### REVIEW: Beyond PSA—The Next Generation of Prostate Cancer Biomarkers

*J. R. Prensner et al.*

### REVIEW: Applying What We Know to Accelerate Cancer Prevention

*G. A. Colditz et al.*

### RESEARCH ARTICLE: Anti-Invasive Adjuvant Therapy with Imipramine Blue Enhances Chemotherapeutic Efficacy Against Glioma

*J. M. Munson et al.*

### RESEARCH ARTICLE: Colocalization of Inflammatory Response with B7-H1 Expression in Human Melanocytic Lesions Supports an Adaptive Resistance Mechanism of Immune Escape

*J. M. Taube et al.*

### RESEARCH ARTICLE: Targeting of AML1-ETO in t(8;21) Leukemia by Oridonin Generates a Tumor Suppressor–Like Protein

*T. Zhen et al.*

## SCIENCE CAREERS

[www.sciencereers.org/career\\_magazine](http://www.sciencereers.org/career_magazine)

Free Career Resources for Scientists

### Does a Professional Science Master's Degree Pay Off?

*S. Carpenter*

Data on PSM graduates' employment outcomes are scarce, but anecdotal evidence of success abounds.

[http://scim.ag/PSM\\_Payoff](http://scim.ag/PSM_Payoff)

### Plant Hunters

*E. Pain*

Plant collecting offers excitement for adventurous scientists—at some cost in comfort and security.

<http://scim.ag/PlantHunters>

### NPA Founders Find Success

*M. Price*

The founders the National Postdoctoral Association say that the experience helped their careers.

[http://scim.ag/NPA\\_Founders](http://scim.ag/NPA_Founders)

## SCIENCE PODCAST

[www.sciencemag.org/multimedia/podcast](http://www.sciencemag.org/multimedia/podcast)

Free Weekly Show

On the 30 March *Science* Podcast: uranium age-dating, the brain's geometry, data replication, and more.

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 © 2012 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): \$149 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$990; 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.



ADVANCING SCIENCE. SERVING SOCIETY

# Science

**335 (6076)**

*Science* **335** (6076), 1542-1647.

ARTICLE TOOLS

<http://science.sciencemag.org/content/335/6076>

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. The title *Science* is a registered trademark of AAAS.

Copyright © 2012 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.