

## EDITORIAL

- 13 *Science* for Science  
Bruce Alberts

## NEWS OF THE WEEK

- 20 Hitting Early, Epidemic Meningitis Ravages Nigeria and Niger
- 21 Children's Study Exhibits Healthy Appetite
- 22 Sleeping to Reset Overstimulated Synapses  
>> Reports pp. 105 and 109
- 23 Recycling, the Radio-Astronomical Way
- 24 Nancy Pelosi: Foursquare for Science
- 25 New Texas Standards Question Evolution, Fossil Record
- 25 From the *Science* Policy Blog
- 26 Overcoming Opposition, Brazil Banks on Stem Cells
- 27 Support for Tenure-Track Jobs in Biomedical Sciences
- 27 From *Science's* Online Daily News Site

## NEWS FOCUS

- ORIGINS
- 28 On the Origin of Flowering Plants  
>> *Science Podcast*
- 32 Ken Golden: Cold Equations
- 34 Trouble on the Final Frontier

## LETTERS

- 36 Taste of Astronomy Lacked International Flavor  
*P. Couture*  
Response  
*R. Coontz*  
Creating a Common Climate Language  
*T. E. Bowman et al.*  
Effects of Increased Urbanization  
*R. Chao*  
Rheumatic Fever: Neglected Again  
*D. A. Watkins et al.*

## BOOKS ET AL.

- 38 Writing  
*B. B. Powell, reviewed by A. Robinson*
- 39 Origins of Human Communication  
*M. Tomasello, reviewed by N. J. Enfield*

## POLICY FORUM

- 40 Will Threat of Biological Invasions Unite the European Union?  
*P. E. Hulme et al.*

## PERSPECTIVES

- 42 The Forgotten Megafauna  
*D. M. Hansen and M. Galetti*
- 43 Automating Science  
*D. Waltz and B. G. Buchanan*  
>> Reports pp. 81 and 85; *Science Podcast*
- 44 Rethinking Water Splitting  
*R. Eisenberg*  
>> Report p. 74
- 46 Building a Better Nano-Biped  
*W. Sherman*  
>> Report p. 67
- 47 Turnover After the Fallout  
*C. E. Murry and R. T. Lee*  
>> Report p. 98
- 48 Just a Dream—or Future Reality?  
*H. A. Gasteiger and N. M. Marković*  
>> Report p. 71

## REVIEW

- 50 The Bent Hawaiian-Emperor Hotspot Track: Inheriting the Mantle Wind  
*J. Tarduno et al.*

## BREVIA

- 54 Conditional Mutagenesis in *Drosophila*  
*C. M. Choi et al.*  
A powerful genetic technique allows dissection of gene activity at different times and locations in the *Drosophila* fruit fly.

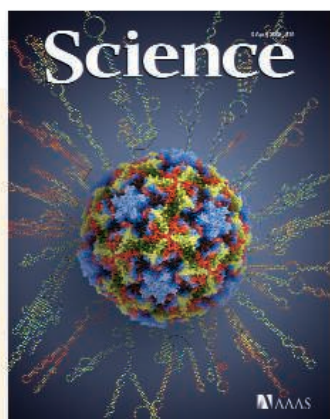
CONTENTS continued >>



page 28



page 38



## COVER

QuoteMol-rendered image of human rhinovirus 3 (Protein Data Bank ID: 1rhi) illustrating virion topography. Red, blue, and yellow denote the three major surface capsid proteins; examples of RNA regional motifs are colored according to predicted base-pairing fidelity. Sequence diversity within the major surface proteins contributes to the wide range of immunogenic serotypes characteristic of the "common cold." See page 55.

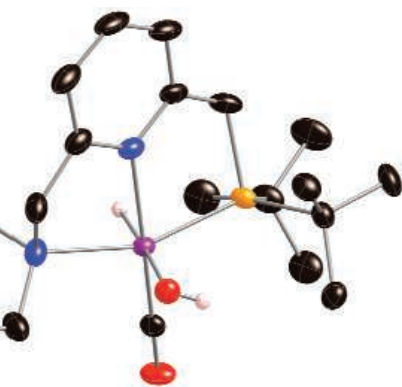
Image: *H. Adam Steinberg and Jean-Yves Sgro/University of Wisconsin–Madison*

## DEPARTMENTS

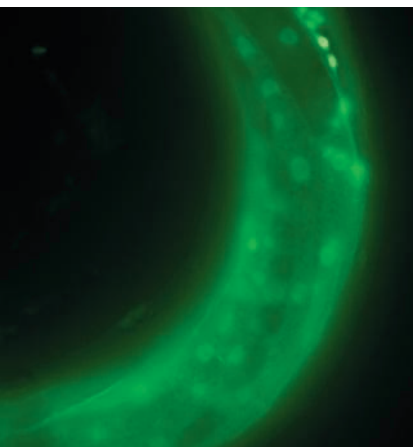
- 11 This Week in *Science*
- 15 Editors' Choice
- 16 *Science* Staff
- 19 Random Samples
- 113 New Products
- 114 *Science* Careers



page 42



pages 44 &amp; 74



page 95

## RESEARCH ARTICLE

- 55 Sequencing and Analyses of All Known Human Rhinovirus Genomes Reveal Structure and Evolution  
A. C. Palmenberg et al.  
Rhinoviruses, which are a common cause of colds, fall into three or possibly four major clades and can undergo strain recombination.

## REPORTS

- 59 Photodegradable Hydrogels for Dynamic Tuning of Physical and Chemical Properties  
A. M. Kloxin et al.  
The mechanical and biochemical properties of hydrogels can be tuned using photochemically induced reactions.
- 63 Switchable Ferroelectric Diode and Photovoltaic Effect in BiFeO<sub>3</sub>  
T. Choi et al.  
Single crystals of bismuth iron oxide contain a single ferroelectric domain that can be switched with an electric field.
- 67 A Bipedal DNA Brownian Motor with Coordinated Legs  
T. Omabegho et al.  
A unidirectional DNA walker is constructed and shown to walk a full cycle along a DNA track.  
>> Perspective p. 46
- 71 Iron-Based Catalysts with Improved Oxygen Reduction Activity in Polymer Electrolyte Fuel Cells  
M. Lefèvre et al.  
Iron-based catalysts now rival traditional platinum fuel-cell catalysts.  
>> Perspective p. 48
- 74 Consecutive Thermal H<sub>2</sub> and Light-Induced O<sub>2</sub> Evolution from Water Promoted by a Metal Complex  
S. W. Kohl et al.  
A ruthenium complex can split water into hydrogen and oxygen through successive thermal and photolytic steps.  
>> Perspective p. 44
- 78 Persistent Positive North Atlantic Oscillation Mode Dominated the Medieval Climate Anomaly  
V. Trouet et al.  
The North Atlantic Oscillation drove the climate anomalies across Europe and northern Africa during the Medieval Climate Anomaly.
- 81 Distilling Free-Form Natural Laws from Experimental Data  
M. Schmidt and H. Lipson  
An algorithm has been developed to search for natural laws of physics in large data sets.  
>> Perspective p. 43

- 85 The Automation of Science  
R. D. King et al.  
A robot scientist discovers orphan enzymes that take part in yeast metabolism.  
>> Perspective p. 43
- 89 Priming in Systemic Plant Immunity  
H. W. Jung et al.  
Azelaic acid is a long-distance signal conferring immunity against infection in plants.
- 92 RNA Pol II Accumulates at Promoters of Growth Genes During Developmental Arrest  
L. R. Baugh et al.  
Growth and development genes, poised for expression during developmental arrest in nematodes, respond rapidly to feeding.
- 95 Nuclear Hormone Receptor Regulation of MicroRNAs Controls Developmental Progression  
A. Bethke et al.  
During *Caenorhabditis elegans* development, a hormone-coupled microRNA molecular switch turns off earlier programs to allow for later ones.
- 98 Evidence for Cardiomyocyte Renewal in Humans  
O. Bergmann et al.  
Analyses of human heart cells labeled by a worldwide pulse-chase event reveal that some heart cells are younger than their owner.  
>> Perspective p. 47; Science Podcast
- 102 S-Nitrosylation of Drp1 Mediates β-Amyloid-Related Mitochondrial Fission and Neuronal Injury  
D.-H. Cho et al.  
Biochemical modification of a neuronal protein damages mitochondria and is linked to neurodegeneration.
- 105 Use-Dependent Plasticity in Clock Neurons Regulates Sleep Need in *Drosophila*  
J. M. Donlea et al.  
Neurons involved in circadian rhythms are required for increased sleep after social experience and for consolidation of memories.  
>> News story p. 22
- 109 Widespread Changes in Synaptic Markers as a Function of Sleep and Wakefulness in *Drosophila*  
G. F. Gilestro et al.  
In *Drosophila*, neural connection proteins increase their expression after wakefulness and decrease it after sleep.  
>> News story p. 22

## SCIENCEONLINE

## SCIENCEEXPRESS

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

**Extinction-Reconsolidation Boundaries: Key to Persistent Attenuation of Fear Memories**  
*M.-H. Monfils et al.*

Behavioral manipulations can reverse a learned fearful association in rats.  
10.1126/science.1167975

**Understanding the Spreading Patterns of Mobile Phone Viruses**

*P. Wang et al.*

Current mobile phone usage prevents major mobile virus outbreaks, but conditions could arise leading to a phone epidemic.  
10.1126/science.1167053

**Apicomplexan Parasites Co-Opt Host Calpains to Facilitate Their Escape from Infected Cells**

*R. Chandramohanadas et al.*

A host protease helps newly replicated microbial parasites escape from incubator cells.  
10.1126/science.1171085

**Size and Shape of Saturn's Moon Titan**

*H. A. Zebker et al.*

Titan's poles lie at lower elevations than the equator, perhaps explaining its high-latitude hydrocarbon lakes.  
10.1126/science.1168905

**Fabricating Genetically Engineered High-Power Lithium Ion Batteries Using Multiple Virus Genes**

*Y. J. Lee et al.*

A genetically modified virus is used to form an efficient cathodic battery material.  
10.1126/science.1171541

## SCIENCENOW

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

Highlights From Our Daily News Coverage

**The Keen Eyes of a Gamer**

Playing shoot-and-kill video games improves visual acuity.

**For Migrating Birds, Eating = Exercise**

Sandpipers boost their fitness by gorging on omega-3-rich shrimp.

**How Choosing Changes You**

Could deciding on a beach vacation make you less fond of mountains?

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

**EDITORIAL GUIDE: Why We Need Quantitative Dynamic Models**

*R. Iyengar*

Quantitative models provide insight into the mechanisms of cellular behavior and should enable personalized disease intervention.

**RESEARCH ARTICLE: Phosphorylation of Nogo Receptors Suppresses Nogo Signaling, Allowing Neurite Regeneration**

*Y. Takei*

Extracellular phosphorylation of Nogo receptors by casein kinase II blocks agonist binding.

**PERSPECTIVE: Reversing DNA Methylation: New Insights from Neuronal Activity-Induced Gadd45b in Adult Neurogenesis**

*H. Wu and Y. E. Sun*

Gadd45b causes epigenetic modification of promoters for *Bdnf* and *Fgf* genes in postmitotic neurons in response to neuronal activity.

**PERSPECTIVE: Syndecans Shed Their Reputation as Inert Molecules**

*M. D. Bass et al.*

The shedding of the extracellular domain of a transmembrane proteoglycan can be controlled by its cytoplasmic domain.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

**Taken for Granted: The Jackpot's Consequences**

*B. L. Bendorly*

Opinions are mixed about the ultimate impact of the huge federal stimulus on early-career scientists.

**A Quiet Scientist Returns to His Roots**

*E. Pain*

After working in several countries and research fields, Tiago Fleming Outeiro returned home to Portugal and fundamental biology.

**April 2009 Funding News**

*J. Fernández*

Learn about the latest in research funding, scholarships, fellowships, and internships.

## SCIENCE PODCAST

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

Free Weekly Show

Download the 3 April *Science* Podcast to hear about renewal of cardiac muscle cells in the human heart, automating science, the origins of flowering plants, and more.

## ORIGINS BLOG

[blogs.sciencemag.org/origins](http://blogs.sciencemag.org/origins)

A History of Beginnings

## SCIENCE INSIDER

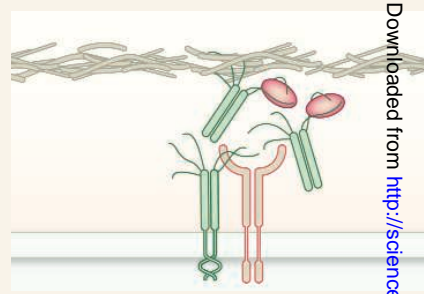
[blogs.sciencemag.org/scienceinsider](http://blogs.sciencemag.org/scienceinsider)

Science Policy News and Analysis



## SCIENCE NOW

Shoot more, see more.



## SCIENCE SIGNALING

Shedding syndecan ectodomains.



## SCIENCE CAREERS

Did science really hit the jackpot?

**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 © 2009 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): \$146 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$835; 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 \$20.00 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

**324 (5923)**

*Science* **324** (5923), 11-113.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/324/5923>

**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.