

## EDITORIAL

- 1059 Science to Bridge the Americas  
*Timothy J. DeVoogd*

## NEWS OF THE WEEK

- 1066 New Network to Track Drugs and Vaccines in Pregnancy
- 1067 Century-Long Debate Over Momentum of Light Resolved?
- 1068 Experts Map the Terrain of Mood Disorders  
Suicide Scale
- 1069 DOE Reworks Student Initiative to Prepare Energy Researchers
- 1069 From the *Science* Policy Blog
- 1070 AAAS Annual Meeting  
Scientists Grapple With 'Completely Out of Hand' Attacks on Climate Science  
The Latest on Geoengineering  
Is a Dolphin a Person?  
More Highlights From AAAS 2010

## NEWS FOCUS

- 1072 Cancer's Circulation Problem  
Keeping Tabs on Tumor DNA  
>> *Science Podcast*
- 1075 Iceball Mars Proving a Tough Place to Find Liquid Water
- 1076 Dog Dealers' Days May Be Numbered

## LETTERS

- 1078 Sowing the Seeds of Soil Conservation  
*H. Lin*  
Spain's Budget Neglects Research  
*X. A. Álvarez et al.*  
The Permanence Debate  
*M. Skutsch and B. H. J. De Jong*  
Life in Science: The Cow Ate My Fieldwork  
*B. L. Madsen*

## BOOKS ET AL.

- 1081 The Immortal Life of Henrietta Lacks  
*R. Skloot, reviewed by L. K. Boerner*
- 1082 Predicting the Unpredictable  
*S. Hough, reviewed by C. H. Scholz*  
>> *Perspective p. 1089;*  
*Reports pp. 1117 and 1119*

## POLICY FORUM

- 1083 Fixing the Legal Framework for Pharmaceutical Research  
*S. M. Knowles*

## PERSPECTIVES

- 1085 Observing Weather from Space  
*S. Q. Kidder and T. H. Vonder Haar*
- 1086 Intelligent Infrastructure for Energy Efficiency  
*N. Gershenfeld et al.*
- 1088 Reliable Noise  
*D. Levens and A. Gupta*  
>> *Report p. 1142*
- 1089 Changing Views of the San Andreas Fault  
*K. Scharer*  
>> *Books p. 1082;*  
*Reports pp. 1117 and 1119*
- 1091 What Makes a Prion Infectious?  
*S. Supattapone*  
>> *Report p. 1132*
- 1092 Seawater Chemistry and Climate  
*H. Elderfield*  
>> *Report p. 1114*
- 1093 Turning Off Inflammation Signaling  
*S. Sriskantharajah and S. C. Ley*  
>> *Report p. 1135*

## SCIENCE PRIZE ESSAY

- 1095 On the Cutting Edge: Teaching Help for Geoscience Faculty  
*C. A. Manduca et al.*

CONTENTS continued >>

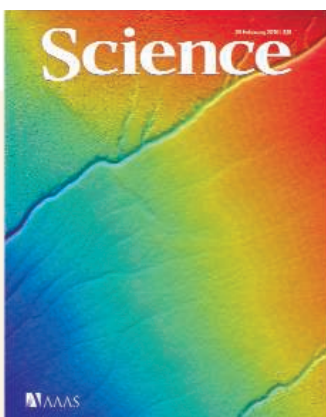


page 1072



pages 1091 & 1132

Downloaded from <http://science.sciencemag.org/> on December 5, 2020



## COVER

High-resolution (0.25 meters per pixel) hillshade map showing the topography of the San Andreas Fault in the Carrizo Plain of California. Two stream channels that bend at the fault have been displaced about 10 meters (lower right) by two earthquakes and 16 meters (upper left) by as many as five earthquakes, including the most recent earthquake in 1857. Blue indicates lower elevations. See pages 1117 and 1119.

*Image: O. Zielke, J. R. Arrowsmith/Arizona State University; L. Grant Ludwig, S. O. Akçiz, G. R. Noriega/University of California, Irvine; topography data gathered by the B4 Project and processed by OpenTopography*

## DEPARTMENTS

- 1055 This Week in *Science*  
1060 Editors' Choice  
1062 *Science* Staff  
1065 Random Samples  
1097 AAAS News & Notes  
1149 New Products  
1150 *Science* Careers

## REVIEW

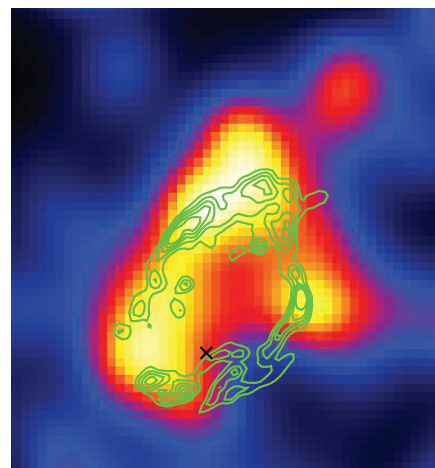
- 1098 Mechanisms Underlying Lineage Commitment and Plasticity of Helper CD4<sup>+</sup> T Cells  
*J. J. O'Shea and W. E. Paul*

## REPORTS

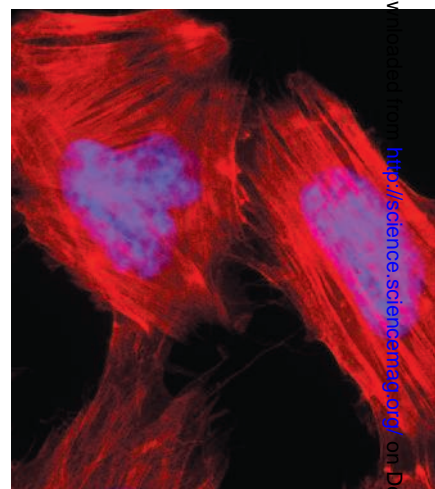
- 1103 Gamma-Ray Emission from the Shell of Supernova Remnant W44 Revealed by the Fermi LAT  
*A. A. Abdo et al.*  
Satellite observations suggest that protons are accelerated in the shell of a supernova remnant.
- 1106 Ferroelectric Control of Spin Polarization  
*V. Garcia et al.*  
Ferroelectric tunnel junctions control the spin polarization of electrons emitted from iron electrodes.
- 1110 Integrated Catalytic Conversion of  $\gamma$ -Valerolactone to Liquid Alkenes for Transportation Fuels  
*J. Q. Bond et al.*  
A biomass-derived compound is transformed into hydrocarbon fuels and a CO<sub>2</sub> stream amenable to sequestration.  
>> *Science Podcast*
- 1114 Reconstructing Past Seawater Mg/Ca and Sr/Ca from Mid-Ocean Ridge Flank Calcium Carbonate Veins  
*R. M. Coggon et al.*  
Calcium carbonate veins from the ocean crust can be used to reconstruct past ocean cation ratios.  
>> *Perspective p. 1092*
- 1117 Climate-Modulated Channel Incision and Rupture History of the San Andreas Fault in the Carrizo Plain  
*L. Grant Ludwig et al.*
- 1119 Slip in the 1857 and Earlier Large Earthquakes Along the Carrizo Plain, San Andreas Fault  
*O. Zielke et al.*  
The historical behavior of the San Andreas Fault may have been dominated by smaller, more frequent slip events.  
>> *Books p. 1082; Perspective p. 1089*

- 1122 Plant Peptides Govern Terminal Differentiation of Bacteria in Symbiosis  
*W. Van de Velde et al.*
- 1126 A Nodule-Specific Protein Secretory Pathway Required for Nitrogen-Fixing Symbiosis  
*D. Wang et al.*  
Products encoded by the leguminous plant *Medicago* direct the differentiation of the bacterial partner in symbiosis.
- 1129 Individuals and the Variation Needed for High Species Diversity in Forest Trees  
*J. S. Clark*  
Within-species variation in response to environmental conditions may explain the coexistence of forest tree species.
- 1132 Generating a Prion with Bacterially Expressed Recombinant Prion Protein  
*F. Wang et al.*  
Recombinant prion protein recapitulates the characteristics of the infectious agent in prion disease.  
>> *Perspective p. 1091*
- 1135 Inhibition of NF- $\kappa$ B Signaling by A20 Through Disruption of Ubiquitin Enzyme Complexes  
*N. Shembade et al.*  
The multifunctional A20 protein can act in diverse ways to limit receptor-induced inflammatory signaling.  
>> *Perspective p. 1093*
- 1139 *Photorhabdus luminescens* Toxins ADP-Ribosylate Actin and RhoA to Force Actin Clustering  
*A. E. Lang et al.*  
A bacterial toxin targets and modifies the actin cytoskeleton in insect larvae.
- 1142 Noise Can Induce Bimodality in Positive Transcriptional Feedback Loops Without Bistability  
*T.-L. To and N. Maheshri*  
Noise induced by multiple binding sites, rather than deterministic bistability, may cause bimodal gene expression in yeast.  
>> *Perspective p. 1088*
- 1145 Cortical Plasticity Induced by Inhibitory Neuron Transplantation  
*D. G. Southwell et al.*  
Plasticity in the mouse brain's visual cortex can be re-induced by neurons embedded by an earlier transplantation.

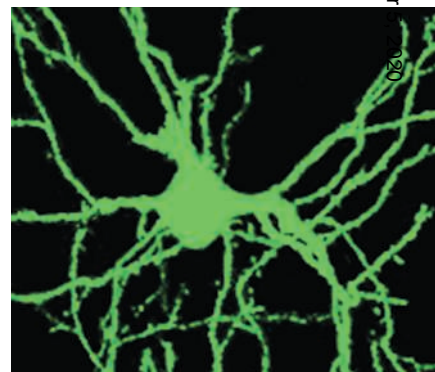
CONTENTS continued &gt;&gt;



page 1103



page 1139



page 1145

## SCIENCEONLINE

## SCIENCEEXPRESS

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

### CKAMP44: A Brain-Specific Protein Attenuating Short-Term Synaptic Plasticity in the Dentate Gyrus

*J. von Engelhardt et al.*

A synaptic protein that regulates postsynaptic AMPA receptor responses has been cloned and functionally characterized.  
10.1126/science.1184178

### $\beta_2$ -Adrenergic Receptor Redistribution in Heart Failure Changes cAMP Compartmentation

*V. O. Nikolaev et al.*

A change in the distribution of a signaling molecule on the surface of heart muscle cells may contribute to heart failure.  
10.1126/science.1185988

### Unicellular Cyanobacterial Distributions Broaden the Oceanic $N_2$ Fixation Domain

*P. H. Moisaner et al.*

Nitrogen fixation in the South Pacific Ocean is partitioned among several microbe species with distinct ecophysiologicals.  
10.1126/science.1185468

### Patterns of Diversity in Marine Phytoplankton

*A. D. Barton et al.*

Highest diversity occurs in physically dynamic mid-latitude zones; lowest diversity and highest biomass occur toward the poles.  
10.1126/science.1184961

### Constraints on the Formation Age of Cometary Material from the NASA Stardust Mission

*J. E. P. Matzel et al.*

Transport of inner solar system material to the Kuiper Belt and incorporation into comets took at least 2 million years.  
10.1126/science.1184741

## SCIENCENOW

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

Highlights From Our Daily News Coverage

### Is a Dolphin a Person?

Dolphin intelligence poses tricky scientific and ethical questions.

### Lack of Sleep Is Contagious

Sleep-deprived teens tend to have sleep-deprived friends and friends who use drugs.

### The Mathematics of Clumpy Crime

Models may help police break up criminal hot spots.

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

### RESEARCH ARTICLE: Apoptotic Cells Activate the "Phoenix Rising" Pathway to Promote Wound Healing and Tissue Regeneration

*F. Li et al.*

## PODCAST

*C.-Y. Li and A. M. VanHook*

Caspases in dying cells trigger the release of growth signals that promote tissue repair.

### RESEARCH ARTICLE: DNA-PKcs Controls an Endosomal Signaling Pathway for a Proinflammatory Response by Natural Killer Cells

*S. Rajagopalan et al.*

Akt and DNA-dependent protein kinase are required for the activation of NF- $\kappa$ B by an endosomal receptor.

### PERSPECTIVE: A New Role for RPTP $\sigma$ in Spinal Cord Injury—Signaling Chondroitin Sulfate Proteoglycan Inhibition

*Y. Duan and R. J. Giger*

RPTP $\sigma$  mediates the inhibitory effects of chondroitin sulfate proteoglycans on axonal growth.

### PERSPECTIVE: ER Stress in Pancreatic $\beta$ Cells—The Thin Red Line Between Adaptation and Failure

*D. L. Eizirik and M. Cnop*

The response of IRE1 $\alpha$  to metabolic ER stress is modulated by its interaction with RACK1.

## FUNDING SOURCES

Find grants and funding opportunities for research and training in cell signaling.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

### Preparing for a Career in Venture Capital

*E. Pain*

Laia Crespo accumulated academic and business credentials to build a career in investment management.

### For Physician-Scientist Couple, Success Is in Balance

*K. Travis*

Deepali Kumar and Atul Humar say their shared specialty helps them balance work and family life.

### Science Careers Blog

*Science Careers Staff*

Get frequent updates including advice, opinion, news, funding opportunities, and links to other online resources.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

### RESEARCH ARTICLE: Development of Personalized Tumor Biomarkers Using Massively Parallel Sequencing

*R. J. Leary et al.*

### PERSPECTIVE: Cancer Sequencing Gets a Little More Personal

*L. Prokunina-Olsson and S. J. Chanock*

Technology to detect personal genetic aberrations in cancer cells moves closer to the clinic.

### RESEARCH ARTICLE: Adipocyte-Derived Factors Potentiate Nutrient-Induced Production of Plasminogen Activator Inhibitor-1 by Macrophages

*P. Kishore et al.*

### PERSPECTIVE: Adipose Tissue Macrophages—A Piece of the PAI of Metabolic Syndrome

*C. N. Lumeng*

Macrophages within fat tissue release a hormone that contributes to atherosclerosis and insulin resistance.

## SCIENCE PODCAST

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

Free Weekly Show

Download the 26 February *Science* Podcast to hear about tracking circulating tumor cells, converting a biomass-derived compound into hydrocarbon fuel, your letters to *Science*, and more.

## SCIENCE INSIDER

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

Science Policy News and Analysis

**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 © 2010 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): \$910; 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

**327 (5969)**

*Science* **327** (5969), 1055-1149.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/327/5969>

**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 © 2010 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.