

EDITORIAL

- 393 Improving Access to Research
Paul N. Courant et al.

NEWS OF THE WEEK

- 398 Foreshadowing Haiti's Catastrophe
- 399 Models Foresee More-Intense Hurricanes in the Greenhouse
>> Report p. 454
- 400 African Physicists Set Their Sights on Mammoth Scope
- 401 Killing of Professor Sparks Fight Over His Science and His Politics
- 401 From *Science's* Online Daily News Site
- 402 Google Plots Exit Strategy As China Shores Up 'Great Firewall'
- 402 Under Fire From Pharma, Institute May Lose Its Director
- 403 From the *Science* Policy Blog

NEWS FOCUS

- 404 The Tangled Roots of Agriculture
>> Science Podcast
- 407 Trends Document China's Prowess
- 408 Fall Meeting of the American Geophysical Union
Flows on Mars But No Water
Magnetics Point to Magma 'Ocean' at Io
Antarctic Glacier Off Its Leash
Snapshots from the Meeting

LETTERS

- 410 Studying Extant Species to Model Our Past
A. Whiten et al.
Response
C. O. Lovejoy et al.
Carbon Accounting a Tricky Business
A. J. Friedland and K. T. Gillingham
East German Institutes Stand Tall
E. Th. Rietschel

BOOKS ET AL.

- 413 Questioning Collapse
P. A. McAnany and N. Yoffee, Eds.,
reviewed by K. Lewis
- 414 Pink Brain, Blue Brain
L. Eliot, reviewed by A. S. Henderson

POLICY FORUM

- 415 Accessible Reproducible Research
J. P. Mesirov

PERSPECTIVES

- 417 Subversion from the Sidelines
N. Argarwal and W. R. Bishai
>> Report p. 466
- 418 Drylands in the Earth System
D. S. Schimel
>> Report p. 451
- 419 Amoeba-Inspired Network Design
W. Marwan
>> Report p. 439
- 420 And Then There Were None?
R. G. Roberts and B. W. Brook
- 422 Adjusting the Solar System's Absolute Clock
J. N. Connelly
>> Report p. 449
- 423 Epitaxial Growth Writ Large
T. L. Einstein and T. J. Stasevich
>> Report p. 445

RESEARCH ARTICLE

- 425 The Genetic Landscape of a Cell
M. Costanzo et al.
A genome-wide interaction map of yeast identifies genetic interactions, networks, and function.

CONTENTS continued >>



page 404



page 414



COVER

Hurricane Ike caused extensive damage throughout the Caribbean and Gulf of Mexico regions in September 2008, as shown here at Pinar del Rio in western Cuba. A state-of-the-art computer model projects that global warming should cause an increase in the frequency of the most intense western Atlantic hurricanes, like Ike, during the 21st century. See page 454.

Photo: Claudia Daut/Reuters/Landov

DEPARTMENTS

- 391 This Week in *Science*
- 394 Editors' Choice
- 396 *Science* Staff
- 397 Random Samples
- 478 New Products
- 479 *Science* Careers

REPORTS

- 432 **Formation of Iapetus' Extreme Albedo Dichotomy by Exogenically Triggered Thermal Ice Migration**
J. R. Spencer and T. Denk
- 435 **Iapetus: Unique Surface Properties and a Global Color Dichotomy from Cassini Imaging**
T. Denk et al.
Thermal migration of water ice explains the observed color asymmetry of Saturn's unusual moon, Iapetus.
- 439 **Rules for Biologically Inspired Adaptive Network Design**
A. Tero et al.
Human municipal transportation engineers might learn design strategies from the lowly slime mold.
>> *Perspective p. 419*
- 442 **Measurement of Universal Thermodynamic Functions for a Unitary Fermi Gas**
M. Horikoshi et al.
Cold Fermi gases are used to study resonant fermion-fermion interactions.
- 445 **Direct Measurements of Island Growth and Step-Edge Barriers in Colloidal Epitaxy**
R. Ganapathy et al.
Multilayer film deposition and the templating of colloidal particles exhibit growth kinetics analogous to epitaxial growth.
>> *Perspective p. 423*
- 449 **$^{238}\text{U}/^{235}\text{U}$ Variations in Meteorites: Extant ^{247}Cm and Implications for Pb-Pb Dating**
G. A. Brennecka et al.
Variable abundances of meteorite isotopes may require correcting the lead-based age of the solar system by 5 million years.
>> *Perspective p. 422*
- 451 **Contribution of Semi-Arid Forests to the Climate System**
E. Rotenberg and D. Yakir
Semi-arid forests could cool climate by sequestering CO_2 , but could also warm it by reducing Earth's albedo.
>> *Perspective p. 418*
- 454 **Modeled Impact of Anthropogenic Warming on the Frequency of Intense Atlantic Hurricanes**
M. A. Bender et al.
Global warming may increase the frequency of intense hurricanes in the western Atlantic region during the 21st century.
>> *News story p. 399; Science Podcast*
- 459 **Requirement of Prorenin Receptor and Vacuolar H^+ -ATPase-Mediated Acidification for Wnt Signaling**
C.-M. Cruciat et al.
A dual-function protein acts as an adaptor in a major developmental signaling pathway.
- 463 **Identification of RACK1 and Protein Kinase $\text{C}\alpha$ as Integral Components of the Mammalian Circadian Clock**
M. S. Robles et al.
Rhythmic activation of signaling occurs by core components of the biological clock mechanism.
- 466 **Tuberculous Granuloma Induction via Interaction of a Bacterial Secreted Protein with Host Epithelium**
H. E. Volkman et al.
Epithelial cells play a role in tubercular granuloma formation and mycobacterial virulence.
>> *Perspective p. 417*
- 469 **Evolution of MRSA During Hospital Transmission and Intercontinental Spread**
S. R. Harris et al.
By tracing the microevolution of a pathogen, high-throughput genomics reveals person-to-person transmission events.
- 474 **Impact of Spikelets on Hippocampal CA1 Pyramidal Cell Activity During Spatial Exploration**
J. Epsztein et al.
Bursts of small voltage spikes coordinate neuron firing in the brain during spatial exploration.

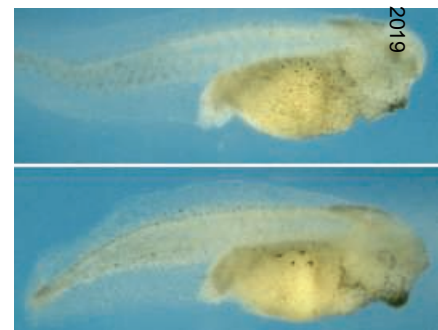
CONTENTS continued >>



page 415



pages 432 & 435



page 459

SCIENCEONLINE

SCIENCEEXPRESS

www.sciencexpress.org

**Repulsion of Superinfecting Virions:
A Mechanism for Rapid Virus Spread**
V. Doceul et al.

Early in infection, vaccinia virus exploits the actin cytoskeleton to promote rapid cell-to-cell spread.
10.1126/science.1183173
>> *Science Podcast*

**The *Lmo2* Oncogene Initiates Leukemia
in Mice by Inducing Thymocyte Self-Renewal**
M. P. McCormack et al.

Expression of an oncogene confers self-renewal activity to committed T cells in the thymus long before disease onset.
10.1126/science.1182378

**Climate-Modulated Channel Incision and
Rupture History of the San Andreas Fault
in the Carrizo Plain**

L. Grant Ludwig et al.
10.1126/science.1182837

**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.
10.1126/science.1182781

SCIENCE NOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Fish May Not Have Evolved Gills to Breathe

New study suggests a surprising reason for adaptation.

Radiocarbon Daters Tune Up Their Time Machine

Researchers can now peer back 50,000 years with accuracy.

**Hang Christiaan Huygens! Here's a Better
Suspension Bridge**

They may be pretty, but simple swooping bridge cables are not the best design.

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

**EDITORIAL GUIDE: Focus Issue—External and
Internal Regulators of Immune Responses**

J. F. Foley and N. R. Gough

Host defense mechanisms are modulated by host-derived and pathogen-derived factors.

**RESEARCH ARTICLE: Distinct Signal Codes
Generate Dendritic Cell Functional Plasticity**
K. Arima et al.

The cytokine TSLP triggers distinct signals in dendritic cells that program a T helper 2 (T_H2)-type response.

**RESEARCH ARTICLE: Attenuation of Rabies
Virulence—Takeover by the Cytoplasmic
Domain of Its Envelope Protein**

C. Prêhaud et al.

Survival of rabies virus-infected neurons depends on a single amino acid in the PDZ-binding site of a viral protein.

**PERSPECTIVE: TAK-ling IKK Activation—
"Ub" the Judge**

S. M. Wuerzberger-Davis and S. Miyamoto

IL-1 β -dependent activation of NF- κ B occurs in two distinct stages.

**REVIEW: What Is the Function of the Dendritic
Cell Side of the Immunological Synapse?**

J. L. Rodriguez-Fernández et al.

The immunological synapse organizes signaling responses in dendritic cells, as well as in T cells.

**CONNECTIONS MAP OVERVIEW: Interleukin-1
(IL-1) Pathway**

A. Weber et al.

IL-1 α and IL-1 β orchestrate the proinflammatory response by multiple tightly controlled mechanisms.

**CONNECTIONS MAP OVERVIEW: Interleukin-1 β
(IL-1 β) Processing Pathway**

A. Weber et al.

The NALP3 inflammasome pathway controls processing and release of interleukin-1 β .

SCIENCE CAREERS

www.sciencecareers.org/career_magazine

Free Career Resources for Scientists

**SPECIAL QUANTITATIVE BIOMEDICINE ISSUE
Quantitative Biomedical Careers**

S. Gaidos

Physicists and mathematicians are finding new ways to apply quantitative skills to biomedical sciences.

**Informatics Careers Take Shape in
Translational and Clinical Research**

B. Vastag

Electronic patient data and research repositories mean new opportunities in medical informatics.

Statistics Serving Biomedicine

E. Pain

Spanish statistician David Rossell supports other biomedical scientists while pursuing his own research.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

**PERSPECTIVE: Optimizing the Delivery
of Cancer Drugs that Block Angiogenesis**

Y. Cao and R. Langer

Optimizing antiangiogenic therapy requires the development of new drug delivery systems.

**COMMENTARY: Meeting the Governance Challenges
of Next-Generation Biorepository Research**

S. M. Fullerton et al.

Requisites for biorepository governance need to keep pace with developments in translational science.

**RESEARCH ARTICLE: Vaccines with MF59 Adjuvant
Expand the Antibody Repertoire to Target Protective
Sites of Pandemic H5N1 Influenza Virus**

S. Khurana et al.

An oil-based adjuvant improves the efficacy of an H1N1 vaccine.

**RESEARCH ARTICLE: Identification of a Class of
HCV Inhibitors Directed Against the Nonstructural
Protein NS4B**

N.-J. Cho et al.

A newly discovered activity in hepatitis C virus gives rise to a distinct class of antiviral compounds.

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast
Free Weekly Show

Download the 22 January *Science* Podcast to hear about the impact of global warming on Atlantic hurricanes, a mechanism for rapid virus spread, the ancient Natufians, and more.

SCIENCE INSIDER

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 (5964)

Science **327** (5964), 391-478.

ARTICLE TOOLS

<http://science.sciencemag.org/content/327/5964>

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.