

EDITORIAL

- 1319 Redefining Cancer Research
Bruce Alberts

NEWS OF THE WEEK

- 1324 VA Pulls the Plug on Disputed Study of Gulf War Illness
- 1325 Firefighters ‘Worked Like Demons’ to Save Observatory
- 1327 Tests Show Moon Not Quite as Strange as Some Physicists Had Hoped
- 1327 From *Science’s* Online Daily News Site
- 1328 A Race Against Time to Vaccinate Against Novel H1N1 Virus
- 1329 Clothes Make the (Hu) Man
- 1329 From the *Science* Policy Blog

NEWS FOCUS

- 1330 How Beach Life Favors Blond Mice
Melding Mammals and Molecules to Track Evolution
>> *Science Podcast*
- 1335 Science Lags on Saving the Arctic From Oil Spills
- 1336 As China’s Rare Earth R&D Becomes Ever More Rarefied, Others Tremble

LETTERS

- 1338 User Feedback Shapes Internet Progress
S. Guo
Introductory Biology: Let’s Train Lecturers
F. Heppner
Introductory Biology: Top-Down Teaching
V. LoPresti
Purposeful Learning with Drug Repurposing
J. H. Toney et al.
Taking Educational Research to School
M. S. Seidenberg
United States Acting to Conserve Tuna Stocks
D. A. Balton

- 1341 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

- 1342 Ecosystem-Based Management for the Oceans
K. McLeod and H. Leslie, Eds., reviewed by K. M. A. Chan et al.
- 1343 Crossing the Finish Line
W. G. Bowen et al., reviewed by R. C. Atkinson and S. Geiser
- 1344 Browsings

POLICY FORUM

- 1345 Looming Global-Scale Failures and Missing Institutions
B. Walker et al.

PERSPECTIVES

- 1347 Cosmology at a Crossroads
C. L. Bennett
- 1348 The Thermodynamics of Quantum Critical Points
Z. Fisk
>> *Research Article p. 1360*
- 1349 Low-Cost Travel in Neurons
P. J. Magistretti
>> *Report p. 1405*
- 1351 The Molecular Basis of Nacre Formation
N. Kröger
>> *Report p. 1388*
- 1352 MITES—The Ultimate Parasites
J. González and D. Petrov
>> *Report p. 1391*
- 1353 Went Fishing, Caught a Snake
D. Meijer
>> *Report p. 1402*

REVIEW

- 1355 Ecological Dynamics Across the Arctic Associated with Recent Climate Change
E. Post et al.

CONTENTS continued >>



page 1330



page 1344

Downloaded from <http://science.sciencemag.org/> on November 15, 2018



COVER

Wind turbines near the Great Wall in Shanxi, China. The Chinese government has aggressively fostered wind power development and tripled its target for the year 2020 to 100 gigawatts of installed capacity. Combining assimilated meteorology with current turbine technologies and concession policies, McElroy *et al.* (page 1378) report on the total wind power potential of China and its prospects for reducing China’s CO₂ emissions.

Photo: Haiying Chen

DEPARTMENTS

- 1315 This Week in *Science*
- 1320 Editors’ Choice
- 1322 *Science* Staff
- 1323 Random Samples
- 1409 New Products
- 1410 *Science* Careers

BREVIA

- 1359** 30,000-Year-Old Wild Flax Fibers
E. Kavadze et al.
Dyed flax fibers from 30,000 years ago show that humans in the Caucasus were making colored twine at that time.

RESEARCH ARTICLE

- 1360** Entropy Landscape of Phase Formation Associated with Quantum Criticality in $\text{Sr}_3\text{Ru}_2\text{O}_7$
A. W. Rost et al.
The thermodynamic properties of strongly correlated electron systems can be probed near their quantum critical point.
>> *Perspective p. 1348*

REPORTS

- 1364** Laser Tunnel Ionization from Multiple Orbitals in HCl
H. Akagi et al.
Ion imaging shows that electrons can tunnel out of states below the highest occupied orbital of a molecule.
- 1367** Extremely Efficient Multiple Electron-Hole Pair Generation in Carbon Nanotube Photodiodes
N. M. Gabor et al.
The decay of photoexcited electrons in a carbon nanotube device creates multiple pairs of charge carriers.
- 1371** Underplating in the Himalaya-Tibet Collision Zone Revealed by the Hi-CLIMB Experiment
J. Nábělek et al.
A seismic study delineates the position and local thickening of the Indian plate underlying the Himalayas and southern Tibet.
- 1374** Dynamic Processes Governing Lower-Tropospheric HDO/H₂O Ratios as Observed from Space and Ground
C. Frankenberg et al.
Tropospheric distributions of light and heavy water reveal previously unrecognized features of atmospheric circulation.
- 1378** Potential for Wind-Generated Electricity in China
M. B. McElroy et al.
Wind power could accommodate the electricity demand projected for China in 2030, which is about twice the current level of consumption.
- 1380** Endogenous Nitric Oxide Protects Bacteria Against a Wide Spectrum of Antibiotics
I. Gusarov et al.
Bacteria deploy nitric oxide synthases to counter oxidative stress from natural toxins and antibiotic drugs.

- 1384** A Dimeric Structure for Archaeal Box C/D Small Ribonucleoproteins
F. Bleichert et al.
Electron microscopy and single-particle analysis show that a small nuclear ribonucleoprotein forms a dimeric structure.
- 1388** An Acidic Matrix Protein, Pif, Is a Key Macromolecule for Nacre Formation
M. Suzuki et al.
A matrix protein is identified that regulates nacre formation in the Japanese pearl oyster.
>> *Perspective p. 1351*
- 1391** Tuned for Transposition: Molecular Determinants Underlying the Hyperactivity of a *Stowaway* MITE
G. Yang et al.
A transposable element in rice enhances its own transposition using another unrelated element's transposase.
>> *Perspective p. 1352*
- 1394** The RNA-Binding Protein NANOS2 Is Required to Maintain Murine Spermatogonial Stem Cells
A. Sada et al.
Cell lineage tracing reveals the factor that preserves stem cells in the undifferentiated state in the mouse male germ line.
- 1398** Activation of Rho GTPases by DOCK Exchange Factors Is Mediated by a Nucleotide Sensor
J. Yang et al.
Crystal structures reveal the mechanism of a nucleotide exchange factor regulating cytoskeleton and cell signaling networks.
- 1402** A G Protein-Coupled Receptor Is Essential for Schwann Cells to Initiate Myelination
K. R. Monk et al.
A G protein-coupled receptor family member elevates cyclic adenosine monophosphate in Schwann cells to trigger myelination in zebrafish.
>> *Perspective p. 1353*
- 1405** Energy-Efficient Action Potentials in Hippocampal Mossy Fibers
H. Alle et al.
Mammalian neurons have developed highly efficient ways to limit energy consumption while propagating neuronal information.
>> *Perspective p. 1349*

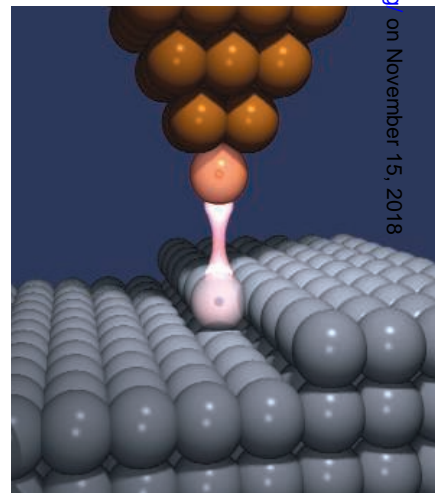
CONTENTS continued >>



pages 1349 & 1405



page 1355



page 1364

SCIENCEONLINE

SCIENCEEXPRESS

www.sciencexpress.org

The Transmissibility and Control of Pandemic Influenza A (H1N1) Virus

Y. Yang et al.

A detailed picture of the pandemic potential of swine-origin influenza offers guidance for effective mitigation strategies.

10.1126/science.1177373

>> [Science Podcast](#)

Using Neural Measures of Economic Value to Solve the Public Goods Free-Rider Problem

I. Krajbich et al.

Neuroimaging measures of individuals' valuation of public goods suggests a path to a coherent public goods economy.

10.1126/science.1177302

RNAi in Budding Yeast

I. A. Drinnenberg et al.

Although the *Saccharomyces cerevisiae* lineage has lost RNA interference, the pathway can be restored by adding genes from *S. castellii*.

10.1126/science.1176945

Reconstruction of Molecular Orbital Densities from Photoemission Data

P. Puschnig et al.

Maps of photoelectron momentum can reveal the orbital geometries of aromatic molecules adsorbed on surfaces.

10.1126/science.1176105

Repetitive Readout of a Single Electronic Spin via Quantum Logic with Nuclear Spin Ancillae

L. Jiang et al.

Controlled interactions with nearby nuclear spins help improve the quantum memory of a nitrogen vacancy in diamond.

10.1126/science.1176496

SCIENCENOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Evolution's Little Helper: Copied Genes

Duplicated genes may make much of life's diversity possible.

Pigeon Wings Sound the Alarm

Special feathers create warning noises when startled birds take off.

Puzzling Mosquito May Complicate Malaria Control

A newly identified insect looks just like a malaria carrier but may not harbor disease.

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

RESEARCH ARTICLE: Rapid Evolution of Functional Complexity in a Domain Family

A. Ernst et al.

Synthetic PDZ domain variants with random mutations reveal the remarkable robustness of this domain for ligand recognition.

RESEARCH ARTICLE: Proteomic Analysis of Integrin-Associated Complexes Identifies RCC2 as a Dual Regulator of Rac1 and Arf6

J. D. Humphries et al.

Regulator of chromosome condensation 2 is a component of fibronectin-activated signaling pathways that regulate cell migration.

RESEARCH ARTICLE: The Tyrosine Kinase Fer Is a Downstream Target of the PLD-PA Pathway That Regulates Cell Migration

T. Itoh et al.

Changes in membrane composition stimulate Fer activity to regulate actin remodeling and drive cell migration.

REVIEW: Oncogenic EGFR Signaling Networks in Glioma

P. H. Huang et al.

EGFR and downstream signaling networks contribute to the hallmark characteristics of glioma.

PODCAST

S. S. Sidhu and A. M. VanHook

Synthetic PDZ domain variants reveal how this domain can evolve to produce proteins with different binding specificities.

SCIENCE CAREERS

www.sciencereaders.org/career_magazine

Free Career Resources for Scientists

Audacity, Part 1

A. Sasso

What do paradigm-shifting scientists have in common?

A Physician-Researcher Thrives in the Balance

C. Wald

Regan Theiler balances clinical work with lab research on infectious diseases.

Science Careers Blog

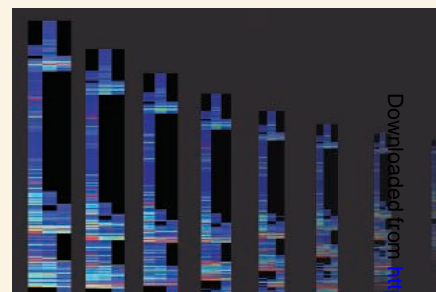
Science Careers Staff

Get frequent updates including advice, news, funding, and links to career resources.



SCIENCE NOW

Copied gene, fewer scales.



SCIENCE SIGNALING

Heat maps of integrin proteomes.

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

Download the 11 September *Science* Podcast to hear about the the transmissibility of swine-origin influenza, the genetic complexity underlying beach mouse adaptation, and more.

ORIGINS BLOG

blogs.sciencemag.org/origins

A History of Beginnings

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 © 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

325 (5946)

Science **325** (5946), 1315-1409.

ARTICLE TOOLS

<http://science.sciencemag.org/content/325/5946>

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.