

EDITORIAL

- 647 Tackling Human Fungal Infections
Gordon D. Brown et al.
>> *Science Podcast*

NEWS OF THE WEEK

- 654 A roundup of the week's top stories

NEWS & ANALYSIS

- 658 Europe Picks Jupiter Probe; Runners-Up Vow to Press On
- 659 Death of California Researcher Spurs Investigation
- 660 Venus's Rare Sun Crossing May Aid Search for Exoplanets
- 661 Reprise of First Experiment Casts Doubt on Supersolid Helium

NEWS FOCUS

- 662 Primeval Land Rises From the Ashes
>> *Science Podcast*
- 664 Researchers Set Course to Blockade Ballast Invaders
A Foul Problem
- 666 With Novel Paint, Chemist Aims to Vanquish the *Vinchuca*

LETTERS

- 668 Conservation Concerns in the Deep
A. C. Hartmann and L. A. Levin
- Presumed Guilt in the Anthrax Case
J. Guillemin
- Response
D. A. Relman
- 668 NextGenVOICES
- 670 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

- 671 How We Remember
M. E. Hasselmo, reviewed by L. L. Colgin
- 672 Harvest the Wind
P. Warburg, reviewed by D. Reicher

POLICY FORUM

- 673 ELSI 2.0 for Genomics and Society
J. Kaye et al.

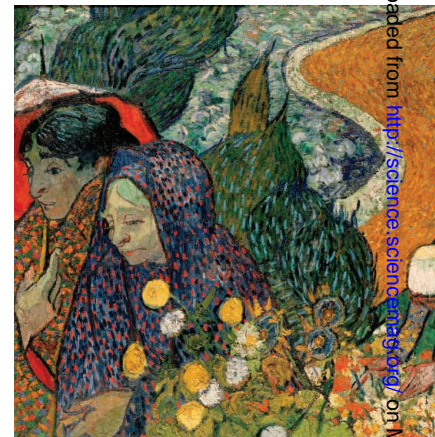
PERSPECTIVES

- 675 FGF21 Takes a Fat Bite
C. Cantó and J. Auwerx
- 676 Understanding Earthquakes
P. Segall
>> *Report p. 707*
- 678 PARP-1 Activation—Bringing the Pieces Together
J.-P. Gagné et al.
>> *Report p. 728*
- 679 Intertwining Electron Tunneling with Light
M. H. Szymańska
>> *Report p. 704*
- 681 RNA Plays Meiotic Matchmaker
A. F. Dernburg
>> *Report p. 732*
- 682 The Ice Age Carbon Puzzle
E. Brook
>> *Report p. 711*

CONTENTS continued >>



page 662



page 671

Downloaded from <https://science.sciencemag.org/> on March 1, 2021



COVER

Enhanced-color view of the “Snowman” craters (Marcia, Calpurnia, and Minucia) on the asteroid Vesta generated by combining imaging and topography data from NASA’s Dawn spacecraft. The 60-kilometer-wide Marcia crater (at bottom) is one of the youngest large craters on Vesta with a small central peak, as well as light and dark streaks on its walls. See the series of six Reports beginning on page 684.

Image generated using Dawn Framing Camera images: Lucille Le Corre (MPS), David O’Brien (PSI), Vishnu Reddy (MPS/UND); PI of Dawn mission: Christopher T. Russell (UCLA); Dawn Framing Camera leader: Andreas Nathues (MPS), significant contributions from Ralf Jaumann (DLR)

DEPARTMENTS

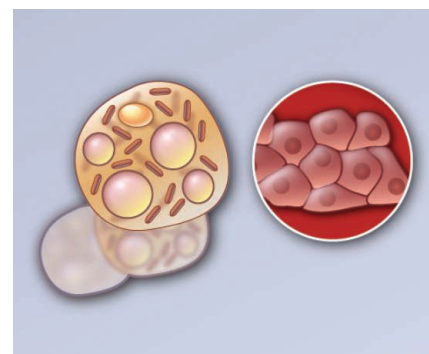
- 643 This Week in *Science*
- 649 Editors’ Choice
- 652 *Science* Staff
- 751 New Products
- 752 *Science* Careers

REPORTS

- 684 Dawn at Vesta: Testing the Protoplanetary Paradigm
C. T. Russell et al.
>> *Science Podcast*
- 687 Vesta's Shape and Morphology
R. Jaumann et al.
- 690 The Violent Collisional History of Asteroid Vesta
S. Marchi et al.
- 694 The Geologically Recent Giant Impact Basins at Vesta's South Pole
P. Schenk et al.
- 697 Spectroscopic Characterization of Mineralogy and Its Diversity Across Vesta
M. C. De Sanctis et al.
- 700 Color and Albedo Heterogeneity of Vesta from Dawn
V. Reddy et al.
Spacecraft data provide a detailed characterization of the second most massive asteroid in the solar system.
- 704 Coupling Quantum Tunneling with Cavity Photons
P. Cristofolini et al.
Optical coupling is used to control the tunneling of electrons between a pair of quantum wells.
>> *Perspective p. 679*
- 707 Under the Hood of the Earthquake Machine: Toward Predictive Modeling of the Seismic Cycle
S. Barbot et al.
Computational models predict the long-term recurrence of earthquakes along a segment of the San Andreas Fault.
>> *Perspective p. 676*
- 711 Carbon Isotope Constraints on the Deglacial CO₂ 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.
>> *Perspective p. 682*
- 714 Ancient Maya Astronomical Tables from Xultun, Guatemala
W. A. Saturno et al.
Wall paintings in a Mayan temple dating to the 9th century C.E. show calculations of Moon and, perhaps, planetary motion.
>> *Science Podcast*

- 717 A Stem Cell–Based Approach to Cartilage Repair
K. Johnson et al.
A chemical screen using mesenchymal stem cells identifies a small molecule, kartogenin, that can promote chondrogenesis.
- 721 Differential Diffusivity of Nodal and Lefty Underlies a Reaction-Diffusion Patterning System
P. Müller et al.
The inhibitor Lefty diffuses more widely than the activator Nodal.
- 724 Mechanical Control of Morphogenesis by Fat/Dachsous/Four-Jointed Planar Cell Polarity Pathway
F. Bosveld et al.
Polarized proto-cadherin and myosin induce an anisotropic tension at cell junctions and thereby shape epithelial tissue.
- 728 Structural Basis for DNA Damage–Dependent Poly(ADP-ribosyl)ation by Human PARP-1
M.-F. Langelier et al.
An enzyme that binds to damaged DNA undergoes a structural reorganization that enhances its catalytic activity.
>> *Perspective p. 678*
- 732 Meiosis-Specific Noncoding RNA Mediates Robust Pairing of Homologous Chromosomes in Meiosis
D.-Q. Ding et al.
An RNA transcript helps to bring together homologous chromosomes during cell division.
>> *Perspective p. 681*
- 736 Epigenomic Enhancer Profiling Defines a Signature of Colon Cancer
B. Akhtar-Zaidi et al.
Methylation tags at long-distance gene regulatory elements provide a signature specific to cancer cells.
- 740 Recent Explosive Human Population Growth Has Resulted in an Excess of Rare Genetic Variants
A. Keinan and A. G. Clark
Genetic models that incorporate recent human population growth can better identify mutations in large samples.
- 744 Transcription-Independent Function of Polycomb Group Protein PSC in Cell Cycle Control
A. Mohd-Sarip et al.
A Polycomb group protein regulates the cell cycle by promoting cyclin B ubiquitylation and degradation.

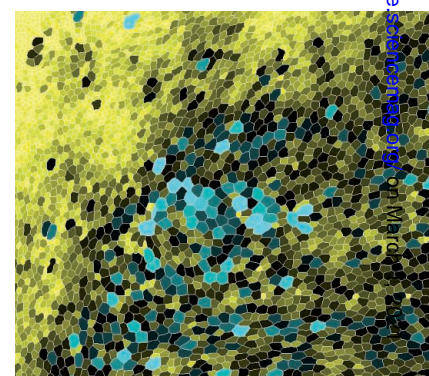
CONTENTS continued >>



page 675



page 714



page 724

SCIENCEONLINE

SCIENCEEXPRESS

www.scienceexpress.org

A Rogue Earthquake Off Sumatra

J. J. McGuire and G. C. Beroza

10.1126/science.1223983

The Heliosphere's Interstellar Interaction: No Bow Shock

D. J. McComas et al.

Observations from the Interstellar Boundary Explorer are not consistent with a bow shock ahead of the heliosphere.

10.1126/science.1221054

The Detection and Characterization of a Nontransiting Planet by Transit Timing Variations

D. Nesvorný et al.

Analysis of the deviations in the orbit of a transiting exoplanet revealed an outer planet in the same planetary system.

10.1126/science.1221141

Evidence of Things Not Seen

N. W. Murray

10.1126/science.1222590

Regulated Virulence Controls the Ability of a Pathogen to Compete with the Gut Microbiota

N. Kamada et al.

Virulence genes and nutritional requirements determine the course of a gastroenteric bacterial infection in mice.

10.1126/science.1222195

Virulence or Competition?

V. Sperandio

10.1126/science.1223303

Secreted Kinase Phosphorylates Extracellular Proteins That Regulate Biom mineralization

V. S. Tagliabracci et al.

The elusive enzyme that modifies proteins involved in building bone and teeth has now been identified.

10.1126/science.1217817

Vitamin K₂ Is a Mitochondrial Electron Carrier That Rescues Pink1 Deficiency

M. Vos et al.

Adding vitamin K rescues fruit flies bearing a mutation in a Parkinson's disease gene homolog.

10.1126/science.1218632

SCIENCE NOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Dogs Feel Your Pain

Canines yawn when they hear people yawn, suggesting cross-species empathy.

http://scim.ag/Dogs_Pain

Infants' Flexible Heads Stretch Back Millions of Years

'Soft skulls' were present in human ancestors.

<http://scim.ag/Flexible-Heads>

The Great Outdoors Is Good for Allergies

Teens living in more rural environments harbor more anti-inflammatory microbes on their skin.

http://scim.ag/Outdoors_Allergies

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

8 May issue: <http://scim.ag/ss050812>

EDITORIAL GUIDE: Focus Issue—

Series on Structural Biology

W. Wong

Research and commentary highlight the use of structural analysis to understand signaling molecules and events.

RESEARCH ARTICLE: An ATP-Site On-Off Switch That Restricts Phosphatase Accessibility of Akt

K. Lin et al.

PERSPECTIVE: Uncaging Akt

S. J. Humphrey and D. E. James

ATP and ADP regulate a conformational switch that determines the kinase activity of Akt.

RESEARCH ARTICLE: Syndecan 4 Regulates FGFR1 Signaling in Endothelial Cells by Directing Macropinocytosis

A. Elfenbein et al.

The FGF2 co-receptor syndecan 4 shapes endothelial signaling initiated by a fibroblast growth factor receptor.

PODCAST

M. T. Nelson and A. M. VanHook

Maximal blood vessel dilation can be induced by calcium influx through a just few channel molecules in vascular endothelial cells.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

9 May issue: <http://scim.ag/stm050912>

RESEARCH ARTICLE: Mixed Chimerism and Growth Factors Augment β Cell Regeneration and Reverse Late-Stage Type 1 Diabetes

M. Wang et al.

FOCUS: Three Strikes and You're Cured

A. S. Chong and G. I. Bell

Glucose tolerance can be restored in a mouse model of type 1 diabetes.

RESEARCH ARTICLE: The Predictive Capacity of Personal Genome Sequencing

N. J. Roberts et al.

FOCUS: What's a Genome Worth?

I. S. Kohane and J. Shendure

Analysis of data from monozygotic twins assesses how well whole-genome sequencing can predict disease risk in the general population.

RESEARCH ARTICLE: Survivin Is a Therapeutic Target in Merkel Cell Carcinoma

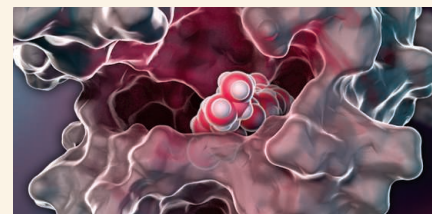
R. Arora et al.

A targeted therapy for a virus-induced cancer involves blockade of the cellular oncoprotein survivin.

RESEARCH ARTICLE: Extended Survival of Glioblastoma Patients After Chemoprotective HSC Gene Therapy

J. E. Adair et al.

Gene therapy using P140K-modified hematopoietic progenitor cells is chemoprotective, enabling glioblastoma patients to withstand myelotoxic doses of chemotherapy.



SCIENCE SIGNALING
Kinase and inhibitor.

SCIENCE CAREERS

www.sciencecareers.org/career_magazine

Free Career Resources for Scientists

Career Q&A: A Career Without Credentials

E. Pain

Paleontologist Jack Horner overcame dyslexia and the lack of a traditional education to become a world leader in his field.

http://scim.ag/QA_JackHorner

Submitting Your Best Possible R01 Application

S. Webb

At a meeting on Long Island, some neuroscientists got tips on how to win an R01 in lean times.

<http://scim.ag/BestR01>

Perspective: Real Data on Career Preferences

J. Austin

When it comes to careers, graduate students in the sciences are flexible, a new study shows.

<http://scim.ag/PreferencesData>

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

On the 11 May *Science* Podcast: Mayan astronomical tables from the 9th century, cosmic insights from Vesta, a fossilized forest in China, and more.

SCIENCE INSIDER

news.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 © 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

336 (6082)

Science **336** (6082), 643-751.

ARTICLE TOOLS

<http://science.sciencemag.org/content/336/6082>

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.