



COVER

Laser-surveyed topography of the elevation in a Pennsylvania landscape, showing evidence of sediment-filled early American millponds along a stream valley. Terraces around the stream channel descend stepwise from upstream to downstream (dark purple, light purple, pink), each associated with a dam. The deeper stream incision into the two downstream terraces is due to more complete dam breaching. See page 299.

Image: U.S. Geological Survey (LIDAR data and preliminary processing); Michael Rahnis (image analysis and generation)

DEPARTMENTS

- 255 Science Online
- 257 This Week in *Science*
- 259 Editors' Choice
- 260 Contact *Science*
- 263 Random Samples
- 265 Newsmakers
- 349 Science Careers

EDITORIAL

- 258 Engaging Iran
by Glenn Schweitzer and Norman Neureiter

NEWS OF THE WEEK

- Uncle Sam's Biomedical Archive Wants Your Papers 266
- Satellite Company Offers Earth-Observing Researchers a Ride 267
- Mirror Neurons May Help Songbirds Stay in Tune 269

SCIENCE SCOPE

- 269 New Dark-Matter Map Reveals Where Galaxies Gambol 270
- Polynesians Took the Express Train Through Melanesia to the Pacific 270
- Most-Massive Black Hole Confirms Relativity Rules the Universe 271
- Isolated Tribe Gives Clues to the Origins of Syphilis 272
- Calculating Iraq's Death Toll: WHO Study Backs Lower Estimate 273

NEWS FOCUS

- Gene Tests for Psychiatric Risk Polarize Researchers Hoping for a Glimpse of What's Ahead 274
- Seeking the Roots of Ritual Just Don't Call It the Garden of Eden 278



278

LETTERS

- Conservation with Sense *M. L. M. Lim et al.* 281
- Scientific Meetings: Worth Attending *M. McNutt*
- Scientific Meetings: Call In Instead *R. Roy*
- Putting a Human Face on Energy Usage *R. Burruss*
- Fair Game for Chimpanzees *E. Visalberghi and J. Anderson*
- Response *K. Jensen, J. Call, M. Tomasello*

BOOKS ET AL.

- Cool It The Skeptical Environmentalist's Guide to Global Warming 285
B. Lomborg, reviewed by W. F. Ruddiman (U.S. and U.K. editions)

POLICY FORUM

- Aging Infrastructure and Ecosystem Restoration 286
M. W. Doyle et al.

PERSPECTIVES

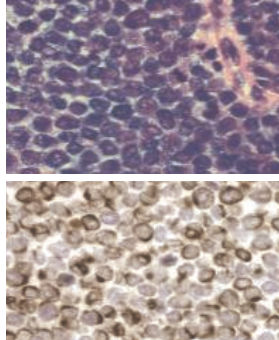
- Organizing the Source of Memory 288
E. A. Grove
>> *Research Article p. 304*
- Orion Continues to Surprise 289
C. R. O'Dell and L. K. Townsley
>> *Report p. 309*
- Managing Coastal Wetlands 290
I. Valiela and S. E. Fox
>> *Report p. 321*
- Dreams of Natural Streams 291
D. R. Montgomery
>> *Research Article p. 299*
- Probing Quantum Magnetism with Cold Atoms 292
M. Lewenstein and A. Sanpera
>> *Research Article p. 295*



288

Downloaded from <http://science.sciencemag.org/> on October 22, 2018

CONTENTS continued >>



SCIENCE EXPRESS

www.scienceexpress.org

MOLECULAR BIOLOGY

A Shared Docking Motif in TRF1 and TRF2 Used for Differential Recruitment of Telomeric Proteins

Y. Chen et al.

Two similar members of the protein complex that protects the free ends of chromosomes have distinct binding sites for other complex members and accessory proteins.

10.1126/science.1151804

CELL BIOLOGY

Differential Regulation of Dynein and Kinesin Motor Proteins by Tau

R. Dixit, J. L. Ross, Y. E. Goldman, E. L. F. Holzbaur

The motor proteins dynein and kinesin both encounter the protein tau as they move along the microtubules; the former reverses direction, whereas the latter detaches.

10.1126/science.1152993

MEDICINE

Clonal Integration of a Polyomavirus in Human Merkel Cell Carcinoma

H. Feng, M. Shuda, Y. Chang, P. S. Moore

A rare, but highly aggressive, form of human skin cancer may be caused by a previously uncharacterized human polyomavirus.

10.1126/science.1152586

GEOPHYSICS

Rogue Mantle Helium and Neon

F. Albarède

Anomalous high ratios of ³He to ⁴He in the recycled basalts under ocean islands may result from helium diffusing in from more pristine, primitive mantle.

10.1126/science.1150060

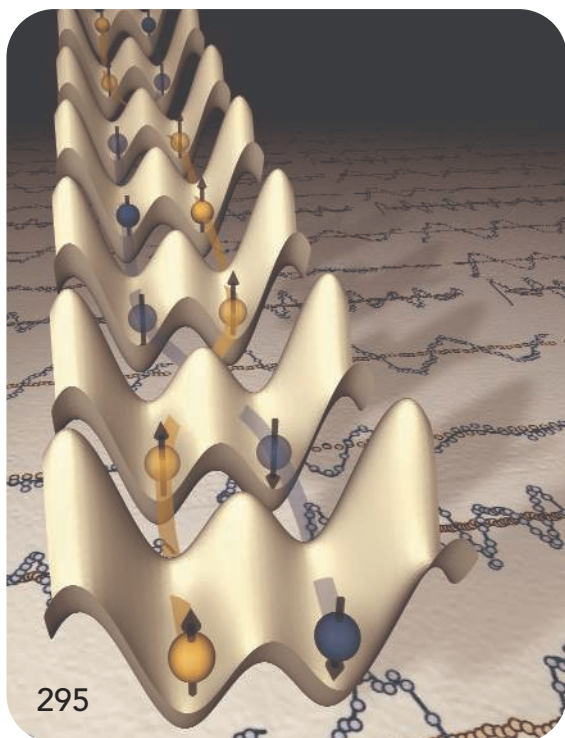
BREVIA

PLANT SCIENCE

***Arabidopsis* CLV3 Peptide Directly Binds CLV1 Ectodomain** 294

M. Ogawa, H. Shinohara, Y. Sakagami, Y. Matsubayashi

Peptides that maintain the stem cells in the shoot apical meristem of *Arabidopsis* act by binding to the extracellular portion of a receptor-like kinase.



CREDIT (BOTTOM): I. BLOCH/UNIVERSITY OF MANIZ

RESEARCH ARTICLES

PHYSICS

Time-Resolved Observation and Control of Superexchange Interactions with Ultracold Atoms in Optical Lattices 295

S. Trotzky et al.

Ultracold atoms trapped at sites of optical lattices are used to investigate the superexchange interaction between neighboring spins. >> *Perspective p. 292*

GEOLOGY

Natural Streams and the Legacy of Water-Powered Mills 299

R. C. Walter and D. J. Merritts

Floodplains and streams in the eastern United States were altered extensively by milldams in the 1700s and 1800s, challenging recent hydrologic interpretations and restoration approaches.

>> *Perspective p. 291*

NEUROSCIENCE

Lhx2 Selector Activity Specifies Cortical Identity and Suppresses Hippocampal Organizer Fate 304

V. S. Mangale et al.

The brain's cortex begins as a one-cell-thick sheet of stem cells, whose ultimate identity is specified by a gene that suppresses noncortical cell fates.

>> *Perspective p. 288*

REPORTS

ASTRONOMY

Million-Degree Plasma Pervading the Extended Orion Nebula 309

M. Güdel et al.

Million-degree gas fills the Orion Nebula, implying that shock-heated gas from stellar outflows is common in our Galaxy.

>> *Perspective p. 289*

CONTENTS continued >>

REPORTS CONTINUED...

CHEMISTRY

Elementary Structural Motifs in a Random Network of Cytosine Adsorbed on a Gold(111) Surface 312

R. Otero et al.

Upon cooling, cytosine molecules on a gold surface form a disordered network based on the assembly of three elementary structural units, which may have analogies with glasses.

GEOPHYSICS

The Subduction Zone Flow Field from Seismic Anisotropy: A Global View 315

M. D. Long and P. G. Silver

Identification of the fastest seismic-wave propagation speed in subduction zones reveals that trench migration induces flow in the mantle above and beneath the subducting slab.

EVOLUTION

A Localized Negative Genetic Correlation Constrains Microevolution of Coat Color in Wild Sheep 318

J. Gratten et al.

Although the fitness of wild sheep increases with size, large, dark sheep are becoming rarer because color is genetically linked to genes that decrease fitness.

ECOLOGY

Coastal Ecosystem–Based Management with Nonlinear Ecological Functions and Values 321

E. B. Barbier et al.

Taking into account the nonlinear relation between preserved habitat area and wave attenuation facilitates integrated management of coastal conservation and development.

>> *Perspective p. 290*

DEVELOPMENTAL BIOLOGY

β -Catenin Defines Head Versus Tail Identity During Planarian Regeneration and Homeostasis 323

K. A. Gurley, J. C. Rink, A. S. Alvarado

Smed- β catenin-1 Is Required for Anteroposterior Blastema Polarity in Planarian Regeneration 327

C. P. Petersen and P. W. Reddien

After the head or tail of a planarian is severed, the signal intensity of a prominent developmental signaling pathway controls whether a new head or tail regenerates.

GENETICS

Natural Genetic Variation in *Lycopene Epsilon Cyclase* Tapped for Maize Biofortification 330

C. E. Harjes et al.

Identification of the gene that controls vitamin A levels in maize will allow production of varieties that can improve global health without using transgenic methods.



290 & 321

CELL BIOLOGY

Dual Positive and Negative Regulation of Wingless Signaling by Adenomatous Polyposis Coli 333

C. M. Takacs et al.

An important developmental signaling molecule known to be a tumor suppressor can also activate growth, possibly explaining the responses of some cancers.

MEDICINE

Initiating and Cancer-Propagating Cells in *TEL-AML1*–Associated Childhood Leukemia 336

D. Hong et al.

Identical twins each carry preleukemic cells containing the characteristic chromosomal translocation, but only one undergoes further genetic changes and develops leukemia.

BIOCHEMISTRY

Effects of Molecular Memory and Bursting on Fluctuations in Gene Expression 339

J. M. Pedraza and J. Paulsson

A theory of stochastic gene expression suggests that noise can be modulated without feedback loops, complicating interpretation of single-cell experiments.

Downloaded from <http://science.sciencemag.org/> on October 22, 2018

CREDIT: JURGENNE PRIMAVERA

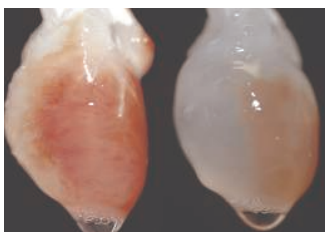


ADVANCING SCIENCE. SERVING SOCIETY

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 © 2008 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): \$144 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$770; 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. SCIENCE is printed on 30 percent post-consumer recycled paper. **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.

CONTENTS continued >>>



A change of heart.

SCIENCE NOW

www.sciencenow.org DAILY NEWS COVERAGE

Building a New Heart From Old Tissue

When newborn cells are transplanted onto a “skeleton” of an adult heart, it becomes a pumping organ in the lab.

How to Make a Submarine Disappear

Researchers think objects can be made acoustically “invisible.”

High Prices Just Feel Good

Anticipation of quality activates our brain’s pleasure center.



Making a graceful exit.

SCIENCE CAREERS

www.sciencereers.org CAREER RESOURCES FOR SCIENTISTS

MiSciNet: Following the Image

A. Sasso

Ahna Skop built a career from things others pass over, from cellular detritus to shy high school students.

Mind Matters: Leaving a Lab Gracefully

I. S. Levine

When it’s time to leave the lab, the key is to make sure the end isn’t bitter.

Tooling Up: Dealing With Men Who Have a Problem With Women

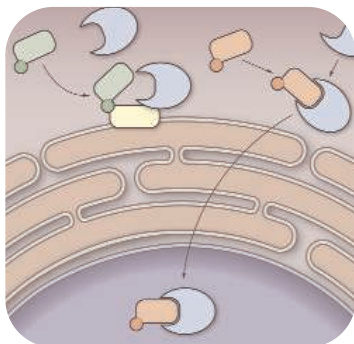
D. Jensen

You’re likely to encounter men who have never learned how to relate to strong, competent women.

From the Archives: You’ve Worked Hard to Get This Far

J. Austin

Don’t blow your academic job interview.



Proteins escape from the ER surface.

SCIENCE SIGNALING

www.stke.org THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

PERSPECTIVE: The Endoplasmic Reticulum Takes Center Stage in Cell Cycle Regulation

P. Fearon and O. Cohen-Fix

The ER appears to play a key role in controlling the spatial localization of proteins involved in the cell cycle.

ST NETWATCH: UCSC Genome Bioinformatics

Analyze your gene of interest in a range of organisms using the tools available at the UCSC Genome Browser; in Bioinformatics Resources.

SCIENCE PODCAST



Listen to the 18 January *Science* podcast to hear about genetic testing for psychiatric disorders, a possible viral culprit in a rare skin cancer, the legacy of water-powered mills, and more.

www.sciencemag.org/about/podcast.dtl

Separate individual or institutional subscriptions to these products may be required for full-text access.

Science

319 (5861)

Science **319** (5861), 257-348.

ARTICLE TOOLS

<http://science.sciencemag.org/content/319/5861>

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.