

## EDITORIAL

- 1583 The End of “Small Science”?  
*Bruce Alberts*

## NEWS OF THE WEEK

- 1588 A roundup of the week’s top stories

## NEWS & ANALYSIS

- 1591 Ice-Free Arctic Sea May Be Years, Not Decades, Away
- 1592 U.S. Study Shows Unconscious Gender Bias in Academic Science
- 1593 Turning From War to Peace in Papua New Guinea  
*>> Report p. 1651*
- 1594 Drug Trial Offers Uncertain Start in Race to Save Children With Progeria

## NEWS FOCUS

- 1596 Roots of Empire  
Where Asia’s Monsoons Go to Die  
*>> Science Podcast*
- 1600 Satellite Labs Extend Science  
How to Go Global

## LETTERS

- 1604 Curiosity and Contamination  
*J. L. Bada*  
Religiously Protecting Myanmar’s Environment  
*K. Y. Chong*  
U.S. Basic Research: Delayed Drug Development  
*M. M. Reidenberg and H. Erle*  
U.S. Basic Research: Still Number One?  
*S. Altman*
- 1605 CORRECTIONS AND CLARIFICATIONS
- 1605 TECHNICAL COMMENT ABSTRACTS

## BOOKS ET AL.

- 1606 The Story of Earth  
*R. M. Hazen, reviewed by A. D. Anbar*
- 1607 Extreme Measures  
*B. K. McNab, reviewed by K. Hammond*

## POLICY FORUM

- 1608 When Scientific Research and Legal Practice Collide  
*R. Camilli et al.*

## PERSPECTIVES

- 1610 Suppression of Sleep for Mating  
*J. M. Siegel*  
*>> Report p. 1654*
- 1611 How Oblate Is the Sun?  
*D. Gough*  
*>> Report p. 1638*
- 1612 Insecticide Resistance After *Silent Spring*  
*D. G. Heckel*
- 1614 Life in a Contaminated World  
*L. J. Guillette Jr. and T. Iguchi*
- 1616 Immune Surveillance from Chromosomal Chaos?  
*M. Zanetti and N. R. Mahadevan*  
*>> Report p. 1678*
- 1617 A Radical Route for Nitrogenase Carbide Insertion  
*A. K. Boal and A. C. Rosenzweig*  
*>> Report p. 1672*
- 1619 Retrospective: R. Duncan Luce (1925–2012)  
*J. L. McClelland*

## SCIENCE PRIZE ESSAY

- 1620 Personal Plants: Making Botany Meaningful by Experimentation  
*L. A. Hyatt*

## REVIEW

- 1623 Scientific Thinking in Young Children: Theoretical Advances, Empirical Research, and Policy Implications  
*A. Gopnik*  
*>> Science Podcast*

CONTENTS continued >>

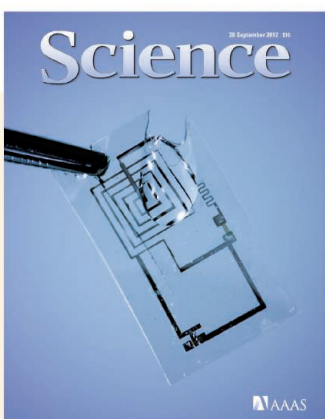


page 1596



page 1608

Downloaded from <http://science.sciencemag.org/> on December 19, 2018



## COVER

A biodegradable integrated circuit (length: ~2.54 centimeters) shown partially dissolved by a droplet of water. This demonstration system includes transistors; diodes; inductors and capacitors, with magnesium for the electrodes/interconnects; magnesium oxide for the gate/interlayer dielectrics; silicon nanomembranes for the semiconductor; and silk as a thin, flexible substrate. The dissolution characteristics can be tuned to address applications such as bioresorbable implants, biodegradable environmental monitors, and compostable consumer electronics. See page 1640.

Image: Beckman Institute, University of Illinois, and Tufts University

## DEPARTMENTS

- 1580 This Week in *Science*
- 1584 Editors’ Choice
- 1586 *Science* Staff
- 1622 AAAS News & Notes
- 1689 New Products
- 1690 *Science* Careers

## BREVIA

- 1628 **Next-Generation Digital Information Storage in DNA**  
G. M. Church et al.  
Digital information can be stored in DNA at densities higher than digital media such as flash memory or quantum holography.

## RESEARCH ARTICLES

- 1629 **Out of the Tropics: The Pacific, Great Basin Lakes, and Late Pleistocene Water Cycle in the Western United States**  
M. Lyle et al.  
Precipitation source regions for western North America changed substantially over the last deglaciation.
- 1634 **Parallel Molecular Evolution in an Herbivore Community**  
Y. Zhen et al.  
Parallel mutations in the alpha subunit of the sodium pump allow insects to specialize on host plants that produce ouabain.

## REPORTS

- 1638 **The Precise Solar Shape and Its Variability**  
J. R. Kuhn et al.  
Observations with NASA's Solar Dynamics Observatory show that the shape of the Sun does not vary with the 11-year solar cycle.  
>> *Perspective p. 1611*
- 1640 **A Physically Transient Form of Silicon Electronics**  
S.-W. Hwang et al.  
A platform of materials and fabrication methods furnishes resorbable electronic devices for in vivo use.  
>> *Science Podcast*
- 1644 **Gold-Catalyzed Direct Arylation**  
L. T. Ball et al.  
A gold catalyst can link together aromatic rings under very mild conditions.
- 1648 **Synthesis and Characterization of a Rhodium(I)  $\sigma$ -Alkane Complex in the Solid State**  
S. D. Pike et al.  
Hydrogenation of a crystalline precursor enables structural characterization of a commonly evoked reaction intermediate.
- 1651 **Toward Peace: Foreign Arms and Indigenous Institutions in a Papua New Guinea Society**  
P. Wiessner and N. Pupu  
A case study shows that controlling conflict depends on local institutions.  
>> *News story p. 1593*
- 1654 **Adaptive Sleep Loss in Polygynous Pectoral Sandpipers**  
J. A. Lesku et al.  
Male pectoral sandpipers go without sleep for days in order to mate as often as possible in the high Arctic.  
>> *Perspective p. 1610*

- 1658 **Mutations in the *neverland* Gene Turned *Drosophila pachea* into an Obligate Specialist Species**  
M. Lang et al.  
A few changes made the fly *Drosophila pachea* reliant on the steroid precursors produced by the senita cactus.
- 1661 **Fermentation, Hydrogen, and Sulfur Metabolism in Multiple Uncultivated Bacterial Phyla**  
K. C. Wrighton et al.  
Near-complete reconstruction of the genomes of 21 widespread uncultured environmental bacteria reveals metabolic novelties.
- 1665 **Disulfide Rearrangement Triggered by Translocon Assembly Controls Lipopolysaccharide Export**  
S.-S. Chng et al.  
Protein-protein interactions promote oxidative protein folding during assembly of a bacterial lipopolysaccharide exporter.
- 1668 **Sedlin Controls the ER Export of Procollagen by Regulating the Sar1 Cycle**  
R. Venditti et al.  
Sedlin, the product of the gene mutated in spondyloepiphyseal dysplasia tarda, acts to expand cargo containers to fit bulky procollagen.
- 1672 **Radical SAM-Dependent Carbon Insertion into the Nitrogenase M-Cluster**  
J. A. Wigg et al.  
The carbon atom in the middle of a large metal cluster originates from the one-carbon donor S-adenosylmethionine.  
>> *Perspective p. 1617*
- 1675 **Evidence of Abundant Purifying Selection in Humans for Recently Acquired Regulatory Functions**  
L. D. Ward and M. Kellis  
Diversity in human-specific regions of the genome has been reduced by functional constraints.
- 1678 **An Immunosurveillance Mechanism Controls Cancer Cell Ploidy**  
L. Senovilla et al.  
Polyploid cancer cells trigger an immune response owing to proteins aberrantly exposed on their outer surfaces.  
>> *Perspective p. 1616*
- 1684 **Mycobacterial Disease and Impaired IFN- $\gamma$  Immunity in Humans with Inherited ISG15 Deficiency**  
D. Bogunovic et al.  
A mutation that accounts for adverse reactions to the Bacille Calmette-Guérin vaccine against tuberculosis is identified.

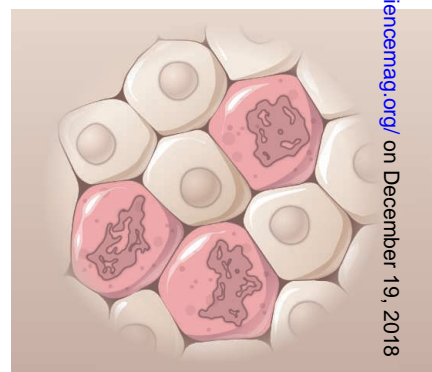
**CONTENTS** continued >>



pages 1611 & 1638



pages 1610 & 1654



pages 1616 & 1678

## SCIENCEONLINE

## SCIENCEEXPRESS

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

Publication Ahead of Print

Status and Solutions for the World's Unassessed Fisheries

C. Costello et al.

10.1126/science.1223389

Coagulation Factor X Activates Innate Immunity to Human Species C Adenovirus

K. Doronin et al.

10.1126/science.1226625

Gene Loops Enhance Transcriptional Directionality

S. M. Tan-Wong et al.

10.1126/science.1224350

The APC/C Inhibitor XErp1/Emi2 Is Essential for *Xenopus* Early Embryonic Divisions

T. Tischer et al.

10.1126/science.1228394

Jet-Launching Structure Resolved Near the Supermassive Black Hole in M87

S. S. Doeleman et al.

10.1126/science.1224768

## TECHNICALCOMMENTS

Comment and Response on "The Geometric Structure of the Brain Fiber Pathways"

Comment: M. Catani et al.

<http://dx.doi.org/10.1126/science.1223425>

Response: V. J. Wedeen et al.

<http://dx.doi.org/10.1126/science.1223493>

## SCIENCENOW

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

Highlights From Our Daily News Coverage

Compared With Chimps, Humans Slow to Insulate Nerve Fibers

Prolonged development may make our brains more malleable—and more susceptible to illness.

[http://scim.ag/Prolonged\\_Development](http://scim.ag/Prolonged_Development)

Korean Eunuchs Outlived Uncastrated Peers

A study of 16th to 19th century eunuchs suggests that testosterone may shorten men's lives.

<http://scim.ag/Eunuchs-Testosterone>

A Wrinkle in Slime: Cell Deaths

Form Biofilm Folds

Researchers harness the secrets of bacterial wrinkling.

[http://scim.ag/Biofilm\\_Folds](http://scim.ag/Biofilm_Folds)

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

**25 September issue:** <http://scim.ag/ss092512>

RESEARCH ARTICLE: Superbinder SH2 Domains Act as Antagonists of Cell Signaling

T. Kaneko et al.

PERSPECTIVE: Peptide-Binding Domains—Are Limp Handshakes Safest?

N. J. Haslam and D. C. Shields

Engineered, high-affinity SH2 domains inhibit cell signaling, which may have therapeutic potential.

RESEARCH ARTICLE: Phosphorylation of Cytohesin-1 by Fyn Is Required for Initiation of Myelination and the Extent of Myelination During Development

J. Yamauchi et al.

Transgenic and knockout mice reveal a pathway that controls myelination by Schwann cells.

RESEARCH ARTICLE: The Tumor Suppressor PTEN Is Exported in Exosomes and Has Phosphatase Activity in Recipient Cells

U. Putz et al.

A tumor suppressor protein with lipid phosphatase activity travels to target cells in microvesicles.

PERSPECTIVE: Where EGF Receptors Transmit Their Signals

N. L. Lill and N. I. Sever

Trafficking of activated receptors controls the transcriptional response to epidermal growth factor.

PERSPECTIVE: Cell Responses to Growth Factors—The Role of Receptor Tyrosine Kinase Intracellular Domain Fragments

G. Carpenter and A. Pozzi

Proteolytic fragments of receptor tyrosine kinases have distinct roles in growth factor signaling.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

**26 September issue:** <http://scim.ag/stm092612>

RESEARCH ARTICLE: Quantitative Analysis of the Human Airway Microbial Ecology Reveals a Pervasive Signature for Cystic Fibrosis

P. C. Blainey et al.

A distinctive, stereotyped microbiome is present in the lungs of cystic fibrosis patients.

RESEARCH ARTICLE: An RNA Profile Identifies Two Subsets of Multiple Sclerosis Patients Differing in Disease Activity

L. Ottoboni et al.

Multiple sclerosis patients that relapse more often show distinct mRNA profiles in blood immune cells.

RESEARCH ARTICLE: Vascular Catheters with a Nonleaching Poly-Sulfobetaine Surface Modification Reduce Thrombus Formation and Microbial Attachment

R. S. Smith et al.

A coating for catheters inhibits microbial adherence and thrombosis in vitro and in vivo.

PERSPECTIVE: Pharmacogenomics and Patient Care—One Size Does Not Fit All

K. M. Giacomini et al.

Pharmacogenomics research points to a personalized approach for prescribing and dosing medications.

REVIEW: Biomaterial-Associated Infection—Locating the Finish Line in the Race for the Surface

H. J. Busscher et al.

Infection-reducing biomaterials must balance host tissue integration and prevention of microbial attachment.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

<http://scim.ag/SciCareers28September2012>

Experimental Error: The Audacity of Graduate School

A. Ruben

The overworked grad student seems to embody the most pointless aspects of graduate school.

Big Pharma Ramps Up Postdoc Programs

M. Price

After years of layoffs, drug companies are turning to the youngest Ph.D. scientists for fresh ideas.

Content Collection: Getting Your Research Published

E. Pain

Proficiently publishing scientific articles is among the attributes that determine academic success.

## SCIENCE PODCAST

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

Free Weekly Show for 28 September 2012

Melt-away electronics, scientific thinking in kids, climate change in Mongolia, and more.

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

**337 (6102)**

*Science* **337** (6102), 1580-1689.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/337/6102>

**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.