

SPECIAL SECTION

Quantum Information Processing

INTRODUCTION

1163 The Future of Quantum Information Processing

REVIEWS

1164 Scaling the Ion Trap Quantum Processor
C. Monroe and J. Kim

1169 Superconducting Circuits for Quantum Information: An Outlook
M. H. Devoret and R. J. Schoelkopf

1174 Quantum Spintronics: Engineering and Manipulating Atom-Like Spins in Semiconductors
D. D. Awschalom et al.
>> *Science Podcast*

1179 Topological Quantum Computation—From Basic Concepts to First Experiments
A. Stern and N. H. Lindner



page 1138

EDITORIAL

1123 Denial of Catastrophic Risks
Martin Rees
>> *Science Podcast*

NEWS OF THE WEEK

1130 A roundup of the week's top stories

NEWS & ANALYSIS

1134 Early Treatment May Have Cured Infant of HIV Infection

1135 Siberian Meteor Spurs Dash for Data, Calls for Safeguards

1136 At Home on the Range: Prairie Rodents Yield Their Secrets to a Dogged Observer
>> *Report p. 1205*

NEWS FOCUS

1138 A Sea Change for U.S. Oceanography
The New Generation of Sea Scientist Ahoy, Telepresence
>> *Science Podcast*

1144 Europe's Science Superwoman Struggles to Get Off the Ground

LETTERS

1148 The Other Revolution in the Life Sciences
C. De Duve

Museums' Role: Increasing Knowledge
G. C. Mayer et al.

Museums' Role: Pollen and Forensic Science
S. Warny

1149 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

1150 The Emergence of Organizations and Markets
J. F. Padgett and W. W. Powell, Eds., reviewed by M. Macy

1151 2052
J. Randers, reviewed by R. E. Horn

POLICY FORUM

1152 Behavioral Economics and the Retirement Savings Crisis
S. Benartzi and R. H. Thaler
>> *Science Podcast*

PERSPECTIVES

1154 With a Little Help from Prokaryotes
E. P. C. Rocha
>> *Report p. 1207*

1155 (De)Personalized Medicine
R. I. Horwitz et al.

1156 Red Wine, Toast of the Town (Again)
H. Yuan and R. Marmorstein
>> *Report p. 1216*

1157 Caffeine Boosts Bees' Memories
L. Chittka and F. Peng
>> *Report p. 1202*

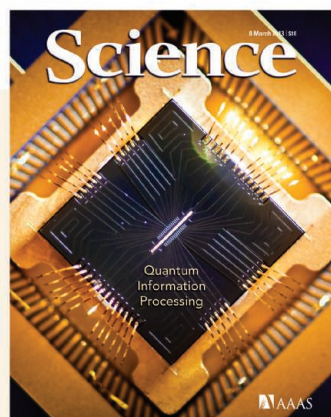
1159 Getting the Jump on Explosive Percolation
R. M. Ziff
>> *Report p. 1185*

1160 Guilty by Association
N. S. Joshi and T. Jacks
>> *Report p. 1219*

1161 Exceptional Properties by Design
M. Zhou
>> *Report p. 1191*

CONTENTS continued >>

Explore our rich online offerings, including multimedia, news, *Science Careers*, and our two research journals—*Science Signaling* and *Science Translational Medicine*—at www.sciencemag.org



COVER

Photograph of a silicon chip (area of entire chip: 33 mm²) that levitates individual atoms. Static and radio frequency voltages are applied to the array of electrodes at the center, creating an electric confinement for individual atomic ions, which hover ~0.1 mm above the chip. Such trapped ion systems are a leading physical implementation for quantum information processing. See the special section beginning on page 1163.

Photo: Curt Suplee and Emily Edwards, Joint Quantum Institute and University of Maryland; Chip fabrication: Sandia National Laboratories with support from the Intelligence Advanced Research Projects Activity

DEPARTMENTS

- 1121 This Week in *Science*
- 1125 Editors' Choice
- 1128 *Science* Staff
- 1225 New Products
- 1226 *Science Careers*

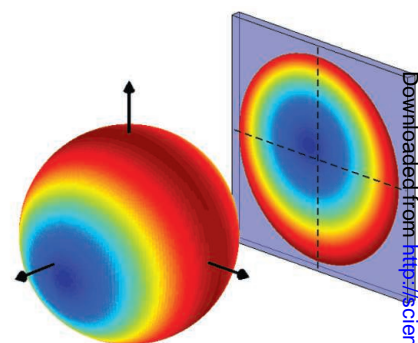
REPORTS

- 1185** **Avoiding a Spanning Cluster in Percolation Models**
Y. S. Cho et al.
In a percolation model that avoided bridge bonds, the continuity of transitions depends on lattice dimensionality.
>> *Perspective p. 1159*
- 1187** **Emergence of a Measurement Basis in Atom-Photon Scattering**
Y. Glickman et al.
The scattering of single photons from a trapped ion may shed light on the process of decoherence and quantum measurement.
- 1191** **A Transforming Metal Nanocomposite with Large Elastic Strain, Low Modulus, and High Strength**
S. Hao et al.
The use of a shape-memory metal alloy as a matrix better exploits the inherent elastic properties of niobium nanowires.
>> *Perspective p. 1161*
- 1194** **Terrestrial Accretion Under Oxidizing Conditions**
J. Siebert et al.
Earth's core formed under conditions similar to those that formed the most common meteorites.
- 1198** **A Reconstruction of Regional and Global Temperature for the Past 11,300 Years**
S. A. Marcott et al.
Current global average surface air temperature is warmer than that for all but a small fraction of the past 11,300 years.
- 1202** **Caffeine in Floral Nectar Enhances a Pollinator's Memory of Reward**
G. A. Wright et al.
Caffeine at concentrations found in flowers helps individual honeybees remember where to find associated nectar.
>> *Perspective p. 1157*

- 1205** **Prairie Dogs Disperse When All Close Kin Have Disappeared**
J. L. Hoogland
Long-term observation reveals that the presence of family members keeps a new generation of prairie dogs close to home.
>> *News story p. 1136*
- 1207** **Gene Transfer from Bacteria and Archaea Facilitated Evolution of an Extremophilic Eukaryote**
G. Schönknecht et al.
A mosaic of genes acquired from various phyla enable a red alga to grow abundantly in hot, acidic, and toxic niches.
>> *Perspective p. 1154*
- 1210** **Cell Death from Antibiotics Without the Involvement of Reactive Oxygen Species**
Y. Liu and J. A. Imlay
- 1213** **Killing by Bactericidal Antibiotics Does Not Depend on Reactive Oxygen Species**
I. Keren et al.
Tests of the oxidative damage mechanism for antibiotic killing do not support the generality of the hypothesis.
- 1216** **Evidence for a Common Mechanism of SIRT1 Regulation by Allosteric Activators**
B. P. Hubbard et al.
An interaction of the deacetylase SIRT1 with its substrate offers a possible explanation for some effects on aging.
>> *Perspective p. 1156*
- 1219** **Aire-Dependent Thymic Development of Tumor-Associated Regulatory T Cells**
S. Malchow et al.
Prostate tumors in mice recruit thymus-derived regulatory T cells that are specific for tissue autoantigens.
>> *Perspective p. 1160*



page 1150



page 1187



pages 1157 & 1202

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 © 2013 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.

Science

339 (6124)

Science **339** (6124), 1121-1225.

ARTICLE TOOLS

<http://science.sciencemag.org/content/339/6124>

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.