

EDITORIAL

- 1127 The Values of Science
Ismail Serageldin

NEWS OF THE WEEK

- 1132 A roundup of the week's top stories

NEWS & ANALYSIS

- 1135 Quake Experts to Be Tried for Manslaughter
- 1136 Concerns About Arsenic-Laden Bacterium Aired
>> *Editor's Note p. 1149*;
Research Article p. 1163
- 1138 Wellcome Puts Its Money on Elite Researchers
- 1139 Appraising U.K. Ecosystems, Report Envisions Greener Horizon

NEWS FOCUS

- 1140 DNA Nanotechnology Grows Up
Next Step: DNA Robots?
- 1144 Possible Sighting of Dark Matter
Fires Up Search and Tempers

LETTERS

- 1149 Editor's Note and Technical Comments on Wolfe-Simon *et al.*
B. Alberts
>> *News & Analysis story p. 1136*;
Research Article p. 1163
- Zoos and Captive Breeding
A. Balmford et al.
- Response
D. A. Conde et al.

- 1150 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

- 1152 An Empire of Ice
E. J. Larson, reviewed by V. B. Smocovitis
- 1153 Little Eagles
R. Munro, directed by R. Silbert;
Little Eagles
R. Munro

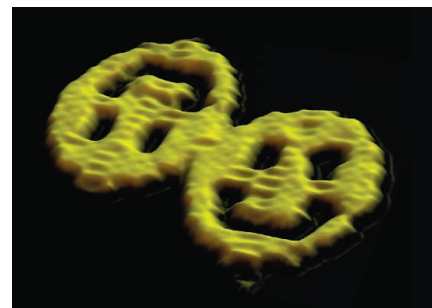
POLICY FORUM

- 1154 Research Principles for Developing Country Food Value Chains
M. I. Gómez et al.

PERSPECTIVES

- 1156 Scaling Up DNA Computation
J. H. Reif
>> *Report p. 1196*
- 1157 Io's Tortured Interior
A. J. Coates
>> *Report p. 1186*
- 1158 Potential Solutions for Creating Responsive Materials
K. Sieradzki
>> *Report p. 1179*
- 1160 In Evolution, the Sum Is Less than Its Parts
S. Kryazhimskiy et al.
>> *Reports pp. 1190 and 1193*
- 1161 Behavior and the Dynamic Genome
A. M. Bell and G. E. Robinson

CONTENTS continued >>



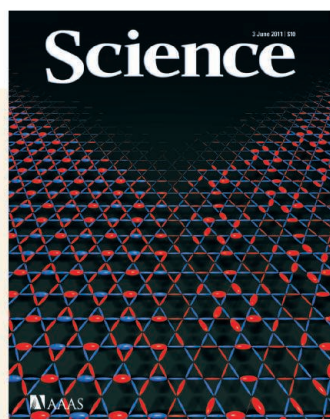
page 1140



page 1152



page 1161



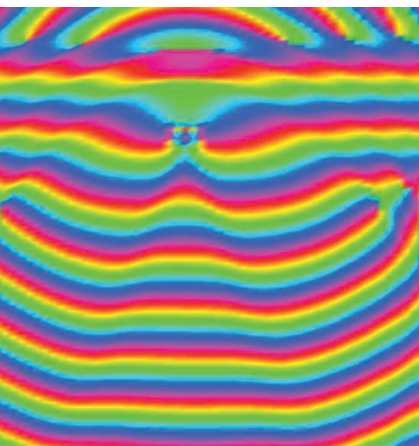
COVER

Three possible phases of the kagome Heisenberg antiferromagnet, a model of geometrically "frustrated" magnetism: the diamond-pattern valence bond crystal (lower left), honeycomb valence bond crystal (lower right), and quantum spin liquid (upper empty wedge). Deviations of bond strengths from their average values are shown by bond widths and colors (red, stronger; blue, weaker). The simulations of Yan *et al.* (p. 1173) show that the true ground-state phase is the quantum spin liquid.

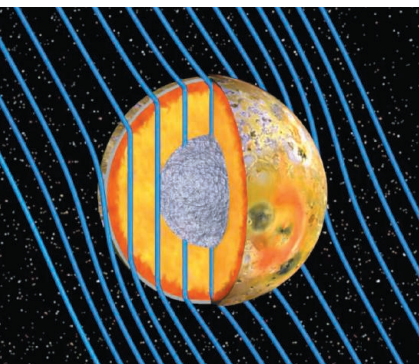
Image: Steven R. White, University of California, Irvine

DEPARTMENTS

- 1124 This Week in *Science*
- 1128 Editors' Choice
- 1130 *Science* Staff
- 1217 New Products
- 1218 *Science* Careers



page 1167



pages 1157 & 1186



pages 1156 & 1196

RESEARCH ARTICLE

- 1163** A Bacterium That Can Grow by Using Arsenic Instead of Phosphorus
F. Wolfe-Simon et al.
Evidence is offered for arsenate replacing phosphate as a molecular building block in a Mono Lake, California, bacterium.
>> *News & Analysis story p. 1136;*
Editor's Note p. 1149

REPORTS

- 1167** Polariton Superfluids Reveal Quantum Hydrodynamic Solitons
A. Amo et al.
A condensed-matter system is used to study superfluid dynamics.
- 1170** Observing the Average Trajectories of Single Photons in a Two-Slit Interferometer
S. Kocsis et al.
An experiment determined the trajectories of single photons through a two-slit interferometer.
- 1173** Spin-Liquid Ground State of the $S = 1/2$ Kagome Heisenberg Antiferromagnet
S. Yan et al.
Numerical calculations reveal that the true ground state of a frustrated two-dimensional system is a gapped spin liquid.
- 1176** Two-Dimensional Mott-Hubbard Electrons in an Artificial Honeycomb Lattice
A. Singha et al.
A collective electron excitation displays an unusual dependence on applied magnetic field.
- 1179** A Material with Electrically Tunable Strength and Flow Stress
H.-J. Jin and J. Weissmüller
Changes in a layer of oxygen adsorbed onto nanoporous gold reversibly affect its mechanical properties.
>> *Perspective p. 1158*
- 1183** Magnetosphere Sawtooth Oscillations Induced by Ionospheric Outflow
O. J. Brambles et al.
Numerical simulations show that a class of magnetospheric disturbance can be generated by the outflow of ions from the ionosphere into the magnetosphere.
- 1186** Evidence of a Global Magma Ocean in Io's Interior
K. K. Khurana et al.
Magnetic field measurements made near Jupiter's moon Io strengthen the evidence for a magma ocean in its interior.
>> *Perspective p. 1157*
- 1190** Diminishing Returns Epistasis Among Beneficial Mutations Decelerates Adaptation
H.-H. Chou et al.
- 1193** Negative Epistasis Between Beneficial Mutations in an Evolving Bacterial Population
A. I. Khan et al.
Interactions between genes reduce the benefits of a mutation and decrease the rate of fitness gain during adaptation.
>> *Perspective p. 1160*
- 1196** Scaling Up Digital Circuit Computation with DNA Strand Displacement Cascades
L. Qian and E. Winfree
Scalability and noise control are demonstrated in a molecular computer built of DNA.
>> *Perspective p. 1156*
- 1202** Crystal Structure of the Maltose Transporter in a Pretranslocation Intermediate State
M. L. Oldham and J. Chen
An intermediate structure provides insight into how a transport substrate allosterically activates adenosine triphosphatase activity.
- 1206** Residue-Specific Vibrational Echoes Yield 3D Structures of a Transmembrane Helix Dimer
A. Remorino et al.
Vibrational spectroscopy coupled with isotopic substitution can probe protein structure.
- 1210** Interaction Between Notch and Hif- α in Development and Survival of *Drosophila* Blood Cells
T. Mukherjee et al.
Ligand-independent Notch signaling promotes blood cell survival during normal development and under hypoxic stress.
- 1214** Increased Structure and Active Learning Reduce the Achievement Gap in Introductory Biology
D. C. Haak et al.
A focus on problem-solving skills reduced achievement gaps in university classes.

SCIENCEONLINE

SCIENCEEXPRESS

www.scienceexpress.org

Detection of Convective Downflows in a Sunspot Penumbra

G. B. Scharmer et al.

Downflows detected near the edges of a sunspot's outer filaments provide a missing piece for convective models of sunspot motion.

10.1126/science.1206429

Recombinant Origin of the Retrovirus XMRV

T. Paprotka et al.

Analysis of the origin of XMRV suggests that links between the virus and human disease are due to laboratory contamination.

10.1126/science.1205292

No Evidence of Murine-Like Gammaretroviruses in CFS Patients Previously Identified as XMRV-Infected

K. Knox et al.

Chronic fatigue syndrome patients reported previously to be XMRV-infected show no signs of the virus in an independent evaluation.

10.1126/science.1204963

Editorial Expression of Concern on Lombardi et al. Report

B. Alberts

10.1126/science.1208542

Coupled, Circumferential Motions of the Cell Wall Synthesis Machinery and MreB Filaments in *B. subtilis*

E. C. Garner et al.

10.1126/science.1203285

Processive Movement of MreB-Associated Cell Wall Biosynthetic Complexes in Bacteria

J. Domínguez-Escobar et al.

Bacteria elongation involves moving synthetic complexes around the cell wall.

10.1126/science.1203466

Adult Neural Function Requires MeCP2

C. M. McGraw et al.

An epigenetic program regulated by MeCP2 needs to be maintained throughout life for normal neurological function.

10.1126/science.1206593

SCIENCE NOW

www.sciencenow.org

Highlights From Our Daily News Coverage

On the Fly, German Doctors Find Treatment for Deadly *E. coli* Infections

But some question the evidence for efficacy.

<http://scim.ag/ecoli-infections>

Satellite Imagery UnCOVERS Up to 17 Lost Egyptian Pyramids

Eyes in the sky spy buried archaeological treasures.

<http://scim.ag/lost-pyramids>

Who Needs a Moon?

Earth-like extrasolar planets could be suitable for life even if their rotation is not stabilized by a large moon.

<http://scim.ag/no-moon>

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

31 May issue: <http://scim.ag/ss053111>

RESEARCH ARTICLE: Reduction of Complex Signaling Networks to a Representative Kernel

J.-R. Kim et al.

An algorithmic approach enables the simplification of complex signaling networks and identifies potential therapeutic targets.

RESEARCH ARTICLE: Integration of Activating and Inhibitory Receptor Signaling by Regulated Phosphorylation of Vav1 in Immune Cells

S. Mesecke et al.

The extent of phosphorylation of a guanine nucleotide exchange factor determines the cytotoxicity of natural killer cells.

PERSPECTIVE: Cancer Cells Exploit the Eph-Ephrin System to Promote Invasion and Metastasis—Tales of Unwitting Partners

B. Wang et al.

Eph receptors and their ephrin ligands regulate contact inhibition of locomotion and its evasion in cancer cells.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

1 June issue: <http://scim.ag/stm060111>

RESEARCH ARTICLE: Rituximab Targets Podocytes in Recurrent Focal Segmental Glomerulosclerosis

A. Fornoni et al.

PERSPECTIVE: Rituximab's New Therapeutic Target—The Podocyte Actin Cytoskeleton

A. C. Chan

A well-characterized monoclonal antibody drug imparts therapeutic benefit in kidney disease through an off-target-mediated mechanism.

RESEARCH ARTICLE: A HIF-Regulated VHL-PTP1B-Src Signaling Axis Identifies a Therapeutic Target in Renal Cell Carcinoma

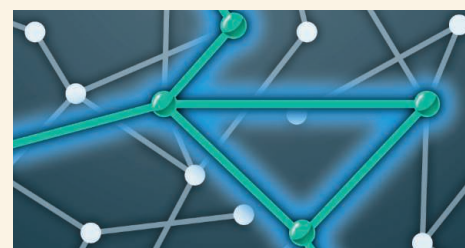
N. Suwaki et al.

Signaling through the VHL-PTP1B-Src pathway in renal cell carcinomas may determine sensitivity to Src inhibitors and provide a basis for treatment planning.

RESEARCH ARTICLE: MF59 Adjuvant Enhances Diversity and Affinity of Antibody-Mediated Immune Response to Pandemic Influenza Vaccines

S. Khurana et al.

Adjuvant use improves the quality and quantity of the immune response to pandemic influenza vaccines.



SCIENCE SIGNALING
Reducing network complexity.

SCIENCE CAREERS

www.sciencereers.org/career_magazine
Free Career Resources for Scientists

Reinventing the Standard Model of Science Presentations

S. Reed

A developmental biologist-turned-design expert thinks there are better ways to present scientific information.

<http://scim.ag/presentations1>

Taken for Granted: Immigrants and Entrepreneurship

B. L. Benderly

Recent research questions some popular estimates of the role of the foreign-born in founding high-tech companies.

http://scim.ag/tfg_entrepreneurs

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast
Free Weekly Show

On the 3 June *Science* Podcast: verifying dark matter results, the pace of evolution, highly structured biology courses, 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 © 2011 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 \$25.00 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

332 (6034)

Science **332** (6034), 1124-1217.

ARTICLE TOOLS

<http://science.sciencemag.org/content/332/6034>

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.