

SPECIAL SECTION

Superconductivity

INTRODUCTION

189 Happy 100th, Superconductivity!

NEWS

190 Superconductivity's Smorgasbord of Insights: A Movable Feast

193 Search for Majorana Fermions Nearing Success at Last?

REVIEWS

196 The Challenge of Unconventional Superconductivity

M. R. Norman

200 The Electron-Pairing Mechanism of Iron-Based Superconductors

F. Wang and D.-H. Lee

 >> *Science Careers* article p. 143

EDITORIAL

 149 Merged Cultures to Empower Women
Kerri-Ann Jones et al.
NEWS OF THE WEEK

154 A roundup of the week's top stories

NEWS & ANALYSIS

159 First Specific Drugs Raise Hopes for Hepatitis C

160 First Detection of Ozone Hole Recovery Claimed

161 Daring Experiment in Higher Education Opens Its Doors

 162 DOE Pulls the Plug on Massive Training Initiative
NSF Hits Ceiling on Graduate Fellowships

 163 Signature on Visitor's Form Fuels *Stanford v. Roche* Court Battle

164 Plans Afoot to Extend Welcome Mat to More U.S.-Trained Science Grads

165 Winds of Change Leave Bioscientists Scrambling

NEWS FOCUS

 166 Can Biotech and Organic Farmers Get Along?
Scientist in the Middle of the GM-Organic Wars
>> *Science Podcast*

 170 American Physical Society Meeting
Electrons Surf Sound Waves to Connect the Quantum Dots
Ice Is Predicted to Be Weirder Still
One Cool Way to Erase Information
Snapshots From the Meeting

LETTERS

 173 Food for Thought on Climate Policy
B. G. Subhadra

 AIDS Prevention Plans Must Reflect Local Values
A. Mazus

 NSF Program Benefits Schools in Need
R. Parthasarathy et al.

 Drug Regulatory Systems Must Foster Innovation
H. Schellekens et al.

 Viability of GM Fungi Crucial to Malaria Control
C. J. M. Koenraad et al.

175 TECHNICAL COMMENT ABSTRACTS

BOOKS ET AL.

 176 Radioactive
L. Redniss, reviewed by H. R. Shell

 177 Next Medicine
W. M. Bortz II, reviewed by R. L. Krall
POLICY FORUM

 178 Mekong Hydropower Development
R. E. Grumbine and J. Xu
PERSPECTIVES

 180 Shooting for the Stars
M. H. Montgomery
>> *Brevia* p. 205; *Reports* pp. 213 and 216;
Science Podcast

 181 Climbing in 190 Dimensions
M. Yarus
>> *Research Article* p. 209

 182 The Phase Behavior of Interfaces
M. P. Harmer
>> *Research Article* p. 206

 184 Minor Splicing, Disrupted
H. K. J. Pessa and M. J. Frilander
>> *Reports* pp. 238 and 240

 185 Rapid Insect Evolution by Symbiont Transfer
F. M. Jiggins and G. D. D. Hurst
>> *Report* p. 254

 186 Eosinophils Forestall Obesity
R. M. Maizels and J. E. Allen
>> *Report* p. 243

CONTENTS continued >>

DEPARTMENTS

 145 This Week in *Science*
150 Editors' Choice
152 *Science* Staff
257 New Products
258 *Science Careers*


page 159


COVER

When certain materials drop below a critical temperature, they enter a superconducting phase characterized by zero electrical resistance. A readily visualized signature of the superconducting state is the ability to expel magnetic fields. In this photo, a magnet placed on top of the ceramic yttrium barium copper oxide levitates as the temperature drops below 123 kelvin and the material becomes superconducting. See the special section beginning on page 189.

Photo: Takeshi Takahara/Photo Researchers, Inc.

BREVIA

- 205 **Kepler Detected Gravity-Mode Period Spacings in a Red Giant Star**
P. G. Beck et al.
Asteroseismic observations with the Kepler satellite probed the deep interior of an evolved star.
>> *Perspective p. 180; Reports pp. 213 and 216*

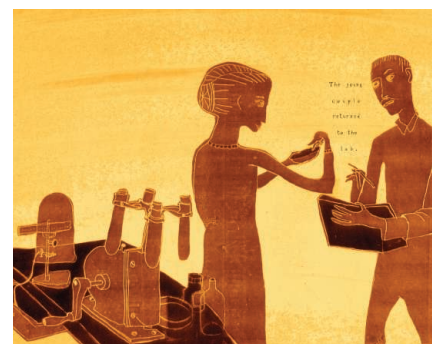
RESEARCH ARTICLES

- 206 **Nanometer-Thick Equilibrium Films: The Interface Between Thermodynamics and Atomistics**
M. Baram et al.
Model experiments show that nanometer-thick films at interfaces reduce interface energy and form an equilibrium state.
>> *Perspective p. 182*
- 209 **Ribozyme-Catalyzed Transcription of an Active Ribozyme**
A. Wochner et al.
A functional RNA has been synthesized by an RNA enzyme from mononucleotide building blocks.
>> *Perspective p. 181*

REPORTS

- 213 **Ensemble Asteroseismology of Solar-Type Stars with the NASA Kepler Mission**
W. J. Chaplin et al.
Measurements of 500 Sun-like stars show that their properties differ from those predicted by stellar population models.
- 216 **HD 181068: A Red Giant in a Triply Eclipsing Compact Hierarchical Triple System**
A. Derekas et al.
The Kepler satellite reveals details of the oscillation patterns of an evolved star in an exotic triple-star system.
>> *Perspective p. 180; Brevia p. 205*
- 218 **Surface-Plasmon Holography with White-Light Illumination**
M. Ozaki et al.
A technique based on light-induced electronic excitations on a metal-film surface is used for three-dimensional color displays.
- 220 **The Hot Summer of 2010: Redrawing the Temperature Record Map of Europe**
D. Barriopedro et al.
Large parts of eastern Europe experienced exceptional warmth during the summer of 2010.
- 224 **^{13}C NMR Guides Rational Design of Nanocatalysts via Chemisorption Evaluation in Liquid Phase**
K. Tedsree et al.
Nuclear magnetic resonance spectroscopy can reveal the strength of substrate interactions with heterogeneous catalysts.

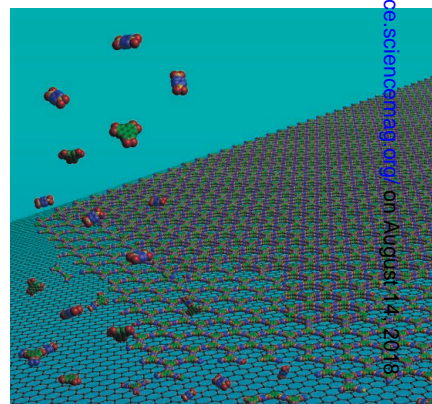
- 228 **Oriented 2D Covalent Organic Framework Thin Films on Single-Layer Graphene**
J. W. Colson et al.
Microporous covalent organic frameworks, which usually form as insoluble powders, grow as crystalline films on graphene.
- 231 **A Virophage at the Origin of Large DNA Transposons**
M. G. Fischer and C. A. Suttle
A parasite of a giant DNA virus that rescues the host has been shown to be the progenitor of a widespread transposon.
- 234 **A Dynamic Knockout Reveals That Conformational Fluctuations Influence the Chemical Step of Enzyme Catalysis**
G. Bhabha et al.
An *Escherichia coli* dihydrofolate reductase mutant is catalytically defective, because motions in the active site are impaired.
- 238 **Mutations in U4atac snRNA, a Component of the Minor Spliceosome, in the Developmental Disorder MOPD I**
H. He et al.
Minor RNA splicing defects can cause a major human developmental disorder.
- 240 **Association of TALS Developmental Disorder with Defect in Minor Splicing Component U4atac snRNA**
P. Ederly et al.
Mutation in a small nuclear RNA hinders splicing of pre-messenger RNAs and causes the severe malformations of Taybi-Linder syndrome.
>> *Perspective p. 184*
- 243 **Eosinophils Sustain Adipose Alternatively Activated Macrophages Associated with Glucose Homeostasis**
D. Wu et al.
Regulation of adipose tissue macrophages by eosinophils reveals an unexpected role for eosinophils in metabolic homeostasis.
>> *Perspective p. 186*
- 247 **AMP-Activated Protein Kinase Regulates Neuronal Polarization by Interfering with PI 3-Kinase Localization**
S. Amato et al.
A bioenergy-sensing pathway determines axon initiation and growth in neurons.
- 251 **Coping with Chaos: How Disordered Contexts Promote Stereotyping and Discrimination**
D. A. Stapel and S. Lindenberg
Messiness makes people long for orderliness, which results in a rush to categorize and simplify.
>> *Science Podcast*
- 254 **Rapid Spread of a Bacterial Symbiont in an Invasive Whitefly Is Driven by Fitness Benefits and Female Bias**
A. G. Himler et al.
A *Rickettsia* bacterium promotes its own geographical spread by manipulating its insect host's sex ratio and fecundity.
>> *Perspective p. 185*



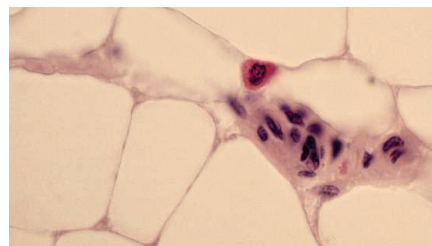
page 176



pages 185 & 254



page 228



pages 186 & 243

CONTENTS continued >>

SCIENCEONLINE

SCIENCEEXPRESS

www.sciencexpres.org

Trans-Endocytosis of CD80 and CD86: A Molecular Basis for the Cell Extrinsic Function of CTLA-4

O. S. Qureshi et al.

An inhibitory T cell receptor acts by stripping activating ligands off dendritic cells.

10.1126/science.1202947

Neuronal GPCR Controls Innate Immunity by Regulating Noncanonical Unfolded Protein Response Genes

J. Sun et al.

Two nematode worm neurons “smell” disease and promote resistance to pathogens.

10.1126/science.1203411

Observation of Orbital Currents in CuO

V. Scagnoli et al.

Resonant x-ray scattering is used to detect microscopic loop currents within the plane of cupric oxide.

10.1126/science.1201061

Orbital-Independent Superconducting Gaps in Iron-Pnictides

T. Shimajima et al.

Bulk photoemission studies of iron pnictides suggest a role for orbital fluctuations in creating the superconducting state.

10.1126/science.1202150

Venus’s Southern Polar Vortex Reveals Precessing Circulation

D. Luz et al.

Observations with the Venus Express Orbiter reveal complex polar atmospheric dynamics.

10.1126/science.1201629

TECHNICALCOMMENTS

Comment on “Calcareous Nannoplankton Response to Surface-Water Acidification Around Oceanic Event 1a”

S. J. Gibbs et al.

Full text at www.sciencemag.org/cgi/content/ful/332/6026/175-b

Response to Comment on “Calcareous Nannoplankton Response to Surface-Water Acidification Around Oceanic Event 1a”

E. Erba et al.

Full text at www.sciencemag.org/cgi/content/ful/332/6026/175-c

SCIENCENOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Tuberculosis Followed the Fur Trade

Genetic fingerprints reveal movement of deadly bacterium from Europeans to native Canadians.

<http://scim.ag/tb-fur>

The Curse of the Mummies’ Arteries

A new study traces the origins of heart disease in ancient Egypt.

<http://scim.ag/mummy-curse>

A Bacterium That Acts Like a Toothbrush

Oral microbe fights plaque buildup, could lead to development of better toothpaste.

<http://scim.ag/bug-tooth>

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

5 April issue: <http://scim.ag/ss040511>

RESEARCH ARTICLE: Poly(ADP-Ribose) (PAR) Binding to Apoptosis-Inducing Factor Is Critical for PAR Polymerase-1–Dependent Cell Death (Parthanatos)

Y. Wang et al.

Poly(ADP-ribose) binds to apoptosis-inducing factor to trigger its release from mitochondria and induce cell death.

RESEARCH ARTICLE: Confinement of Activating Receptors at the Plasma Membrane Controls Natural Killer Cell Tolerance

S. Guia et al.

PODCAST

S. Ugolini et al.

The responsiveness of activating NK cell receptors is determined by the distribution of inhibitory receptors.

PERSPECTIVE: ATM Is a Redox Sensor Linking Genome Stability and Carbon Metabolism

A. Krüger and M. Ralser

By linking genome stability, the cell cycle, and carbon catabolism, ATM emerges as a central regulator of cancer cell metabolism.

PERSPECTIVE: All Stressed Out Without ATM Kinase

J. J. P. Perry and J. A. Tainer

Oxidation activates ATM, allowing this kinase to mediate antioxidant responses.

PRESENTATION: Proteomic Analysis of Integrin Adhesion Complexes

A. Byron et al.

A workflow for the proteomic analysis of integrin-associated complexes reveals ligand-specific adhesion networks.

SCIENCE CAREERS

www.sciencereers.org/career_magazine

Free Career Resources for Scientists

Taken for Granted: Doctoral Candidate

B. L. Benderly

Postdoc-turned-politician Peter Ferguson hopes to bring his scientific insight to Canada’s federal Parliament.

http://scim.ag/tfg_ferguson

Q&A: Philip Phillips—A Roundabout Approach to Superconductivity

E. Pain

His unconventional training allowed theoretical condensed matter physicist Philip Phillips to tackle superconductivity using a novel and indirect approach.

<http://scim.ag/qaphillips>

>> *Superconductivity section p. 189*

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

6 April issue: <http://scim.ag/stm040611>

STATE OF THE ART REVIEW: Alzheimer’s Disease—The Challenge of the Second Century

D. M. Holtzman et al.

PODCAST

D. M. Holtzman and O. M. Smith

The first article in our State of the Art Review series explores the challenges of translating research advances into clinical treatments for Alzheimer’s disease.

RESEARCH ARTICLE: Genital HIV-1 RNA Predicts Risk of Heterosexual HIV-1 Transmission

J. M. Baeten et al.

PERSPECTIVE: HIV Transmission—Time for Translational Studies to Bridge the Gap

P. Anton and B. C. Herold

Genital HIV-1 RNA quantity predicts risk of heterosexual HIV-1 transmission independently of plasma HIV-1 concentration.

RESEARCH ARTICLE: CD44-SLC1A2 Gene Fusions in Gastric Cancer

J. Tao et al.

One partner of a fusion gene found in gastric cancer, CD44-SLC1A2, may contribute to the tumor’s abnormal metabolism.

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

On the 8 April Science Podcast: connecting disorder and stereotyping, GM-organic coexistence, stellar variations, 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 (6026)

Science **332** (6026), 145-257.

ARTICLE TOOLS

<http://science.sciencemag.org/content/332/6026>

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.