

SPECIAL SECTION

Crystallography at 100

INTRODUCTION

1091 Going from Strength to Strength

NEWS

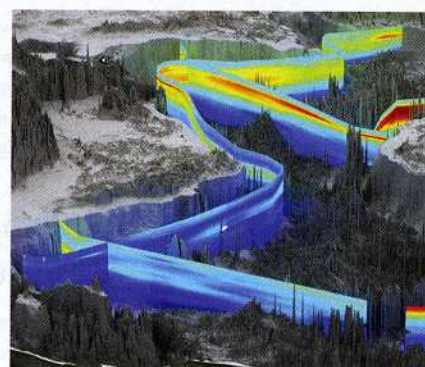
 1092 Dazzling History
 >> *Science Podcast*

1094 Gently Does It

REVIEWS

 1098 Cutting-Edge Techniques Used for the Structural Investigation of Single Crystals
J. A. K. Howard and M. R. Probert

 1102 Developments in X-ray Crystallographic Structure Determination of Biological Macromolecules
E. F. Garman

 1108 Femtosecond Crystallography with Ultrabright Electrons and X-rays: Capturing Chemistry in Action
R. J. D. Miller
 >> *Editorial p. 1057; News story p. 1072; Reports pp. 1133, 1137, and 1140; Science Express Research Article by H. Wu et al.; and Science Signaling Perspective by S. J. Smerdon at www.sciencemag.org/special/crystallography*


page 1070

EDITORIAL

 1057 Crystallography and Geopolitics
Gautam R. Desiraju
 >> *Crystallography at 100 section p. 1091*
NEWS OF THE WEEK

1062 A roundup of the week's top stories

NEWS & ANALYSIS

1065 Sabotaged Scientist Sues Yale and Her Lab Chief

 1067 A Bid to Thwart HIV With Shot of Long-Lasting Drug
 >> *Report p. 1151*

1068 Diet Studies Challenge Thinking on Proteins Versus Carbs

1069 Major Conservation Group Guts Science Team in Strategy Shift

1070 Chemical Atlas Shows Where Seas Are Tainted—And Where They Can Bloom

1071 Europe's Copernicus Offers a Daily Dose of Earth Data

NEWS FOCUS

 1072 Structural Biology Scales Down
 >> *Crystallography at 100 section p. 1091*
LETTERS

 1076 Small Telescopes, Big Rewards
W. B. Weaver

 A Safety Net for Diabetics
J. C. Javitt

 Supporting Mavericks
P. Andrews

1077 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

 1078 The Social Lives of Forests
S. B. Hecht et al., Eds., reviewed by T. Plieninger

 1079 The Dynamics of Disaster
S. W. Kieffer, reviewed by D. Turcotte
POLICY FORUM

 1080 Why Should We Care About Temporary Waterways?
V. Acuña et al.
PERSPECTIVES

 1082 The Secret Garden—Epigenetic Alleles Underlie Complex Traits
R. J. Schmitz
 >> *Report p. 1145*

 1083 CO Meets CO, One at a Time
M. Salmeron
 >> *Report p. 1120*

 1084 Water Loss from the Great Lakes
A. D. Gronewold and C. A. Stow

 1086 Feedback of the Magnetosphere
J. E. Borovsky
 >> *Report p. 1122*

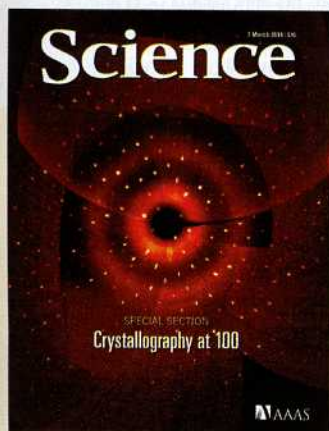
 1087 A Genomic Road Map for Complex Human Disease
P. K. Gregersen
 >> *Research Articles pp. 1118 and 1119*

 1088 Combating Evolution to Fight Disease
S. M. Rosenberg and C. Queitsch
CONTENTS continued >>
ON THE WEB THIS WEEK

 >> **Science Podcast**

Listen to stories on 100 years of crystallography, firming up the link between climate change and malaria, and more.

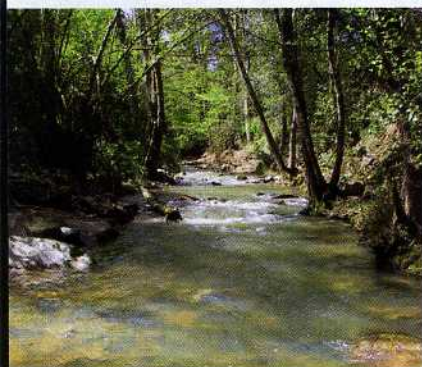
 >> **Find More Online**

 Check out *Science Express*, the weekly podcast, videos, daily news, our research journals, and *Science Careers* at www.sciencemag.org.

COVER

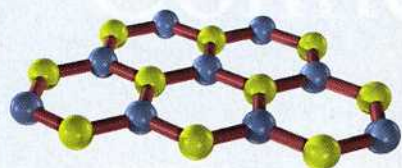
 Precession image reconstructed from x-ray diffraction data collected from a benzene single crystal. For the past 100 years, x-ray crystallography has been a key tool for determining the structures of ever more complex chemical and biochemical systems. See the special section beginning on page 1091 and at www.sciencemag.org/special/crystallography.

 Image: *Judith A. K. Howard and Michael R. Probert*
DEPARTMENTS

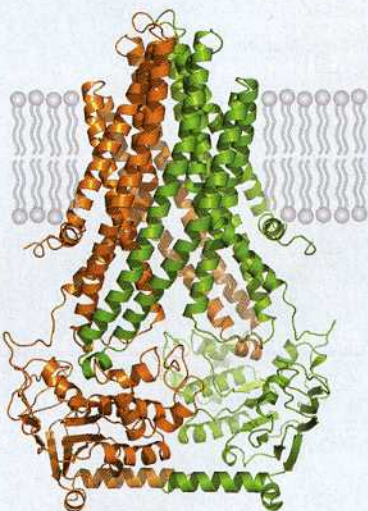
- 1055 This Week in *Science*
- 1058 Editors' Choice
- 1060 *Science Staff*
- 1159 New Products
- 1160 *Science Careers*



page 1080



page 1125



pages 1133 & 1137

RESEARCH ARTICLES

- 1117 **Dynamic Reorganization of River Basins**
S. D. Willett et al.
 A proxy for river elevation demonstrates the degree to which river networks reorganize and equilibrate.
Research Article Summary; for full text:
<http://dx.doi.org/10.1126/science.1248765>
- 1118 **Innate Immune Activity Conditions the Effect of Regulatory Variants upon Monocyte Gene Expression**
B. P. Fairfax et al.
 Analysis of the transcriptional responses during induced innate immune activity in primary human monocytes is explained.
Research Article Summary; for full text:
<http://dx.doi.org/10.1126/science.1246949>
- 1119 **Common Genetic Variants Modulate Pathogen-Sensing Responses in Human Dendritic Cells**
M. N. Lee et al.
 Mapping of human host-pathogen gene-by-environment interactions identifies pathogen-specific loci.
Research Article Summary; for full text:
<http://dx.doi.org/10.1126/science.1246980>
 >> *Perspective p. 1087*

REPORTS

- 1120 **Quantifying Molecular Stiffness and Interaction with Lateral Force Microscopy**
A. J. Weymouth et al.
 Lateral force microscopy reveals the torsional spring constant of a carbon monoxide molecule at the end of an atomic force microscope tip.
 >> *Perspective p. 1083*
- 1122 **Simultaneous Ground- and Space-Based Observations of the Plasmaspheric Plume and Reconnection**
B. M. Walsh et al.
 Ground-based and satellite observations show that a plume extends all the way to the magnetopause and can persist for hours.
 >> *Perspective p. 1086*
- 1125 **Tunable Phonon Polaritons in Atomically Thin van der Waals Crystals of Boron Nitride**
S. Dai et al.
 Infrared nanoimaging is used to detect a type of surface collective mode in a representative van der Waals crystal.

- 1129 **Rapid Reductions in North Atlantic Deep Water During the Peak of the Last Interglacial Period**
E. V. Gelaasen et al.
 Deep ocean circulation was less stable during the last interglacial periods than previously supposed.
- 1133 **Structural Basis for Heavy Metal Detoxification by an Atm1-Type ABC Exporter**
J. Y. Lee et al.
- 1137 **Crystal Structures of Nucleotide-Free and Glutathione-Bound Mitochondrial ABC Transporter Atm1**
V. Srinivasan et al.
 Structural and functional studies of ABC exporters provide insight into how glutathione derivatives are translocated.
 >> *Crystallography at 100 section p. 1091*
- 1140 **Mechanism of the C5 Stereoinsertion Reaction in the Biosynthesis of Carbapenem Antibiotics**
W.-C. Chang et al.
 Crystallography and spectroscopy detail a key mechanistic step in the microbial biosynthesis of an important antibiotic class.
 >> *Crystallography at 100 section p. 1091*
- 1145 **Mapping the Epigenetic Basis of Complex Traits**
S. Cortijo et al.
 Genetic mapping reveals epigenetic changes associated with flowering time and root length.
 >> *Perspective p. 1082*
- 1148 **A Single Gene Affects Both Ecological Divergence and Mate Choice in *Drosophila***
H. Chung et al.
 A methyl-branched cuticular hydrocarbon affects both desiccation resistance and mate choice in related *Drosophila* species.
- 1151 **Long-Acting Integrase Inhibitor Protects Macaques from Intrauterine Simian/Human Immunodeficiency Virus**
C. D. Andrews et al.
 Prolonged protection from repeated SHIV challenges is demonstrated in macaques.
 >> *News story p. 1067*
- 1154 **Altitudinal Changes in Malaria Incidence in Highlands of Ethiopia and Colombia**
A. S. Siraj et al.
 Warmer years promote malaria cases at higher altitudes.
 >> *Science Podcast*

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 © 2014 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.