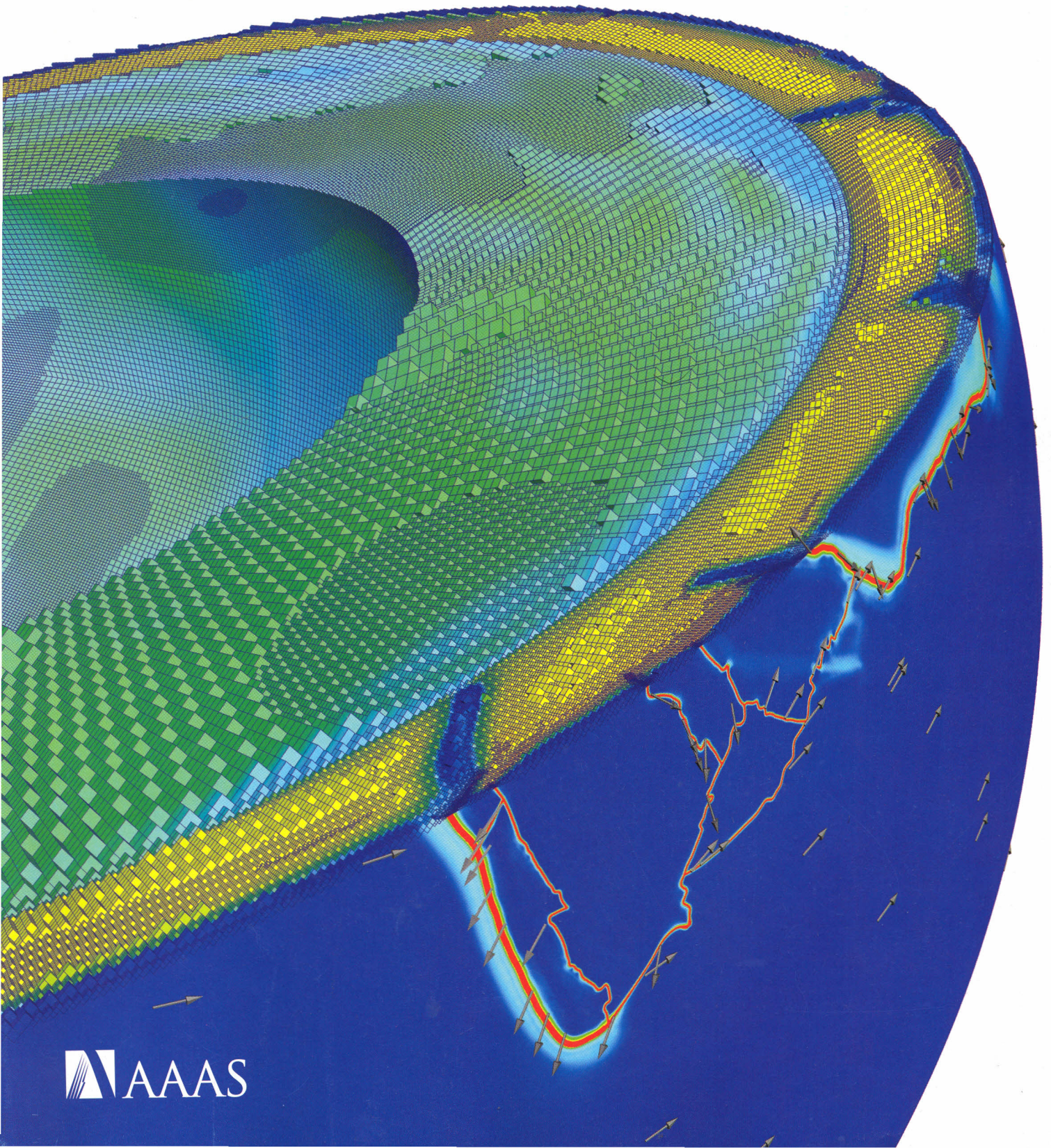


27 August 2010 | \$10

# Science



## EDITORIAL

- 996 What Is STEM Education?  
*Rodger W. Bybee*

## NEWS OF THE WEEK

- 1000 New XMRV Paper Looks Good, Skeptics Admit—Yet Doubts Linger
- 1001 Hard Summer for Corals Kindles Fears for Survival of Reefs
- 1002 Astronomers Hope Their Prize Telescope Isn't Blinded by the Light
- 1003 U.S. Physicists Eye Australia for New Site of Gravitational-Wave Detector
- 1004 To Scientists' Dismay, Mixed-Up Cell Lines Strike Again
- 1005 From *Science's* Online Daily News Site
- 1006 Organizers Panned for Omitting Israelis From Meeting in Jordan
- 1006 NSF Turns Math Earmark on Its Ear to Fund New Institute
- 1007 From the *Science* Policy Blog

## NEWS FOCUS

- 1008 Google Earth Shows Clandestine Worlds  
*>> Science Podcast*
- 1010 From Pigs to People:  
The Emergence of a New Superbug

## LETTERS

- 1012 Dietary Restriction:  
Standing Up for Sirtuins  
*J. A. Baur et al.*
- Response  
*L. Fontana and L. Partridge*
- Response  
*V. D. Longo*
- Dietary Restriction:  
Theory Fails to Satiety  
*L. Hayflick*
- Response  
*L. Fontana et al.*

- 1013 TECHNICAL COMMENT ABSTRACTS

## BOOKS ET AL.

- 1016 Teaching Children Science  
*S. G. Kohlstedt, reviewed by M. V. Barrow Jr.*
- 1017 The Invisible Gorilla  
*C. Chabris and D. Simons, reviewed by A. Oliva*

## POLICY FORUM

- 1018 Scenario-Building for the Deepwater Horizon Oil Spill  
*G. E. Machlis and M. K. McNutt*

## PERSPECTIVES

- 1020 Fine-Scale Modeling of Global Plate Tectonics  
*T. Becker*  
*>> Research Article p. 1033*
- 1021 Prime, Boost, and Broaden  
*R. W. Doms*  
*>> Report p. 1060*
- 1022 Decisions Made Better  
*M. O. Ernst*  
*>> Report p. 1081*
- 1024 Microenvironment Mimicry  
*M. Bhatia*  
*>> Report p. 1078*
- 1025 Opening the Door to Peptide-Based Porous Solids  
*P. A. Wright*  
*>> Report p. 1053*
- 1026 Looking Inside Adenovirus  
*S. C. Harrison*  
*>> Research Article p. 1038; Report p. 1071*

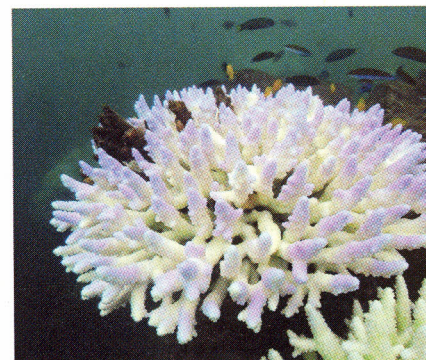
## SCIENCE PRIZE ESSAY

- 1028 The Universe Online  
*M. J. Raddick and A. S. Szalay*

## BREVIA

- 1032 CoRoT Reveals a Magnetic Activity Cycle in a Sun-Like Star  
*R. A. García et al.*  
Observations of a distant star reveal a magnetic activity cycle similar to that of the Sun.

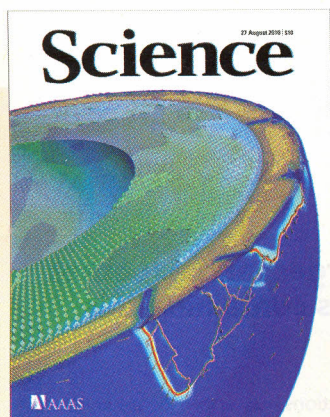
CONTENTS continued >>



page 1001



page 1016



## COVER

Dynamic interaction of tectonic plates in the southwest Pacific Ocean computed from a flow model of Earth's interior (arrows show predicted velocity). The computational mesh, for which color represents viscosity (yellow, softer; blue, stiffer), is refined to resolve the forces in the deep mantle that are coupled directly into the edges of plates through narrow slabs. Red lines indicate low-viscosity zones corresponding to plate boundaries. See page 1033.

Image: Georg Stadler, The University of Texas at Austin

## DEPARTMENTS

- 995 This Week in *Science*
- 997 Editors' Choice
- 998 *Science* Staff
- 999 Random Samples
- 1030 AAAS News & Notes
- 1089 New Products
- 1090 *Science* Careers

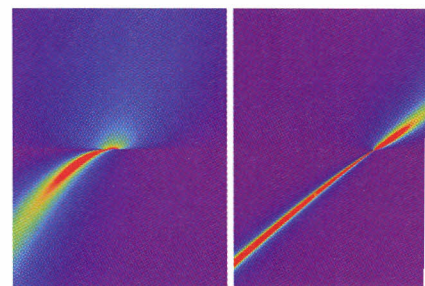
## RESEARCH ARTICLES

- 1033 The Dynamics of Plate Tectonics and Mantle Flow: From Local to Global Scales**  
G. Stadler et al.  
Computational advances enable the modeling of global geophysical processes to the scale of a kilometer.  
>> *Perspective p. 1020*
- 1038 Atomic Structure of Human Adenovirus by Cryo-EM Reveals Interactions Among Protein Networks**  
H. Liu et al.  
High-resolution structures provide a basis for optimizing adenovirus as a vaccine and gene-therapy vector.  
>> *Perspective p. 1026; Report p. 1071*

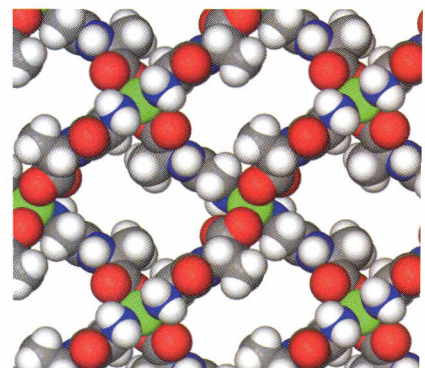
## REPORTS

- 1043 Strange Metal Transport Realized by Gauge/Gravity Duality**  
T. Faulkner et al.  
Black hole theory is used to develop a mathematical description of a class of metals with unusual electronic properties.
- 1047 Dynamical Instability Produces Transform Faults at Mid-Ocean Ridges**  
T. Gerya  
Transform faults on the sea floor are rotated and stretched sections of the mid-ocean ridge.
- 1050 The Chlorine Isotope Composition of the Moon and Implications for an Anhydrous Mantle**  
Z. D. Sharp et al.  
The range of chlorine isotope values of the Moon is distinct from those of Earth and meteorites, indicating that the Moon is dry.
- 1053 An Adaptable Peptide-Based Porous Material**  
J. Rabone et al.  
Conformational changes in a porous material during the sorption of small molecules lead to a dynamic increase in porosity.  
>> *Perspective p. 1025*
- 1057 Trapping a Diradical Transition State by Mechanochemical Polymer Extension**  
J. M. Lenhardt et al.  
Strained carbon rings in the backbone of a polymer can be opened by external application of shear forces.
- 1060 Induction of Broadly Neutralizing H1N1 Influenza Antibodies by Vaccination**  
C.-J. Wei et al.  
An influenza virus vaccine elicits a broadly neutralizing, cross-protective antibody response in mice, ferrets, and nonhuman primates.  
>> *Perspective p. 1021*
- 1065 Secreted Peptide Signals Required for Maintenance of Root Stem Cell Niche in *Arabidopsis***  
Y. Matsuzaki et al.  
Short-range signaling by sulfated peptides maintains root stem cells.
- 1068 Genomic Comparison of the Ants *Camponotus floridanus* and *Harpegnathos saltator***  
R. Bonasio et al.  
Comparison reveals the epigenetic controls on caste development in ants.  
>> *Science Podcast*
- 1071 Crystal Structure of Human Adenovirus at 3.5 Å Resolution**  
V. S. Reddy et al.  
High-resolution structures provide a basis for optimizing adenovirus as a vaccine and gene-therapy vector.  
>> *Perspective p. 1026; Research Article p. 1038*
- 1075 Insects Betray Themselves in Nature to Predators by Rapid Isomerization of Green Leaf Volatiles**  
S. Allmann and I. T. Baldwin  
Damage caused by a caterpillar releases compounds that are transformed by the pest's saliva into a predator attractant.
- 1078 Substrate Elasticity Regulates Skeletal Muscle Stem Cell Self-Renewal in Culture**  
P. M. Gilbert et al.  
Muscle stem cells prefer a soft substrate.  
>> *Perspective p. 1024*
- 1081 Optimally Interacting Minds**  
B. Bahrami et al.  
Sharing choices and confidence in those choices can be an empowering experience.  
>> *Perspective p. 1022*
- 1085 Phosphatidic Acid Is a pH Biosensor That Links Membrane Biogenesis to Metabolism**  
B. P. Young et al.  
Lipid signaling in yeast is regulated by intracellular pH.

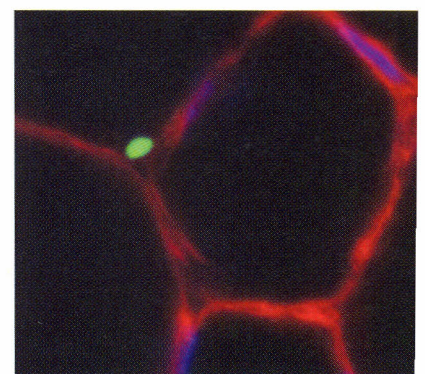
CONTENTS continued &gt;&gt;



page 1043



pages 1025 &amp; 1053



pages 1024 &amp; 1078

## SCIENCEONLINE

## SCIENCEEXPRESS

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

**Mitotic Recombination in Patients with Ichthyosis Causes Reversion of Dominant Mutations in *KRT10***  
*K. A. Choate et al.*

Patches of normal skin in patients with a rare skin disorder are due to cells that have lost the disease-causing mutation.  
10.1126/science.1192280

**Freezing Tolerance in Plants Requires Lipid Remodeling at the Outer Chloroplast Membrane**  
*E. R. Moellering et al.*

An enzyme that remodels galactolipids protects chloroplasts against freeze damage in *Arabidopsis thaliana*.  
10.1126/science.1191803

**$\alpha$ -Synuclein Promotes SNARE-Complex Assembly in Vivo and in Vitro**  
*J. Burré et al.*

A protein implicated in neurodegeneration promotes the assembly of membrane fusion complexes.  
10.1126/science.1195227

**Kepler-9: A System of Multiple Planets Transiting a Sun-Like Star, Confirmed by Timing Variations**  
*M. J. Holman et al.*

Two Saturn-sized planets show variations in the times they take to transit their star due to gravitational interaction.  
10.1126/science.1195778

>> *Science Podcast*

**Deep-Sea Oil Plume Enriches Indigenous Oil-Degrading Bacteria**

*T. C. Hazen et al.*  
Cold-loving bacteria biodegrade hydrocarbons in the oil plume faster than expected.  
10.1126/science.1195979

## TECHNICALCOMMENTS

**Comment on "A Southern Tyrant Reptile"**  
*M. C. Herne et al.*  
Full text at [www.sciencemag.org/cgi/content/full/329/5995/1013-c](http://www.sciencemag.org/cgi/content/full/329/5995/1013-c)

**Response to Comment on "A Southern Tyrant Reptile"**  
*R. B. J. Benson et al.*

Full text at [www.sciencemag.org/cgi/content/full/329/5995/1013-d](http://www.sciencemag.org/cgi/content/full/329/5995/1013-d)

## SCIENCENOW

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

Highlights From Our Daily News Coverage

**Hair Follicles Track the Body's Clock**  
Researchers follow sleep-wake cycles by plucking hairs from scalps and beards.

**Tapping Tesla to Save Trapped Miners**  
Century-old technology uses magnetic waves to communicate through rock.

**You Are Now Free to Move About the Insect**  
Researchers discover how flies settle on a comfortable cruising altitude.

## SCIENCESIGNALING

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

The Signal Transduction Knowledge Environment

**RESEARCH ARTICLE: Self-Induced Patched Receptor Down-Regulation Modulates Cell Sensitivity to the Hedgehog Morphogen Gradient**

*A. Casali*

A self-regulating receptor allows cells to maintain the appropriate balance of ligand-bound and unbound receptors.

**RESEARCH ARTICLE: Akt-RSK-S6-Kinase Signaling Networks Activated by Oncogenic Receptor Tyrosine Kinases**

*A. Moritz et al.*

## PODCAST

*M. J. Comb and A. M. VanHook*

A phosphoproteomic analysis of signaling pathways downstream of oncogenic receptor tyrosine kinases identifies potential therapeutic targets.

**RESEARCH ARTICLE: A Direct and Functional Interaction Between  $G_q$  and Rab5 During G Protein-Coupled Receptor Signaling**

*V. Purvanov et al.*

Regulation of a small GTPase by a heterotrimeric G protein determines the outcome of signaling from the receptor Frizzled.

**PERSPECTIVE: Bridging the Synaptic Cleft—Lessons from Orphan Glutamate Receptors**

*S. M. Schmid and M. Hollmann*

Three proteins act as a transsynaptic bridge at a major type of cerebellar synapse.

## SCIENCECAREERS

[www.sciencereers.org/career\\_magazine](http://www.sciencereers.org/career_magazine)  
Free Career Resources for Scientists

**Making Team Science Work: Advice From a Team**  
*K. Hede*

A long-term commitment and an ego-free workplace allow the Yale Melanoma Research Group to excel.

**Experimental Error: All That Glitters Is All We Remember**

*A. Ruben*

Why are we most fascinated by the irrelevant aspects of science?

## SCIENTETRANSLATIONAL MEDICINE

[www.sciencetranslationalmedicine.org](http://www.sciencetranslationalmedicine.org)  
Integrating Medicine and Science

**EDITORIAL: Advancing Science, Promoting Peace**

*P. C. Agre and V. Turekian*

Despite political differences, scientific diplomacy can help to bridge disparate cultures.

**PERSPECTIVE: Recommendations for Biomarker Identification and Qualification in Clinical Proteomics**

*H. Mischak et al.*

Recommendations about structuring proteomic biomarker studies should increase the probability that such markers will be clinically useful.



SCIENCESIGNALING  
Bridging the synaptic cleft.

**RESEARCH ARTICLE: A Biosynthetic Alternative to Human Donor Tissue for Inducing Corneal Regeneration: 24-Month Follow-Up of a Phase 1 Clinical Study**

*P. Fagerholm et al.*

A biosynthetic cornea is stably integrated with host tissues for 2 years after implantation and produces nerve regeneration and vision improvement.

**RESEARCH ARTICLE: Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS): A Multiorgan Antiviral T Cell Response**

*D. Picard et al.*

A dangerous drug reaction may be caused by a severe immune response to reactivated resident herpes viruses.

## SCIENCEPODCAST

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

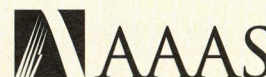
Download the 27 August *Science* Podcast to hear about modeling the epigenetics of aging and behavior, multiple planets discovered around a Sun-like star, using satellite images for archaeological research, and more.

## SCIENCEINSIDER

[news.sciencemag.org/scienceinsider](http://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 © 2010 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): \$146 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$910; 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 \$20.00 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