

SPECIAL SECTION

H5N1

INTRODUCTION

1521 H5N1

POLICY FORUMS AND PERSPECTIVES

1522 Benefits and Risks of Influenza Research: Lessons Learned
A. S. Fauci and F. S. Collins

1523 Regulating the Boundaries of Dual-Use Research
M. S. Frankel

1525 Implementing the New U.S. Dual-Use Policy
C. D. Wolinetz

1527 Securing Medical Research: A Cybersecurity Point of View
B. Schneier

1529 Evolution, Safety, and Highly Pathogenic Influenza Viruses
M. Lipsitch et al.

1531 Influenza: Options to Improve Pandemic Preparation
R. Rappuoli and P. R. Dormitzer

REPORTS

1534 Airborne Transmission of Influenza A/H5N1 Virus Between Ferrets
S. Herfst et al.

1541 The Potential for Respiratory Droplet-Transmissible A/H5N1 Influenza Virus to Evolve in a Mammalian Host
C. A. Russell et al.

>> *News story p. 1494; Science Podcast at http://scim.ag/H5N1_Flu*

EDITORIAL

1482 Universities, Key to Prosperity
Charles O. Holliday
>> *News story p. 1491*

NEWS OF THE WEEK

1486 A roundup of the week's top stories

NEWS & ANALYSIS

1489 Young Researchers Deserve More Support, Reviews Say

1490 Action Urged to Curb Racial Bias in NIH Grants

1491 Panel Says More Money, Fewer Rules Are Best Ways to Stay Ahead of Pack
>> *Editorial p. 1482*

1492 NASA's New X-ray Satellite Packs Compact Power

1493 Second Bacterium Theory Stirs Haiti's Cholera Controversy

1494 Public at Last, H5N1 Study Offers Insight Into Virus's Possible Path to Pandemic For Young Scientists, A Wild Ride How Much Longer Will Moratorium Last?
>> *H5N1 section p. 1521*

NEWS FOCUS

1498 Hang On! Curiosity Is Plunging Onto Mars
>> *Science Podcast*

1500 Could a Whiff of Methane Revive the Exploration of Mars?

LETTERS

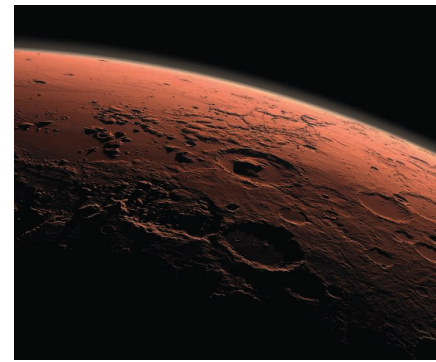
1504 Community Colleges: Veterans' Best Bet
R. Murphy

An Eye Toward Iodine in China
G. R. DeLong

Chile's Research Planning Aims High
J. M. Aguilera

1506 CORRECTIONS AND CLARIFICATIONS

1506 TECHNICAL COMMENT ABSTRACTS



page 1498

BOOKS ET AL.

1507 Consciousness
C. Koch, reviewed by S. Dehaene

1507 Browsings

1508 Imagine
J. Lehrer, reviewed by A. Vlasits

EDUCATION FORUM

1509 Engaging Teachers, Scientists, and Multimedia to Promote Learning
D. Liu et al.

PERSPECTIVES

1510 Entangling Superconductivity and Antiferromagnetism
S. Sachdev
>> *Report p. 1554*

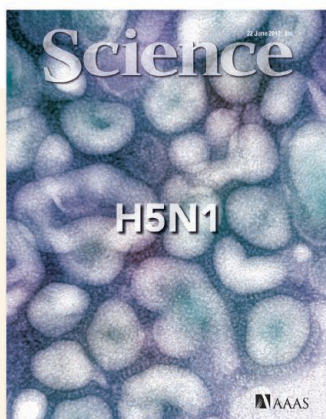
1511 A Unifying Role for Prions in Neurodegenerative Diseases
S. B. Prusiner

1513 Genetic Events That Shape the Cancer Epigenome
R. J. H. Ryan and B. E. Bernstein

1515 Primed to Remember
D. Hewak and B. Gholipour
>> *Report p. 1566*

1516 Biotic Multipliers of Climate Change
P. L. Zarnetske et al.

CONTENTS continued >>



COVER

False-colored transmission electron microscopy image of avian H5N1 influenza virus isolated in Hong Kong (field-of-view width ~260 nm). A highly pathogenic influenza subtype is currently pandemic among the world's wild birds, with serious outbreaks occurring in domestic poultry. Concern about the possibility of the virus evolving into a human pandemic threat has prompted controversial research on mutations that facilitate airborne infection between mammals. See the special section beginning on page 1521 for details of the scientific investigations and policy.

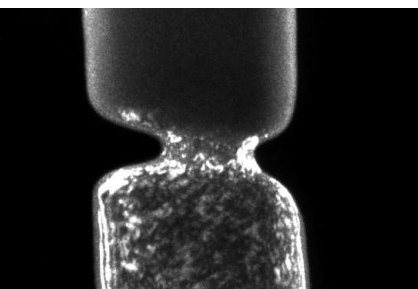
Image: Dr. Gopal Murti/Visuals Unlimited, Inc.

DEPARTMENTS

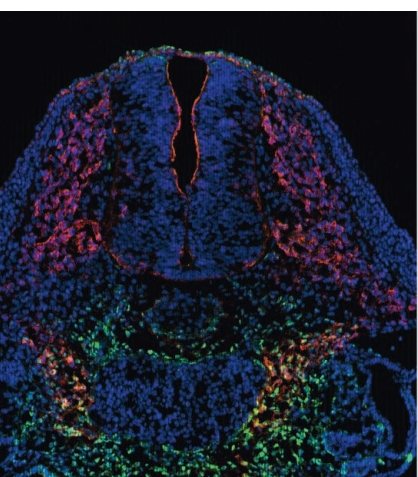
- 1480 This Week in *Science*
- 1483 Editors' Choice
- 1485 *Science* Staff
- 1599 New Products
- 1600 *Science* Careers



pages 1518 & 1573



page 1561



page 1578

- 1518** Carbon from Tropical Deforestation
D. J. Zarin
>> Report p. 1573
- 1519** Wnt Regulates TERT—Putting the Horse Before the Cart
C. W. Greider
>> Research Article p. 1549

RESEARCH ARTICLE

- 1549** Wnt/ β -Catenin Signaling Regulates Telomerase in Stem Cells and Cancer Cells
K. Hoffmeyer et al.
A molecular link exists between two key regulators of the “undifferentiated” state of proliferative cells.
>> Perspective p. 1519

REPORTS

- 1554** A Sharp Peak of the Zero-Temperature Penetration Depth at Optimal Composition in $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)_2$
K. Hashimoto et al.
A quantum critical point may be lurking inside the superconducting dome of a pnictide series.
>> Perspective p. 1510
- 1557** Electromechanical Properties of Graphene Drumheads
N. N. Klimov et al.
Mechanical straining of suspended graphene films leads to confinement of charge carriers into quantum dots.
- 1561** Electrical Wind Force–Driven and Dislocation-Templated Amorphization in Phase-Change Nanowires
S.-W. Nam et al.
The transition from crystalline to amorphous states in a phase-change material may not require a melting process.
- 1566** Breaking the Speed Limits of Phase-Change Memory
D. Loke et al.
A constant applied voltage causes preordering and accelerates phase changes in $\text{Ge}_2\text{Sb}_2\text{Te}_5$, leading to faster switching.
>> Perspective p. 1515
- 1570** Roton-Type Mode Softening in a Quantum Gas with Cavity-Mediated Long-Range Interactions
R. Mottl et al.
Low-energy excitations of the type present in superfluid helium are observed in a cold gas of rubidium atoms.
- 1573** Baseline Map of Carbon Emissions from Deforestation in Tropical Regions
N. L. Harris et al.
Tropical deforestation and degradation across three continents led to ~0.8 petagrams of yearly carbon emissions from 2000 to 2005.
>> Perspective p. 1518
- 1576** Endophytic Insect-Parasitic Fungi Translocate Nitrogen Directly from Insects to Plants
S. W. Behie et al.
A fungal plant symbiont also consumes insects in surrounding soil and transfers animal nitrogen to the plant’s roots.
- 1578** The Dorsal Aorta Initiates a Molecular Cascade That Instructs Sympatho-Adrenal Specification
D. Saito et al.
Morphogenetic proteins provided by the dorsal aorta control early and late processes in neurovascular development.
- 1581** Membrane Fusion Intermediates via Directional and Full Assembly of the SNARE Complex
J. M. Hernandez et al.
During vesicle membrane fusion, straining of lipids at the edges of an extended contact zone may initiate fusion.
- 1585** The Fission Yeast FANCM Ortholog Directs Non-Crossover Recombination During Meiosis
A. Lorenz et al.
- 1588** FANCM Limits Meiotic Crossovers
W. Crismani et al.
A homolog of a human Fanconi anemia complementation group protein is involved in controlling crossing over during meiosis.
- 1590** Septin-Mediated Plant Cell Invasion by the Rice Blast Fungus, *Magnaporthe oryzae*
Y. F. Dagdas et al.
A plant pathogen mechanically ruptures cell walls in rice leaves to enter the plant cells and initiate infection.
- 1595** The *lac* Repressor Displays Facilitated Diffusion in Living Cells
P. Hammar et al.
The *lac* repressor slides along DNA in living cells, frequently passing its operator before binding.

SCIENCEONLINE

SCIENCEEXPRESS

www.sciencexpress.org

2.8 Million Years of Arctic Climate Change from Lake El'gygytgyn, NE Russia

M. Melles et al.

A sediment core from a Russian lake provides a high-latitude climate record where prior terrestrial records have been sparse.

10.1126/science.1222135

Kepler-36: A Pair of Planets with Neighboring Orbits and Dissimilar Densities

J. A. Carter et al.

The Kepler spacecraft detected a super-Earth and a Neptune-like planet in very tightly spaced orbits around the same star.

10.1126/science.1223269

Identifying Influential and Susceptible Members of Social Networks

S. Aral and D. Walker

A randomized experiment based on product adoption among Facebook friends identified trend setters and followers.

10.1126/science.1215842

>> [Science Podcast](#)

Human α -Defensin 6 Promotes Mucosal Innate Immunity Through Self-Assembled Peptide Nanonets

H. Chu et al.

Rather than killing bacteria directly, a gut antimicrobial peptide forms netlike structures that ensnare invading bacteria.

10.1126/science.1218831

Deformations Within Moving Kinetochores Reveal Different Sites of Active and Passive Force Generation

S. Dumont et al.

Distinct active, force-generating and passive, frictional interactions with microtubules allow processive chromosome movement.

10.1126/science.1221886

PI4P and PI(4,5)P₂ Are Essential But Independent Lipid Determinants of Membrane Identity

G. R. V. Hammond et al.

The phospholipid phosphatidylinositol 4-phosphate defines important physical properties of the cell membrane.

10.1126/science.1222483

TECHNICALCOMMENTS

Comment on "Seroevidence for H5N1 Influenza Infections in Humans: Meta-Analysis"

M. D. Van Kerkhove et al.

Full text at www.sciencemag.org/cgi/content/full/336/6088/1506-b

Response to Comment on "Seroevidence for H5N1 Influenza Infections in Humans: Meta-Analysis"

T. T. Wang and P. Palese

Full text at www.sciencemag.org/cgi/content/full/336/6088/1506-c

SCIENCENOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Computer Program 'Evolves' Music From Noise

DarwinTunes helps explain how composers refine their compositions based on audience input.

http://scim.ag/DarwinTunes_Composers

Stem Cells Move Into Prime Time

Two promising studies head toward clinical research.

http://scim.ag/Promising_Studies

You Owe Your Life to Rock

The erosion of metal-rich granite long ago set the stage for multicellular organisms.

http://scim.ag/Life_Rock

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

19 June issue: <http://scim.ag/ss061912>

RESEARCH ARTICLE: Direct Modification and Activation of a Nuclear Receptor-PIP₂ Complex by the Inositol Lipid Kinase IPMK

R. D. Blind et al.

PODCAST

H. A. Ingraham et al.

The transcriptional activity of a nuclear receptor is regulated by the phosphorylation status of a bound lipid.

RESEARCH ARTICLE: Histone Deacetylases 6 and 9 and Sirtuin-1 Control Foxp3⁺ Regulatory T Cell Function Through Shared and Isoform-Specific Mechanisms

U. H. Beier et al.

Combined inhibition of distinct histone deacetylases enhances the suppressive effects of regulatory T cells.

PERSPECTIVE: How Growth Abnormalities Delay "Puberty" in *Drosophila*

I. K. Hariharan

An insulin-like peptide delays metamorphosis of the fruit fly in response to injury or tissue overgrowth.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

20 June issue: <http://scim.ag/stm062012>

RESEARCH ARTICLE: DNazyme Targeting *c-jun* Suppresses Skin Cancer Growth

H. Cai et al.

FOCUS: Resurrecting DNazymes as Sequence-Specific Therapeutics

J. S. Rossi et al.

Catalytic DNA molecules that target the transcription factor *c-jun* inhibit skin cancer growth in mice.

RESEARCH ARTICLE: The Structural Basis for Serotype-Specific Neutralization of Dengue Virus by a Human Antibody

E. P. Teoh et al.

The mechanism of action of a serotype-specific natural human antibody against dengue virus has been identified.

RESEARCH ARTICLE: mTOR Inhibitors Synergize on Regression, Reversal of Gene Expression, and Autophagy in Hepatocellular Carcinoma

H. A. Thomas

Combination therapy causes gene reprogramming, autophagy, and tumor regression in a mouse model approximating human HCC.

RESEARCH ARTICLE: Recombinant MG53 Protein Modulates Therapeutic Cell Membrane Repair in Treatment of Muscular Dystrophy

N. Weisleder et al.

FOCUS: A Molecular Bandage for Diseased Muscle

D. J. Burkin and R. D. Wuebbles

Recombinant human MG53 protein can increase membrane repair after injury in cells and can reduce pathology in animal models of muscle injury and muscular dystrophy.

SCIENCE CAREERS

www.sciencereers.org/career_magazine

Free Career Resources for Scientists

Can NIH Renovate the Biomedical Workforce?

M. Price

An NIH committee recommends overhauling training, increasing postdoc pay, and improving and expanding staff scientist positions.

<http://scim.ag/RenovateWorkforce>

Career Q&A: Equality for Quality

E. Pain

Curt Rice of the University of Tromsø discusses why helping women prepare for promotion is both right and smart.

http://scim.ag/QA_CurtRice

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

On the 22 June *Science* Podcast: biosecurity and scientific publishing, influence on a social network, Curiosity's martian arrival, 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 © 2012 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.



ADVANCING SCIENCE. SERVING SOCIETY

Science

336 (6088)

Science **336** (6088), 1480-1599.

ARTICLE TOOLS

<http://science.sciencemag.org/content/336/6088>

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.