

## COVER

Graphic representation of an integrated quantum optics controlled-NOT chip. Single photons (represented as flashes) propagate on the chip, confined by silica waveguides, and are then coupled into optical fibers for detection. See page 646.

*Image: W. Amery/Bristol University*

## DEPARTMENTS

- 579 Science Online
- 581 This Week in *Science*
- 586 Editors' Choice
- 588 Contact *Science*
- 591 Random Samples
- 593 Newsmakers
- 682 New Products
- 683 Science Careers

## EDITORIAL

- 585 Misbegotten Preemptions  
*by Donald Kennedy*

## NEWS OF THE WEEK

- Spotted Owl Recovery Plan Flawed, Review Panel Finds 594
- Mother Nature Cools the Greenhouse, but Hotter Times Still Lie Ahead 595
- Louise Slaughter Interview: How to Get a Genetic Protection Law Through Congress? Keep Trying 596
- Yosemite: Protected but Not Preserved 597

### SCIENCE SCOPE

- Dispute Clouds the Future of U.S. Naval Lab in Indonesia 598
- Fossils Help Figure Out Food Webs Old and New 598

## NEWS FOCUS

- A Bruising Battle Over Lung Scans 600  
*A Bumper Crop of Conflicts*
- Neil Turok: Wishing for an African Einstein 604  
*An African Showcase for Math Studies*
- Two Teams Report Progress in Reversing Loss of Sight 606
- American Association of Physical Anthropologists Meeting 608  
*Tuberculosis Jumped From Humans to Cows, Not Vice Versa*  
*Australopithecus* Not Much of a Nutcracker  
*Snapshots From the Meeting*



## LETTERS

- Ensuring Food Security *P. Wojtkowski* 611  
*Response M. E. Brown et al.*
- Coarse-Resolution Models Only Partly Cloudy  
*K. R. Sperber et al.*  
*Response H. Miura et al.*

## CORRECTIONS AND CLARIFICATIONS

612

## BOOKS ET AL.

- The Neuroscience of Fair Play** Why We (Usually) Follow the Golden Rule 614  
*D. W. Pfaff, reviewed by P. Ak*
- Folk Psychological Narratives** The Sociocultural Basis of Understanding Reasons 615  
*D. D. Hutto, reviewed by E. Myin*

## POLICY FORUM

- Linking Natural Resources to Slow Growth and More Conflict 616  
*C. N. Brunnenschweiler and E. H. Bulte*

## PERSPECTIVES

- High-Performance Transistors by Design 618  
*X. Guo and S. R. P. Silva*
- How Frustration Leads to Inflammation 619  
*L. A. J. O'Neill*  
*>> Report p. 674*
- Synchronized Self-Assembly 620  
*J. S. Moore and M. L. Kraft*
- How Reefs Respond to Mass Coral Spawning 621  
*J. Guest*
- A Unified Picture of Laser Physics 623  
*J. Bravo-Abad and M. Soljačić*  
*>> Report p. 643*
- The Paradox of Silent Heterochromatin 624  
*I. Djupedal and K. Ekwall*



620



## SCIENCE EXPRESS

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

### MATERIALS SCIENCE

#### Dislocation-Driven Nanowire Growth and Eshelby Twist

*M. J. Bierman, Y. K. A. Lau, A. V. Kvit, A. L. Schmitt, S. Jin*

A screw dislocation drives the growth of a nanowire pine tree, in which branches regularly extend from the trunk in a spiral, confirming Eshelby's theory of dislocations.

10.1126/science.1157131

### MEDICINE

#### A Polymorphism Within the *G6PC2* Gene Is Associated with Fasting Plasma Glucose Levels

*N. Bouatia-Naji et al.*

Variation in a gene for a protein in the pancreas may help explain why people have different levels of fasting blood glucose, a factor that affects disease risk.

10.1126/science.1156849

### MOLECULAR BIOLOGY

#### The Transcriptional Landscape of the Yeast Genome Defined by RNA Sequencing

*U. Nagalakshmi et al.*

A more complete catalog of transcribed DNA of yeast is assembled by shotgun sequencing of messenger RNA and reveals numerous previously unknown transcribed regions.

10.1126/science.1158441

### CELL BIOLOGY

#### The Serine Protease *TMPRSS6* Is Required to Sense Iron Deficiency

*X. Du et al.*

A cell-surface enzyme that cleaves proteins is unexpectedly necessary for sensing when iron levels are low and thereby triggering compensatory absorption of iron from food.

10.1126/science.1157121

## TECHNICAL COMMENT ABSTRACTS

### APPLIED PHYSICS

#### Comment on "Long-Lived Giant Number Fluctuations in a Swarming Granular Nematic" 612

*I. S. Aranson, A. Snezhko, J. S. Olafsen, J. S. Urbach*

full text at [www.sciencemag.org/cgi/content/full/320/5876/612c](http://www.sciencemag.org/cgi/content/full/320/5876/612c)

#### Response to Comment on "Long-Lived Giant Number Fluctuations in a Swarming Granular Nematic"

*V. Narayan, S. Ramaswamy, N. Menon*

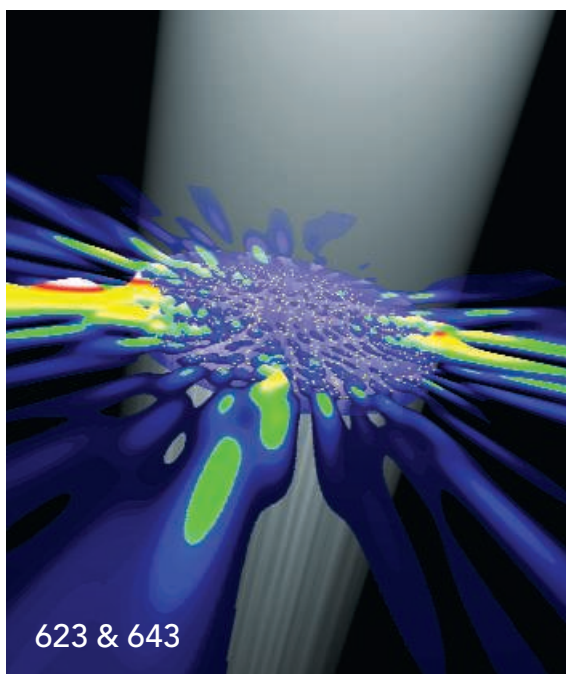
full text at [www.sciencemag.org/cgi/content/full/320/5876/612d](http://www.sciencemag.org/cgi/content/full/320/5876/612d)

## REVIEW

### GEOPHYSICS

#### Structure and Dynamics of Earth's Lower Mantle 626

*E. J. Garnero and A. K. McNamara*



623 & 643

## BREVIA

### CLIMATE CHANGE

#### Fire-Derived Charcoal Causes Loss of Forest Humus 629

*D. A. Wardle, M.-C. Nilsson, O. Zackrisson*

Charcoal enhances the microbial activity in soils, which in turn decreases the amount of carbon and humus in forests over time.

## RESEARCH ARTICLES

### NEUROSCIENCE

#### A Specialized Forebrain Circuit for Vocal Babbling 630

*D. Aronov, A. S. Andalman, M. S. Fee*

The babbling of young zebra finches learning to sing is produced by a brain region distinct from the adult song center, a pattern that may also apply to other motor systems.

### MATERIALS SCIENCE

#### High-Thermoelectric Performance of Nanostructured Bismuth Antimony Telluride Bulk Alloys 634

*B. Poudel et al.*

Milling a thermoelectric alloy, which produces electricity from a thermal gradient, into a nanopowder, then pressing it into a bulk form, greatly improves its performance.

## REPORTS

### PHYSICS

#### Coherent Control of Decoherence 638

*M. P. A. Branderhorst et al.*

Iterative shaping of a laser pulse using feedback from a fluorescence signal extends the phase stability of a molecular vibration in the face of rotational jostling.

### PHYSICS

#### Strong Interactions in Multimode Random Lasers 643

*H. E. Türeci, L. Ge, S. Rotter, A. D. Stone*

A theoretical approach describes lasing in strongly disordered media where multiple excitation modes may switch on and off to emit light over a range of wavelengths.

>> *Perspective p. 623*

CONTENTS continued >>

## REPORTS CONTINUED...

### APPLIED PHYSICS

#### Silica-on-Silicon Waveguide Quantum Circuits 646

A. Politi, M. J. Cryan, J. G. Rarity, S. Yu, J. L. O'Brien

Quantum circuits—in which individual photons interfere, entangle, and form logic gates—have been realized on silicon chips.

### CHEMISTRY

#### Practical Synthesis of Prostratin, DPP, and Their Analogs, Adjuvant Leads Against Latent HIV 649

P. A. Wender, J.-M. Kee, J. M. Warrington

A four-step synthesis starting from an abundant natural material yields large quantities of prostratin, a scarce natural product that may be useful in combating HIV.

### OCEAN SCIENCE

#### Marine Polyphosphate: A Key Player in Geologic Phosphorus Sequestration 652

J. Diaz et al.

Polyphosphates derived from diatoms may help crystallize calcium phosphate (apatite) in marine sediments globally, explaining how this large sink for phosphorus forms.

### OCEAN SCIENCE

#### Expanding Oxygen-Minimum Zones in the Tropical Oceans 655

L. Stramma, G. C. Johnson, J. Sprintall, V. Mohrholz

Since the 1950s, dissolved oxygen concentrations have decreased in low-oxygen zones of the tropical Atlantic and equatorial Pacific, and the zones have expanded toward the surface.

### ECOLOGY

#### A General Model for Food Web Structure 658

S. Allesina, D. Alonso, M. Pascual

A model based on likelihood analysis is able to replicate the actual structure of food web networks derived from experimental data.

### MEDICINE

#### ROS-Generating Mitochondrial DNA Mutations Can Regulate Tumor Cell Metastasis 661

K. Ishikawa et al.

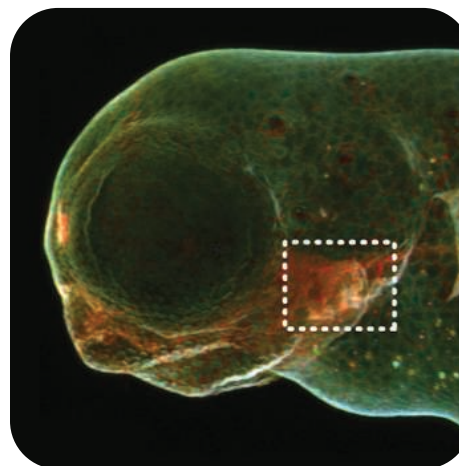
Mutations in mitochondrial DNA that cause enhanced production of reactive oxygen species can increase the propensity of tumor cells to metastasize.

### DEVELOPMENTAL BIOLOGY

#### In Vivo Imaging of Membrane-Associated Glycans in Developing Zebrafish 664

S. T. Laughlin, J. M. Baskin, S. L. Amacher, C. R. Bertozzi

Imaging of cell-surface sugars in developing zebrafish reveals dramatic bursts of sugar production in the jaw, olfactory organ, and pectoral fin 60 to 72 hours after fertilization.



664

### CELL SIGNALING

#### Phosphorylation by p38 MAPK as an Alternative Pathway for GSK3 $\beta$ Inactivation 667

T. M. Thornton et al.

A well-studied kinase is shown to be unexpectedly phosphorylated and inhibited by mitogen-activated protein kinase, and this modification activates cell-survival pathways.

### CELL BIOLOGY

#### Asymmetric Tethering of Flat and Curved Lipid Membranes by a Golgin 670

G. Drin, V. Morello, J.-F. Casella, P. Gounon, B. Antonny

A long protein may tether vesicles to the Golgi apparatus by binding the positively curved vesicle membrane to its N terminus and flat membranes to its C terminus.

### IMMUNOLOGY

#### Innate Immune Activation Through Nalp3 Inflammasome Sensing of Asbestos and Silica 674

C. Dostert et al.

A large multiprotein complex detects particulate airborne pollutants that have been taken up by immune cells in the lung and initiates a potent inflammatory response. >> *Perspective p. 619*

### IMMUNOLOGY

#### A Haptoglobin-Hemoglobin Receptor Conveys Innate Immunity to *Trypanosoma brucei* in Humans 677

B. Vanhollebeke et al.

A lipoprotein in human blood protects against an African parasite by binding to a parasite receptor and triggering uptake of the lipoprotein, which contains a toxic component.



ADVANCING SCIENCE. SERVING SOCIETY

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 © 2008 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): \$144 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$770; 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.

CONTENTS continued >>>



Seeing the light.

## SCIENCE NOW

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

HIGHLIGHTS FROM OUR DAILY NEWS COVERAGE

### Gene Therapy Improves Sight of Four Patients

Treatment could potentially be applied to host of blindness disorders.

### The Oceans Finally Show Their Stripes

High-resolution ocean map reveals a worldwide pattern of striated currents.

### No Substitute for Real Blood

Analysis links blood-replacement products to higher risk of heart attack and death.



Exercise, a natural antidepressant.

## SCIENCE SIGNALING

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

THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

### PERSPECTIVE: VGF, a New Player in Antidepressant Action?

*J. E. Malberg and L. M. Monteggia*

The neuropeptide VGF appears to play a role in the antidepressant effects of exercise, the neurotrophic factor BDNF, and the neurotransmitter serotonin.

### PERSPECTIVE: Synaptic Patterning by Morphogen Signaling

*W. R. Williamson and P. R. Hiesinger*

The morphogen Activin acts as a permissive and local motility restriction signal around individual photoreceptor terminals.

### PODCAST

*E. M. Adler and A. M. VanHook*

Some glial cells can generate action potentials and are hypersensitive to ischemic injury.



New structure for university careers in Europe.

## SCIENCE CAREERS

[www.sciencereers.org/career\\_development](http://www.sciencereers.org/career_development)

FREE CAREER RESOURCES FOR SCIENTISTS

### Structuring Academic Careers in Europe

*C. Wald*

Several European universities have begun defining tenure-like career structures.

### Taken for Granted: Lost in Space

*B. L. Benderly*

A severe disconnect separates some policy-makers from scientists' real lives.

### Mastering Your Ph.D.: Exploring Nonprofit Organizations

*P. Gosling*

The values and culture of nonprofit organizations make them an exciting and rewarding career choice.

### May 2008 Funding News

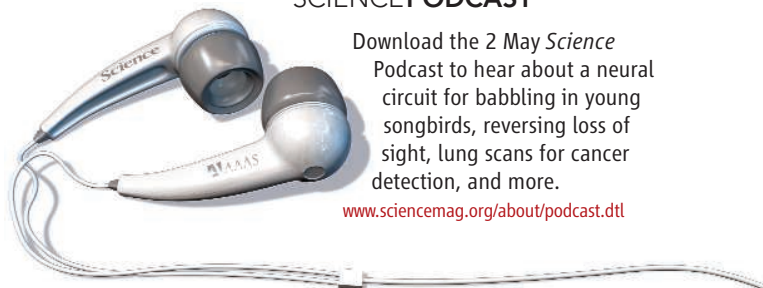
*J. Fernández*

Learn about the latest research funding opportunities, scholarships, fellowships, and internships.

## SCIENCE PODCAST

Download the 2 May *Science* Podcast to hear about a neural circuit for babbling in young songbirds, reversing loss of sight, lung scans for cancer detection, and more.

[www.sciencemag.org/about/podcast.dtl](http://www.sciencemag.org/about/podcast.dtl)



Separate individual or institutional subscriptions to these products may be required for full-text access.

# Science

**320 (5876)**

*Science* **320** (5876), 581-682.

**ARTICLE TOOLS**

<http://science.sciencemag.org/content/320/5876>

**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.