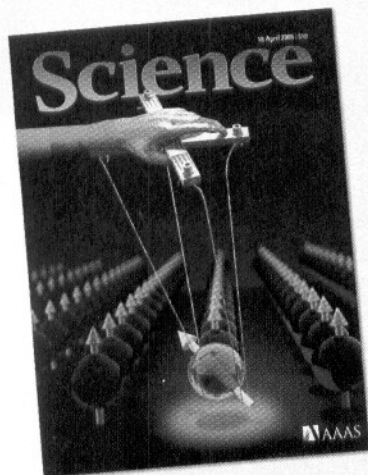




COVER

Optical or electrical pulses can rapidly locate and manipulate the spin of a single electron in a quantum dot or of a nitrogen vacancy in diamond. Such techniques represent progress toward solid-state quantum computing (see pages 349 and 352).

Image: Peter Allen and Jesse Berezovsky

DEPARTMENTS

- 283 *Science Online*
- 285 *This Week in Science*
- 290 *Editors' Choice*
- 294 *Contact Science*
- 297 *Random Samples*
- 299 *Newsmakers*
- 389 *New Products*
- 390 *Science Careers*

EDITORIAL

- 289 *New Career Paths for Scientists*
by Bruce Alberts
- >> *Science Careers* article by B. Vastag

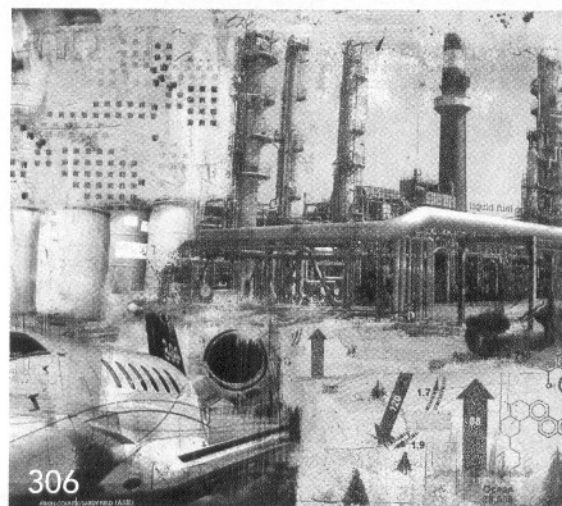
NEWS OF THE WEEK

- IPCC Tunes Up for Its Next Report Aiming for Better, Timely Results 300
- Greenland Ice Slipping Away but Not All That Quickly 301
>> *Science Express Reports* by I. Joughin et al. and S. B. Das et al.
- Team Unveils Mideast Archaeology Peace Plan 302
- As Food Prices Rise, U.S. Support for Agricultural Centers Wilts 303

- SCIENTESCOPE** 303
- Croatian Editors Fight With Medical School Over Journal's Fate 304
- Changes to EPA Toxicology—Speed or Delay? 304

NEWS FOCUS

- The Greening of Synfuels 306
- Watery Echoes Give Clues to the Past and Future of the Seas 309
- Mapmaker for the World of Influenza Coming Out of Asia—Year In, Year Out 310
>> *Research Article* p. 340
- The Mad Dash to Make Light Crystals 312



LETTERS

- Coral Adaptation in the Face of Climate Change 315
A. Baird and J. A. Maynard
Response O. Hoegh-Guldberg et al.
- Freshwater Forcing: Will History Repeat Itself?
P. U. Clark, T. L. Delworth, A. J. Weaver
Response H. F. Kleiven et al.

CORRECTIONS AND CLARIFICATIONS 316

BOOKS ET AL.

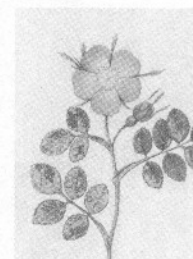
- The Dismal Science** How Thinking Like an Economist Undermines Community 318
S. A. Marglin, reviewed by E. R. Weintraub
- Sensing the Past** Seeing, Hearing, Smelling, Tasting, and Touching in History 319
M. M. Smith, reviewed by A. Keller

POLICY FORUM

- Agriculture at a Crossroads 320
E. T. Kiers et al.

PERSPECTIVES

- Frustration in Complexity 322
P.-M. Binder
- Natural Complexity 323
N. W. Watkins and M. P. Freeman
- Graphene Nanoelectronics 324
R. M. Westervelt
>> *Report* p. 356
- The Ultimate Model Organism 325
A. J. Butte
- Wnt Moves Beyond the Canon 327
B. Bowerman
>> *Report* p. 365
- Geometrical Music Theory 328
R. W. Hall
>> *Report* p. 346



319

CONTENTS continued >>

SCIENCE EXPRESS

www.scienceexpress.org

CLIMATE CHANGE

Seasonal Speedup Along the Western Flank of the Greenland Ice Sheet
I. Joughin et al.

Measurements of ice motion from Greenland show that summer melt water accelerates ice sheet flow by 50 to 100% overall but has less effect in the faster outlet glaciers.

>> *News story p. 301; Science Express Report by S. B. Das et al.*

10.1126/science.1153288

CLIMATE CHANGE

Fracture Propagation to the Base of the Greenland Ice Sheet During Supraglacial Lake Drainage

S. B. Das et al.

A large lake on the surface of the Greenland Ice Sheet drained out through and along the base of the Ice Sheet within 2 hours, revealing an efficient basal hydrological system.

>> *News story p. 301; Science Express Report by I. Joughin et al.*

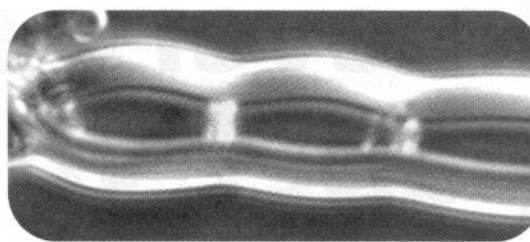
10.1126/science.1153360

PERSPECTIVE: Marine Calcifiers in a High-CO₂ Ocean

V. J. Fabry

>> *Research Article p. 336*

10.1126/science.1157130



CELL BIOLOGY

Reconstitution of Contractile FtsZ Rings in Liposomes

M. Osawa, D. E. Anderson, H. P. Erickson

A tubulin homolog from prokaryotes can, without other proteins, assemble into rings around liposomes and constrict, suggesting a primordial cell division mechanism.

10.1126/science.1154520

PHYSICS

Quasi-Particle Properties from Tunneling in the $\nu = 5/2$ Fractional Quantum Hall State

I. P. Radu, J. B. Miller, C. M. Marcus, M. A. Kastner, L. N. Pfeiffer, K. W. West

Tunneling measurements between the conduction channels in the fractional quantum Hall effect confirm that the charge is quantized in units of $1/4$ of an electron charge.

10.1126/science.1157560

REVIEW

MEDICINE

Qinghaosu (Artemisinin): The Price of Success

N. J. White

330

BREVIA

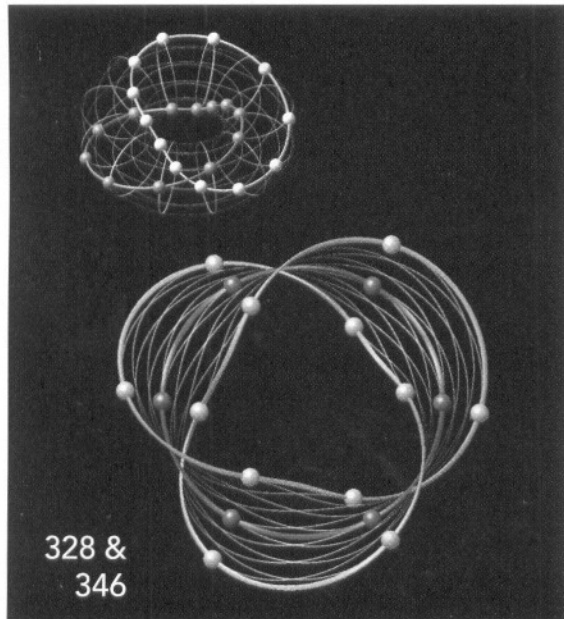
ECOLOGY

The Movement of Aquatic Mercury Through Terrestrial Food Webs

D. A. Cristol et al.

Industrial mercury in a contaminated river can spread beyond the immediate area to nearby terrestrial ecosystems through food web connections.

335



RESEARCH ARTICLES

CLIMATE CHANGE

Phytoplankton Calcification in a High-CO₂ World

M. D. Iglesias-Rodriguez et al.

Experiments show that a coccolithophore grows better at elevated carbon dioxide levels, in contrast to predictions for most plankton, and is already increasing in abundance.

>> *Science Express Perspective by V. J. Fabry*

336

MEDICINE

The Global Circulation of Seasonal Influenza A (H3N2) Viruses

C. A. Russell et al.

Recent seasonal flu strains constantly evolved in overlapping epidemics in Asia, then erupted to periodically sweep the world, ending in South America 6 to 18 months later.

>> *News story p. 310*

340

REPORTS

MATHEMATICS

Generalized Voice-Leading Spaces

C. Callender, I. Quinn, D. Tymoczko

A geometric representation of Western music theory, in which distance represents similarity of chord types, reveals relations among diverse musical concepts.

>> *Perspective p. 328*

346

PHYSICS

Picosecond Coherent Optical Manipulation of a Single Electron Spin in a Quantum Dot

J. Berezovsky et al.

A series of ultrafast optical pulses can be used to rotate the spin of a single electron in a quantum dot by a specified angle within a few picoseconds.

349

CONTENTS continued >>>

REPORTS CONTINUED...

PHYSICS

- Coherent Dynamics of a Single Spin Interacting with an Adjustable Spin Bath** 352
R. Hanson et al.

Simulations successfully show how the spin of a nitrogen vacancy in diamond is coupled to those of surrounding nitrogen impurities and how coherence between them is lost.

APPLIED PHYSICS

- Chaotic Dirac Billiard in Graphene Quantum Dots** 356
L. A. Ponomarenko et al.

Graphene quantum dots vary with their size: Large dots form molecular-scale transistors, intermediate ones show quantum chaos, and the smallest act as single-electron detectors.

>> *Perspective p. 324*

CHEMISTRY

- Atomlike, Hollow-Core-Bound Molecular Orbitals of C₆₀** 359

M. Feng, J. Zhao, H. Petek

Scanning tunneling microscopy and density functional theory reveal that C₆₀ acts as a superatom in which its unoccupied orbitals are atomlike and delocalized in aggregates.

GENETICS

- The Chemical Genomic Portrait of Yeast: Uncovering a Phenotype for All Genes** 362
M. E. Hillenmeyer et al.

Exposing yeast cultures to an extensive variety of small molecules and environmental stresses indicates that almost all genes have a demonstrable biological function.

CELL BIOLOGY

- Wnt5a Control of Cell Polarity and Directional Movement by Polarized Redistribution of Adhesion Receptors** 365

E. S. Witze et al.

A developmental signal causes clustering of membrane-associated proteins (including its receptor) at one end of the cell, marking the cell's polarity for directional movement. >> *Perspective p. 327*

NEUROSCIENCE

- A Model for Neuronal Competition During Development** 369

C. D. Deppmann et al.

Modeling and experiments show that neurons survive during development when neuronal sensitization to survival signals outweighs antagonistic signals for cell death.

MEDICINE

- Recapitulation of IVIG Anti-Inflammatory Activity with a Recombinant IgG Fc** 373

R. M. Anthony et al.

By identifying the sugar modifications responsible for the therapeutic, anti-inflammatory effect of immunoglobulin, an improved recombinant version can be formulated.

BIOCHEMISTRY

- Reconstitution of Pilus Assembly Reveals a Bacterial Outer Membrane Catalyst** 376

M. Nishiyama, T. Ishikawa, H. Rechsteiner, R. Glockshuber

The cell-free formation of the protruberant pilus of a pathogenic bacteria is accelerated by a protein that catalyzes supramolecular assembly without input of cellular energy.

BIOCHEMISTRY

- Structural Basis of Toll-Like Receptor 3 Signaling with Double-Stranded RNA** 379

L. Liu et al.

Two horseshoe-shaped monomers of an innate immunity receptor bind to viral RNA through carboxyl-terminal dimerization, ultimately triggering inflammation.

BIOCHEMISTRY

- Divergence of Quaternary Structures Among Bacterial Flagellar Filaments** 382

V. E. Galkin et al.

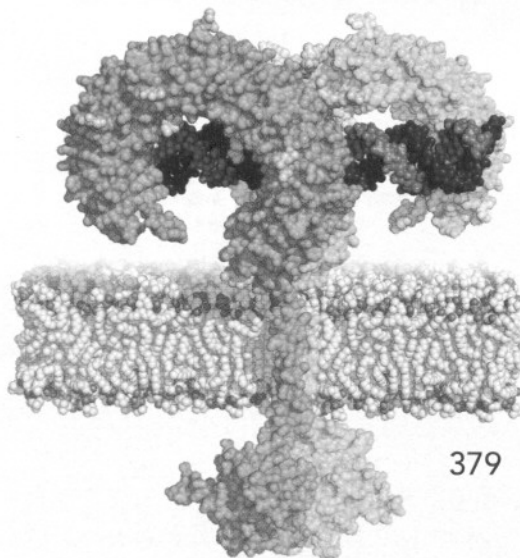
Flagellar proteins from two bacterial species diverge in their coiled-coil regions; only one triggers an immune response, which may have driven their evolutionary divergence.

NEUROSCIENCE

- The Antidepressant Fluoxetine Restores Plasticity in the Adult Visual Cortex** 385

J. F. Maya Vetencourt et al.

An antidepressant drug increases growth factors and reduces inhibitory activity in the visual cortex of adult rats, thereby restoring the plasticity seen only during development.



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 >>