



COVER

Boulders and roots, or spores and hyphae? Parallel microscopic and macroscopic worlds merge in this detail from one of the winners of this year's *Science*/NSF International Science & Engineering Visualization Challenge. See the special section beginning on page 1767.

Image: Colleen Champ, with micrographs by Dennis Kunkel

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by John Edward Porter

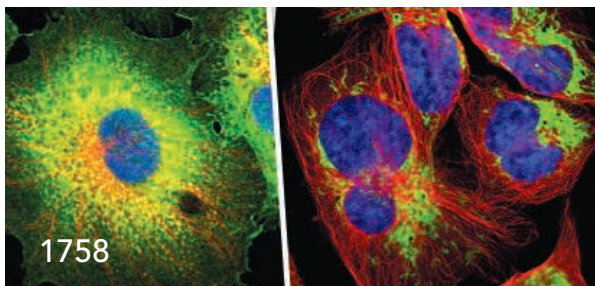
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C. Goldin and L. F. Katz, reviewed by T. Lemieux
- Objectivity** 1780
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M. J. Bryant et al.

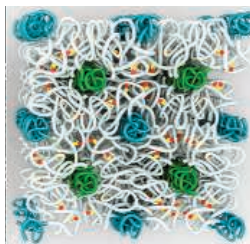
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SCIENCE EXPRESS

www.scienceexpress.org

DEVELOPMENTAL BIOLOGY

Induced Pluripotent Stem Cells Generated Without Viral Integration

M. Stadtfeld, M. Nagaya, J. Utikal, G. Weir, K. Hochedlinger

Transient exposure of mouse fibroblast and liver cells to an adenovirus vector carrying factors that induce pluripotency generates stem cells without viral elements in the genome.

10.1126/science.1162494

GENETICS

Conservation and Rewiring of Functional Modules Revealed by an Epistasis Map in Fission Yeast

A. Roguev et al.

Comparison of genetic wiring in two types of yeast reveals that protein complexes are conserved, but the interactions between them can change radically between species.

10.1126/science.1162609

MATERIALS SCIENCE

Evolution of Block Copolymer Lithography to Highly Ordered Square Arrays

C. Tang, E. M. Lennon, G. H. Fredrickson, E. J. Kramer, C. J. Hawker

The addition of hydrogen bonding units to two block copolymers leads to a template with square patterns that can be used for manufacturing integrated circuits.

10.1126/science.1162950

PHYSICS

Complete Characterization of Quantum-Optical Processes

M. Lobino, D. Korystov, C. Kupchak, E. Figueroa, B. C. Sanders, A. I. Lvovsky

A method requiring only the light from a laser as an input yields a full characterization of quantum optical processes by probing its effect on classical states.

10.1126/science.1162086

REVIEW

CHEMISTRY

Assembling Materials with DNA as the Guide

1795

F. A. Aldaye, A. L. Palmer, H. F. Sleiman

BREVIA

GEOPHYSICS

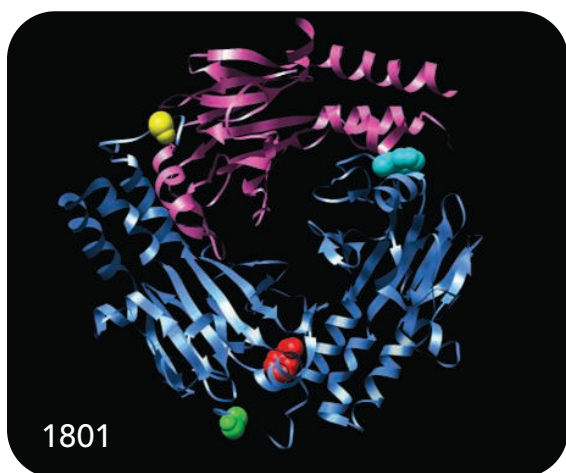
Magnetic Source Separation in Earth's Outer Core

1800

K. A. Hoffman and B. S. Singer

Analysis of Earth's magnetic field as it has changed and reversed suggests that its dipole arises from a distinct part of the outer core than that of the rest of the field.

>> *News story p. 1756*



1801

RESEARCH ARTICLES

MEDICINE

Core Signaling Pathways in Human Pancreatic Cancers Revealed by Global Genomic Analyses

1801

S. Jones et al.

Sequencing of DNA mutations shows that the same 12 signaling pathways are disrupted in most pancreatic tumors, suggesting these as key to tumor development.

MEDICINE

An Integrated Genomic Analysis of Human Glioblastoma Multiforme

1807

D. W. Parsons et al.

Comprehensive analysis of mutations in a brain cancer identifies previously unidentified cancer genes and a frequently mutated protein that may serve as a therapeutic marker.

REPORTS

PHYSICS

Quantum Communication with Zero-Capacity Channels

1812

G. Smith and J. Yard

Two quantum communication channels, each of which is so noisy that it has zero capacity to independently transmit information, can do so when used together.

>> *Perspective p. 1783*

CHEMISTRY

Synthesis and Solid-State NMR Structural Characterization of ¹³C-Labeled Graphite Oxide

1815

W. Cai et al.

Solid-state nuclear magnetic resonance study of graphite oxide made with 100 percent carbon-13 reveals a complex bonding network involving several carbon species.

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REPORTS CONTINUED...

CHEMISTRY

Linear Response Breakdown in Solvation Dynamics Induced by Atomic Electron-Transfer Reactions 1817

A. E. Bragg, M. C. Cavanagh, B. J. Schwartz

A solvent equilibrates faster around a sodium-electron ion pair formed from Na⁺ than from Na⁻, violating a widely used approximation for modeling solvent dynamics.

>> *Perspective p. 1789*

PLANETARY SCIENCE

Mars' Paleomagnetic Field as the Result of a Single-Hemisphere Dynamo 1822

S. Stanley, L. Elkins-Tanton, M. T. Zuber, E. M. Parmentier

A model of Mars' early magnetic field with a north-south gradient in heat flow from the core yields a strong field only in the south, explaining the relic magnetism in the crust.

>> *News story p. 1756; Perspective p. 1784*

GEOPHYSICS

The Structure and Dynamics of Mid-Ocean Ridge Hydrothermal Systems 1825

D. Coumou, T. Driesner, C. A. Heinrich

A three-dimensional model shows that mid-ocean hydrothermal systems self-organize into broad warm downflows feeding narrow, pipelike hot upflows.

GEOCHEMISTRY

Neodymium-142 Evidence for Hadean Mafic Crust 1828

J. O'Neil, R. W. Carlson, D. Francis, R. K. Stevenson

An unusual isotopic anomaly in rocks along the Hudson Bay suggests that they formed 4.28 billion years ago and support early formation of a separate reservoir in Earth's mantle.

>> *News story p. 1755; Science Podcast*

PSYCHOLOGY

Infants' Perseverative Search Errors Are Induced by Pragmatic Misinterpretation 1831

J. Topál, G. Gergely, Á. Miklósi, Á. Erdőhegyi, G. Csibra

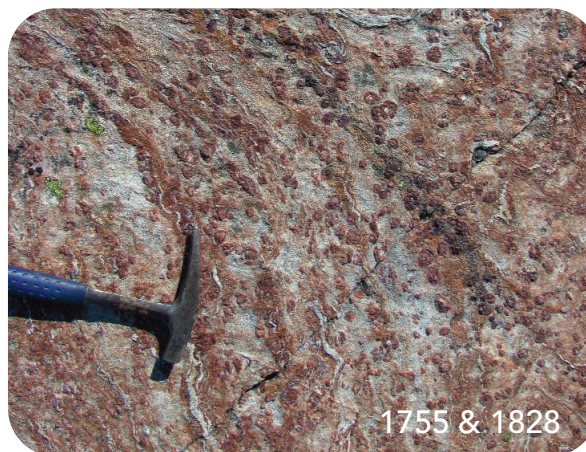
Infants may make mistakes in certain tasks because of the powerful effects of social interaction with an adult, not because of brain immaturity as was previously assumed.

BIOCHEMISTRY

Antigen Recognition by Variable Lymphocyte Receptors 1834

B. W. Han, B. R. Herrin, M. D. Cooper, I. A. Wilson

The receptor that binds antigens in jawless vertebrates differs from the immunoglobulins of jawed vertebrates and uses a variable concave surface and Carboxyl terminal for recognition.



MEDICINE

Disruption of the CFTR Gene Produces a Model of Cystic Fibrosis in Newborn Pigs 1837

C. S. Rogers et al.

Newborn pigs carrying a mutated copy of the gene defective in cystic fibrosis exhibit many features of the human disease and may provide fresh insights for therapy.

MEDICINE

Seeding and Propagation of Untransformed Mouse Mammary Cells in the Lung 1841

K. Podsypanina et al.

In mice, normal mammary cells can colonize the lung, suggesting that metastases might arise from displaced normal cells acquiring genetic changes that confer malignancy.

>> *Perspective p. 1785*

PSYCHOLOGY

The Coevolution of Cultural Groups and Ingroup Favoritism 1844

C. Efferson, R. Lalive, E. Fehr

Results of a laboratory game show that cultural groups and ingroup favoritism arise spontaneously when individuals display an external marker that predicts their actions.

PSYCHOLOGY

Understanding Overbidding: Using the Neural Circuitry of Reward to Design Economic Auctions 1849

M. R. Delgado, A. Schotter, E. Y. Ozbay, E. A. Phelps

Brain areas sensitive to loss are selectively engaged during bidding in an auction, suggesting that the desire to avoid loss underlies the phenomenon of overbidding. >> *Perspective p. 1788*



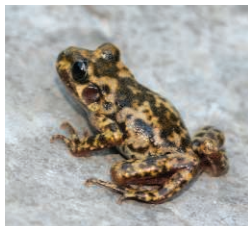
SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. 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. SCIENCE is printed on 30 percent post-consumer recycled paper. Printed in the U.S.A.

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Toad troubles.

SCIENCE NOW

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Conservation Efforts May Have Backfired for Spanish Toad

A potentially deadly fungus was accidentally introduced as part of a breeding program for an endangered amphibian.

Wasps Make Peace With Past Enemies

The insects steer clear of foes they have fought in the past.

Fat Molecule Fights Weight Gain

Compound prevents mice from storing unhealthy fat.



Dave Jensen tools up his own career.

SCIENCE CAREERS

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FREE CAREER RESOURCES FOR SCIENTISTS

Tooling Up: My Career Dissected

D. Jensen

Dave Jensen highlights some of his own career mistakes.

From Watching 'The Expert' to Being an Expert

L. Cahoon

Melanie Lee attributes her success partly to a childhood TV show.

Union Aftershocks in California

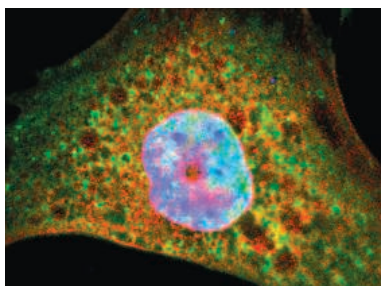
C. Rey

Postdocs and others in the University of California system adjust to life with a union.

The Science Careers Web Log

Science Careers Staff

Here's where to find information from around the Web on careers in the sciences.



Intracellular colocalization of Grb10 and IGF-1 receptors.

SCIENCE SIGNALING

www.sciencesignaling.org

THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

RESEARCH ARTICLE: Nedd4 Controls Animal Growth by Regulating IGF-1 Signaling

X. R. Cao, N. L. Lill, N. Boase, P. P. Shi, D. R. Croucher, H. Shan, J. Qu, E. M. Sweezer, T. Place, P. A. Kirby, R. J. Daly, S. Kumar, B. Yang
Nedd4 acts through Grb10 to enhance insulin-like growth factor signaling and control animal growth.

PERSPECTIVE: Caspase-2—Vestigial Remnant or Master Regulator?

C. M. Troy and E. M. Ribe

Both mitochondrial-dependent and -independent cell death pathways are mediated by caspase-2.

PODCAST

E. M. Adler, N. R. Gough, A. M. VanHook

Bacteria secrete factors that regulate genes that contribute to virulence.

SCIENCE PODCAST

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Science

321 (5897)

Science **321** (5897), 1737-1860.

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