

SPECIAL SECTION

Breakthrough of the Year

WINNER

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COVER

Ardipithecus ramidus, a possible human ancestor, inhabited then-wooded regions of Ethiopia 4.4 million years ago. This year, studies of the fossilized skeleton of a member of the species raised surprising questions about how key human traits evolved. See the Breakthrough of the Year special section beginning on page 1598 and at www.sciencemag.org/btoy2009/.

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- 1662 Regiodivergent Ring Opening of Chiral Aziridines**
B. Wu et al.

A bimetallic catalyst selects different ring-opening sites, depending on the chiral configuration of the substrate.

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- 1663 Stepwise Modification of a Modular Enhancer Underlies Adaptation in a *Drosophila* Population**

M. Rebeiz et al.

A combination of new and previously existing mutations in gene regulatory sequences can drive morphological evolution.

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- 1668 Crystal Structure of the Eukaryotic Strong Inward-Rectifier K⁺ Channel Kir2.2 at 3.1 Å Resolution**

X. Tao et al.

A structure reveals the basis of diode-like conduction properties and toxin insensitivity of these channels.

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- 1675 Formation and Survival of Water Vapor in the Terrestrial Planet-Forming Region**

T. Bethell and E. Bergin

Water in protoplanetary disks shields water molecules in deeper layers of the disk from destructive ultraviolet radiation.

- 1677 Spatial Organization of Hominin Activities at Gesher Benot Ya'aqov, Israel**

N. Alperson-Afil et al.

The spatial distribution of artifacts implies that living space was organized by use as early as 800,000 years ago.

- 1680 Mozambican Grass Seed Consumption During the Middle Stone Age**

J. Mercader

Residues on stone tools imply that early humans were processing grass seeds by 100,000 years ago.

- 1683 Universality in Three- and Four-Body Bound States of Ultracold Atoms**

S. E. Pollack et al.

The interactions involved in the formation of few-body bound states can be probed in a cloud of ultracold atoms.

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- 1686 Experimental Observations of Stress-Driven Grain Boundary Migration**

T. J. Rupert et al.

Shear stresses drive grain boundaries to move in a manner consistent with predictions of coupled grain boundary migration.

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K. Adamczyk et al.

The use of a photoacid enables the long-sought characterization of the conjugate acid of bicarbonate.

- 1694 Bacterial Community Variation in Human Body Habitats Across Space and Time**

E. K. Costello et al.

The composition of microbial communities on the human body is primarily determined by their location.

- 1698 The Fanconi Anemia Pathway Promotes Replication-Dependent DNA Interstrand Cross-Link Repair**

P. Knipscheer et al.

Insertion of a nucleotide during the repair of a complex lesion in DNA requires tagging of a lysine residue.

- 1701 Indirect Punishment and Generosity Toward Strangers**

A. Ule et al.

Frequent rewards spiced with occasional punishment are a recipe for the evolution of cooperation.

- 1704 On the Origin of Species by Natural and Sexual Selection**

G. S. van Doorn et al.

Modeling demonstrates how speciation occurs due to sexual selection.

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- 1707 Structure of the LKB1-STRAD-MO25 Complex Reveals an Allosteric Mechanism of Kinase Activation**

E. Zehiraj et al.

A "pseudokinase" activates the LKB1 tumor suppressor protein without catalyzing phosphorylation.

- 1711 The Subtle Transmission of Race Bias via Televised Nonverbal Behavior**

M. Weisbuch et al.

Nonverbal behaviors can contribute to implicit bias in intergroup attitudes.

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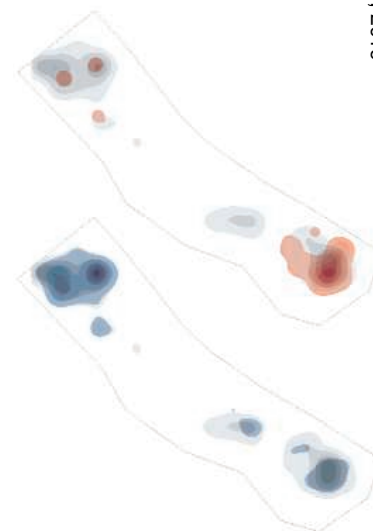
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SCIENCEONLINE

SCIENCEEXPRESS

www.sciencexpress.org

Spontaneous- and X-ray–Triggered Crystallization at Long Range in Self-Assembling Filament Networks

H. Cui et al.

Dilute solutions of alkyl-terminated peptide filaments can undergo ordering upon x-ray exposure.

10.1126/science.1182340

Objective Confirmation of Subjective Measures of Human Well-Being: Evidence from the U.S.A.

A. J. Oswald and S. Wu

Subjective life-satisfaction scores agree with objective measures of well-being across 50 American states.

10.1126/science.1180606

p53 Controls Radiation-Induced Gastrointestinal Syndrome in Mice Independent of Apoptosis

D. G. Kirsch et al.

Ionizing radiation destroys gastrointestinal epithelial cells by a mechanism that appears to be independent of apoptosis.

10.1126/science.1166202

SCIENCE NOW

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Highlights From Our Daily News Coverage

HIV Outwits Yet Another Microbicide

Failure marks the end of the road for nonspecific virus blockers.

A Mind That Touches the Past

People with a sensory mix-up also have exceptional memories.

A Cheap Way to Chop Up Nitrogen

New chemical reaction allows conversion of the ubiquitous gas into a common fertilizer.

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

RESEARCH ARTICLE: EGFR Signaling Through an Akt-SREBP-1–Dependent, Rapamycin-Resistant Pathway Sensitizes Glioblastomas to Antilipogenic Therapy

D. Guo et al.

Inhibitors of fatty acid signaling promote apoptosis in glioblastoma cells with highly active EGFR signaling.

RESEARCH ARTICLE: Function of the Nucleotide Exchange Activity of Vav1 in T Cell Development and Activation

A. Saveliev et al.

The guanine nucleotide exchange activity of Vav1 is required for some, but not all, of its functions in T cells.

PERSPECTIVE: Cell Mechanics and Feedback Regulation of Actomyosin Networks

R. Fernandez-Gonzalez and J. A. Zallen

Mechanical signals shape the organization and dynamics of contractile networks in cells during morphogenesis.

PERSPECTIVE: Book Review—Making Sense of Signal Transduction

W. T. Miller

A textbook provides an overview of signaling concepts and models for teaching.

PODCAST

P. S. Mischel and A. M. VanHook

Inhibiting fatty acid synthesis may be effective in controlling glioblastomas driven by EGFR signaling.

SCIENCE CAREERS

www.sciencereers.org/career_magazine

Free Career Resources for Scientists

Tooling Up: Presenting Your Technology

D. Jensen

Budding scientist-entrepreneurs must be able to present their company skillfully to potential investors and partners.

Breakthrough of the Year: A Tale of Two Paleontologists

E. Pain

Two young paleontologists tell how they got involved in the field work that uncovered *Ardipithecus ramidus* in Ethiopia.

>> *Breakthrough of the Year section p. 1598 and www.sciencemag.org/btoy2009/*

GrantsNet Funding News

GrantsNet Staff

Get the latest funding opportunities for science research, fellowships, scholarships, and internships.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

PERSPECTIVE: Pharmacologic Induction of CD8⁺ T Cell Memory—Better Living Through Chemistry

L. Gattinoni et al.

Targeting the immune system using small molecules may enhance immunotherapy.

PERSPECTIVE: Toward a Systems-Level Analysis of Infection Biology—A New Method for Conducting Genetic Screens in Human Cells

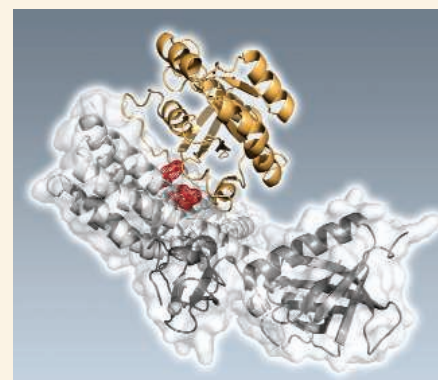
S. A. Stanley and D. T. Hung

Human genetic screens at the DNA level advance therapeutic development.

RESEARCH ARTICLE: Intravenous Hemostat—Nanotechnology to Halt Bleeding

J. P. Bertram et al.

Bioengineers develop functional blood cells.



SCIENCE SIGNALING

Structure of Vav1.

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

Download the 18 December *Science* Podcast to hear about the year's top scientific breakthroughs and the 2009 virus of the year.

>> *Breakthrough of the Year section p. 1598 and www.sciencemag.org/btoy2009/*

BREAKTHROUGH ONLINE

See an expanded version of this week's special section, with references, links, and multimedia at www.sciencemag.org/btoy2009/.

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A History of Beginnings

SCIENCE INSIDER

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Science Policy News and Analysis

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