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BREAKTHROUGH OF THE YEAR

HIV Treatment as Prevention

SPECIAL SECTION

Breakthrough of the Year

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COVER

Scanning electron micrograph of HIV viruses, each ~120 nanometers in diameter, on an infected cell surface. This year, clinical trial results showing that antiretroviral treatments for HIV also keep the virus from spreading raised hopes of ending HIV/AIDS epidemics in whole populations. See the Breakthrough of the Year special section beginning on page 1628 and at www.scim.ag/2011btoy.

Image: Thomas Deerinck, Kathleen Fitzpatrick, John Guatelli, and Mark Ellisman, NCMIR, UCSD/Visuals Unlimited, Inc.

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Pigeons' ability to use abstract numerical rules appears identical to that of monkeys.

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This emission, observed in other galaxies mainly from regions around newborn stars, has now been detected in our Galaxy.

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1669 Npas4 Regulates a Transcriptional Program in CA3 Required for Contextual Memory Formation*K. Ramamoorthi et al.*

A transcription factor dependent on electrical activity regulates genes involved in long-term memory formation.

1675 How a DNA Polymerase Clamp Loader Opens a Sliding Clamp*B. A. Kelch et al.*

Crystal structures show how the sliding clamp that facilitates processive replication is loaded onto DNA.

REPORTS**1681 Asymmetric Electrophilic Fluorination Using an Anionic Chiral Phase-Transfer Catalyst***V. Rauniyar et al.*

A chiral phosphate ion plays a dual role, coaxing a fluorinating agent into solution and then catalyzing its reaction there.

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1684 Angular Momentum Conservation in Dipolar Energy Transfer*D. Guo et al.*

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1687 Graphitic Tribological Layers in Metal-on-Metal Hip Replacements*Y. Liao et al.*

A graphitic layer is found to be the cause of low friction in metal-on-metal hip implants.

1690 Evidence from Numerical Experiments for a Feedback Dynamo Generating Mercury's Magnetic Field*D. Heyner et al.*

Feedback between the external magnetospheric field and the internal magnetic field explains Mercury's weak magnetic field.

1694 Isotopic Evidence for Massive Oxidation of Organic Matter Following the Great Oxidation Event*L. R. Kump et al.*

Analysis of two-billion-year-old rocks reveals an extreme carbon-cycle disruption after atmospheric oxygen increased.

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1696 Fossilized Nuclei and Germination Structures Identify Ediacaran "Animal Embryos" as Encysting Protists*T. Hultgren et al.*

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1699 From Flat Foot to Fat Foot: Structure, Ontogeny, Function, and Evolution of Elephant "Sixth Toes"*J. R. Hutchinson et al.*

Elephants have an extra bone in their feet that can be traced through their fossil record to reveal a transition from flat to raised feet.

1703 Global Seabird Response to Forage Fish Depletion—One-Third for the Birds*P. M. Cury et al.*

One-third of maximum fish biomass must be available for seabirds to sustain high breeding success.

1706 Mouse B-Type Lamins Are Required for Proper Organogenesis But Not by Embryonic Stem Cells*Y. Kim et al.*

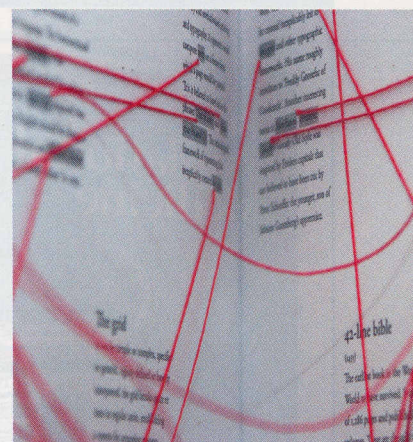
Mice lacking critical structural components of the nucleus, lamin-B intermediate filament proteins, remain viable until birth.

1710 Direct Redox Regulation of F-Actin Assembly and Disassembly by Mical*R.-J. Hung et al.*

A protein involved in redox signaling disassembles actin filaments and alters their reassembly.

1713 Mismatch Repair, But Not Heteroduplex Rejection, Is Temporally Coupled to DNA Replication*H. Hombauer et al.*

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1720 A Cultured Greigite-Producing Magnetotactic Bacterium in a Novel Group of Sulfate-Reducing Bacteria*C. T. Lefèvre et al.*

The crystal structure of biomineralized magnetic nanocrystals depends on environmental and genetic factors.

1723 The Ribosome Modulates Nascent Protein Folding*C. M. Kaiser et al.*

Single-molecule studies show that the ribosome promotes efficient folding of a two-domain protein.

1727 The Hedgehog Pathway Promotes Blood-Brain Barrier Integrity and CNS Immune Quiescence*J. I. Alvarez et al.*

Hedgehog signaling is required for maintaining the integrity of the blood-brain barrier.

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Long-term loss of fearful memories can be achieved through a combination of antidepressant drugs and exposure therapy.

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SCIENCEEXPRESS

www.sciencexpress.org

High-Resolution View of the Yeast Meiotic Program Revealed by Ribosome Profiling

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During yeast sporulation the production of most proteins is tightly regulated by both messenger RNA levels and translational control.

10.1126/science.1215110

Polymerase Exchange During Okazaki Fragment Synthesis Observed in Living Cells

G. Lia et al.

Single-molecule microscopy suggests that a new core polymerase is used to synthesize each Okazaki fragment.

10.1126/science.1210400

Widespread Genetic Switches and Toxicity Resistance Proteins for Fluoride

J. L. Baker et al.

A fluoride-sensing riboswitch regulates the expression of putative fluoride channels in prokaryotes.

10.1126/science.1215063

An All-Silicon Passive Optical Diode

L. Fan et al.

A silicon-based device is developed that allows the asymmetric propagation of light.

10.1126/science.1214383

Broadband Light Bending with Plasmonic Nanoantennas

X. Ni et al.

A plasmonic antenna array is used to control the propagation of a light beam across an interface.

10.1126/science.1214686

SCIENCENOW

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Highlights From Our Daily News Coverage

Is Jupiter Eating Its Own Heart?

Some gas giants may have destroyed their cores.

http://scim.ag/Jupiter_Core

Are You Inhaling Secondhand Coke?

Researchers pick up traces of illegal drugs in the atmosphere.

<http://scim.ag/Secondhand-Coke>

Solar Cells Capture Lost Energy

New materials generate more electrical charges than the number of photons that energize them.

<http://scim.ag/Solar-Cells>

TECHNICALCOMMENTS

Comment on "Nocturnality in Dinosaurs Inferred from Scleral Ring and Orbit Morphology"

M. I. Hall et al.

Full text at www.sciencemag.org/cgi/content/full/334/6063/1641-b

Response to Comment on "Nocturnality in Dinosaurs Inferred from Scleral Ring and Orbit Morphology"

L. Schmitz and R. Motani

Full text at www.sciencemag.org/cgi/content/full/334/6063/1641-c

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

20 December issue: <http://scim.ag/ss122011>

RESEARCH ARTICLE: A Distinct Interaction Mode Revealed by the Crystal Structure of the Kinase p38 α with the MAPK Binding Domain of the Phosphatase MKP5

Y.-Y. Zhang et al.

PERSPECTIVE: Three-Dimensional Docking in the MAPK p38 α

E. J. Goldsmith

Specific anti-inflammatory drugs may be possible with knowledge of how a kinase docks to its inactivating phosphatase.

RESEARCH ARTICLE: Protein O-GlcNAcylation Is Required for Fibroblast Growth Factor Signaling in *Drosophila*

D. Mariappa et al.

Fibroblast growth factor signaling is connected to metabolism through the intracellular O-GlcNAcylation of the receptor complex.

RESEARCH ARTICLE: Human Regulatory T Cells Rapidly Suppress T Cell Receptor–Induced Ca²⁺, NF- κ B, and NFAT Signaling in Conventional T Cells

A. Schmidt et al.

PODCAST

P. H. Krammer and A. M. VanHook

Inhibition of calcium signaling is critical for the suppression of T cell responses by regulatory T cells.

REVIEW: The Emerging Role of Linear Ubiquitination in Cell Signaling

C. H. Emmerich et al.

Linear ubiquitin chains transmit signals that are induced by diverse stimuli and regulate cell activation and death.

EVENTS

Plan your 2012 travels with this calendar of signaling-related meetings and conferences.

SCIENCE TRANSLATIONAL MEDICINE

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Integrating Medicine and Science

21 December issue: <http://scim.ag/stm122111>

PERSPECTIVE: Mapping the Road Forward in Alzheimer's Disease

D. M. Holtzman et al.

A better understanding of genetics, protein aggregation, and neurobiology combined with improved clinical trial design is needed to combat Alzheimer's disease.

REVIEW: Forty-Year Journey of Angiogenesis Translational Research

Y. Cao et al.

Antiangiogenic drugs successfully treat retinal vascular diseases, but challenges remain in the realm of cancer therapy.

RESEARCH ARTICLE: Predicting Adverse Drug Events Using Pharmacological Network Models

A. Cami et al.

A network-based method that uses available pharmacosafety data can predict yet-to-be-discovered adverse drug events to help reduce drug-associated morbidity and mortality.

RESEARCH ARTICLE: Dynamics of Dengue Disease Severity Determined by the Interplay Between Viral Genetics and Serotype-Specific Immunity

M. OhAinle et al.

The complex interactions between serotype-specific immunity and viral genetics drive dengue disease outcomes in endemic populations.

SCIENCE CAREERS

www.sciencemag.org/career_magazine

Free Career Resources for Scientists

Breakthrough Behind the Scenes

M. Price

Kimberly Powers's epidemiological research on HIV helped set the stage for this year's Science Breakthrough of the Year.

<http://scim.ag/KimPowers>

Experimental Error: Truly Alternative Careers

A. Ruben

Looking for a career that is off the well-trod path? Pick up your divining rod.

http://scim.ag/EE_TrulyAlternative

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

On the 23 December Science Podcast: a special show featuring the Breakthrough of the Year, 2011's top news stories in science, and areas to watch in 2012.

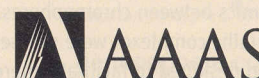
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Science Policy News and Analysis

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 © 2011 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.

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