

SPECIAL SECTION

## Black Holes

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>> *Report p. 554; Science Express Report by R. C. Reis et al.; Science Podcast; and video at [http://scim.ag/black\\_holes](http://scim.ag/black_holes)*



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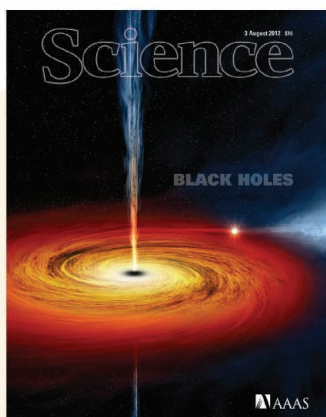
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Illustration of the black hole in Cygnus X-1, a binary star system 6000 light-years away. A disk of stellar material feeds this black hole, which is 15 times as massive as the Sun but less than 60 kilometers across. As it falls toward the black hole, some of the material gets expelled in two opposite jets. A section highlighting recent research on black holes begins on page 535. For the story behind the cover, go to <http://scim.ag/cov6094>.

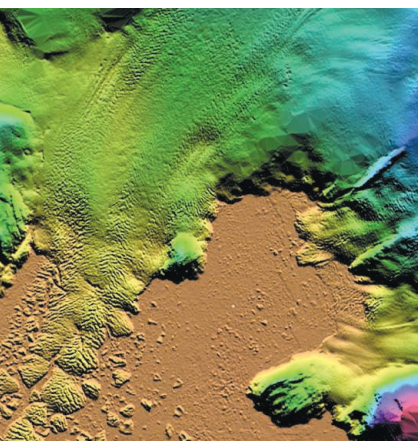
*Image: NASA/Chandra X-ray Center/M. Weiss*

### DEPARTMENTS

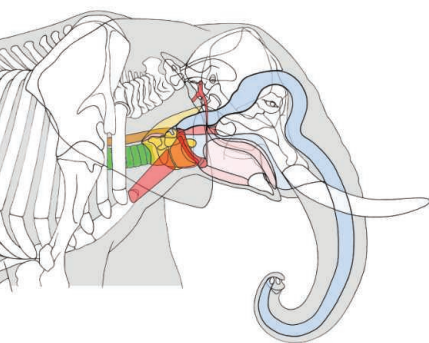
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553 Cartwheel Architecture of *Trichonympha* Basal Body  
P. Guichard et al.  
Electron microscopy provides a close-up view of the ninefold symmetric stacked rings at the base of cilia and flagella.

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554 Radio Detections During Two State Transitions of the Intermediate-Mass Black Hole HLX-1  
N. Webb et al.  
Observations of a candidate intermediate-mass black hole support the scale invariance of jets in black holes.

556 Kepler-36: A Pair of Planets with Neighboring Orbits and Dissimilar Densities  
J. A. Carter et al.  
The Kepler spacecraft detected a super-Earth and a Neptune-like planet in very tightly spaced orbits around the same star.

559 Non-Centrosymmetric Cylindrical Micelles by Unidirectional Growth  
P. A. Rupal et al.  
A capping approach is used to create asymmetrical block copolymer micelles through self-assembly.  
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563 A Reversible and Higher-Rate Li-O<sub>2</sub> Battery  
Z. Peng et al.  
A viable lithium-oxygen battery is demonstrated using dimethyl sulfoxide electrolyte and a porous gold cathode.

566 Aerosols from Overseas Rival Domestic Emissions over North America  
H. Yu et al.  
Roughly half of all particulate matter found in the air above North America originates from sources overseas.

569 Aerial Photographs Reveal Late-20th-Century Dynamic Ice Loss in Northwestern Greenland  
K. H. Kjær et al.  
Archived photographs extending back to the mid-1980s help show the role of dynamic thinning in ice mass loss from Greenland.

574 Function, Targets, and Evolution of *Caenorhabditis elegans* piRNAs  
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Parasitic cuckoos sporting new colors flourish after their warbler hosts learn to defend against the mainstream fashion.  
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580 Unraveling the Life History of Successful Invaders  
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Allocating resources to long-lived adults is one means by which birds succeed in new niches.

584 Quantitative Modulation of Polycomb Silencing Underlies Natural Variation in Vernalization  
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*Arabidopsis* adjusts the onset of flowering to the length of winters via an epigenetic mechanism.

587 Mitochondrial Import Efficiency of ATF5-1 Regulates Mitochondrial UPR Activation  
A. M. Nargund et al.  
When stressed, the mitochondrion reduces import of a transcription factor, which enters the nucleus instead.

591 Opening and Closing of the Bacterial RNA Polymerase Clamp  
A. Chakraborty et al.  
Single-molecule fluorescence measurements define the clamp conformation during transcription initiation and elongation.

595 How Low Can You Go? Physical Production Mechanism of Elephant Infrasonic Vocalizations  
C. T. Herbst et al.  
Elephants produce low-frequency sounds via intrinsic vocal-fold vibrations similar to those in humans.  
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599 Feedback Regulation of Transcriptional Termination by the Mammalian Circadian Clock PERIOD Complex  
K. Padmanabhan et al.  
A circadian rhythm regulator acts by altering the elongation stage of gene expression.

Downloaded from <http://science.sciencemag.org/> on February 24, 2018

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## SCIENCEONLINE

## SCIENCEEXPRESS

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

**A 200-Second Quasi-Periodicity After the Tidal Disruption of a Star by a Dormant Black Hole**

*R. C. Reis et al.*

Oscillations in x-ray emission from a galaxy's central black hole imply that a disc formed after the hole captured a star.

10.1126/science.1223940

**Conduction of Ultracold Fermions Through a Mesoscopic Channel**

*J.-P. Brantut et al.*

Lithium atoms are used to simulate electronic transport.

10.1126/science.1223175

**Lineage Tracing Reveals Lgr5<sup>+</sup> Stem Cell Activity in Mouse Intestinal Adenomas**

*A. G. Schepers et al.*

Multicolor reporter genes signal the fate of stem cells that fuel the growth of intestinal tumors in mice.

10.1126/science.1224676

**Circadian Rhythm of Redox State Regulates Excitability in Suprachiasmatic Nucleus Neurons**

*T. A. Wang et al.*

Diurnal metabolic changes in circadian clock neurons are coupled to changes in potassium channel activity.

10.1126/science.1222826

**Mycobacterial Disease and Impaired IFN- $\gamma$  Immunity in Humans with Inherited ISG15 Deficiency**

*D. Bogunovic et al.*

A mutation that accounts for adverse reactions to the Bacille Calmette-Guérin vaccine against tuberculosis is identified.

10.1126/science.1224026

**Neurexin and Neuroligin Mediate Retrograde Synaptic Inhibition in *C. elegans***

*Z. Hu et al.*

Two synaptic adhesion molecules that have been implicated in psychiatric diseases affect the kinetics of synaptic events.

10.1126/science.1224896

## SCIENCENOW

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

Highlights From Our Daily News Coverage

## Of Ice and Men

Scientists recreate weather conditions that sculpted unusual formations on Japanese mountain.

[http://scim.ag/Ice\\_Men](http://scim.ag/Ice_Men)

## Disarming Deep-Sea Tactics

Robotic submersible documents the first squid known to leave parts behind when provoked.

<http://scim.ag/Deep-Sea>

## Flushing Out Drug Users

Chemical analysis of sewage yields a new picture of drug use across Europe.

<http://scim.ag/Drug-Users>

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

**31 July issue:** <http://scim.ag/ss073112>

**EDITORIAL GUIDE: Focus Issue—Regulation of Lymphocyte Functions**

*E. Andrianantoandro and J. F. Foley*

Similar modes of regulation across different cell types promote effective innate and adaptive immunity.

**RESEARCH ARTICLE: The Scaffolding Protein Synapse-Associated Protein 97 Is Required for Enhanced Signaling Through Isotype-Switched IgG Memory B Cell Receptors**

*W. Liu et al.*

## PODCAST

*S. K. Pierce and A. M. VanHook*

A scaffolding protein clusters B cell receptors to promote antibody secretion by memory B cells.

**RESEARCH ARTICLE: Differential RET Signaling Pathways Drive Development of the Enteric Lymphoid and Nervous Systems**

*A. Patel et al.*

Cis and trans signaling mechanisms direct different developmental responses to ligands for the receptor tyrosine kinase RET.

**PERSPECTIVE: T Cell Signaling Targets for Enhancing Regulatory or Effector Function**

*F. Pan et al.*

The PD-1 receptor in effector T cells and the transcription factor Foxp3 in T<sub>regs</sub> are promising targets for therapies.

**PERSPECTIVE: Tyrosine Kinases Enabling Adaptor Molecules for Chemokine-Induced Rap1 Activation in T Cells**

*L. P. Malherbe and D. Wang*

T cell migration requires phosphorylation of an adaptor protein by Abl family kinases to activate guanosine triphosphatase Rap1.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

**1 August issue:** <http://scim.ag/stm080112>

**RESEARCH ARTICLE: Drug Screening for ALS Using Patient-Specific Induced Pluripotent Stem Cells**

*N. Egawa et al.*

Anacardic acid attenuates mutant TDP-43-associated abnormalities in motor neurons derived from ALS patient-specific induced pluripotent stem cells.

**RESEARCH ARTICLE: Reversal of Paralysis and Reduced Inflammation from Peripheral Administration of  $\beta$ -Amyloid in T<sub>H</sub>1 and T<sub>H</sub>17 Versions of Experimental Autoimmune Encephalomyelitis**

*J. L. Grant et al.*

**FOCUS:  $\beta$ -Amyloid—Enemy or Remedy?**

*R. Hohlfeld and H. Wekerle*

Amyloid  $\beta$  reduces inflammation and improves symptoms in a mouse model of multiple sclerosis.

**RESEARCH ARTICLE: Inhibition of LTi Cell Development by CD25 Blockade Is Associated with Decreased Intrathecal Inflammation in Multiple Sclerosis**

*J. S. A. Perry et al.*

**FOCUS: Anti-CD25 Immunotherapy—Regulating the Regulators**

*J. W. Rose*

Daclizumab inhibition of inflammation in human autoimmunity is associated with blockade of lymphoid tissue inducer cell development.

## SCIENCE CAREERS

[www.sciencereers.org/career\\_magazine](http://www.sciencereers.org/career_magazine)

Free Career Resources for Scientists

## The Paddle and the Pipette

*E. Wayman*

James Wade, a U.S. Olympic Kayak Team alternate and a Ph.D. student in bioengineering, navigates a tricky course between his research and his sport. <http://scim.ag/PaddleandPipette>

## Physicists Learn a Trade

*M. Price*

A few universities are teaching physics students quantitative finance skills, but some observers think that isn't a good idea. <http://scim.ag/PhysicsFinance>

**In Person: What Not to Do With Your Physics Education**

*B. Allen*

A quantitative trader urges physics faculty not to send their students to Wall Street. <http://scim.ag/NotWallStreet>

## SCIENCE PODCAST

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

Free Weekly Show

On the 3 August *Science* Podcast: the quantum mechanics of black holes, analyzing elephant vocalizations, and chasing down the last of the polio virus.

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