



## COVER

False-color image of a section of the Semarkona meteorite. The round objects are chondrules; the large one near the bottom center is about 2 millimeters across. Magnesium-rich minerals (olivine and pyroxene) appear red, sodium-rich glass appears yellow, and the iron-rich material surrounding the chondrules includes matrix (greenish) and sulfides, metal, and oxides (blue). The sodium in the glass suggests that the chondrules formed in extremely dusty environments in the early solar system. See page 1617.

*Image: Jeffrey Grossman/USGS*

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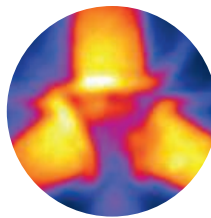
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## SCIENCE EXPRESS

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

### CLIMATE CHANGE

High-Resolution Greenland Ice Core Data Show Abrupt Climate Change Happens in Few Years

*J. P. Steffensen et al.*

Greenland's climate flipped to a different state within 1 to 3 years more than once during the last deglaciation.

10.1126/science.1157707

### IMMUNOLOGY

Censoring of Autoreactive B Cell Development by the Pre-B Cell Receptor

*R. A. Keenan et al.*

A protein that helps newly rearranged antibody chains arrive at the cell surface of immature immune cells is found to help delete cells with potential autoreactivity.

10.1126/science.1157533

### APPLIED PHYSICS

Control of Exciton Fluxes in an Excitonic Integrated Circuit

*A. A. High, E. E. Novitskaya, L. V. Butov, M. Hanson, and A. C. Gossard*

Coupled quantum-wells structures, patterned to create electron-hole circuits, can perform simple logic operations on optical input signals.

10.1126/science.1157845

### IMMUNOLOGY

Modulation of Gene Expression via Disruption of NF- $\kappa$ B Signaling by a Bacterial Small Molecule

*V. V. Kravchenko et al.*

A small molecule produced by a common pathogenic bacterium inhibits the activity of a key immune transcription factor.

10.1126/science.1156499

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Comment on "Athabasca Valles, Mars: A Lava-Draped Channel System" 1588

*D. P. Page*

[full text at www.sciencemag.org/cgi/content/full/320/5883/1588b](http://www.sciencemag.org/cgi/content/full/320/5883/1588b)

Response to Comment on "Athabasca Valles, Mars: A Lava-Draped Channel System"

*W. L. Jaeger et al.*

[full text at www.sciencemag.org/cgi/content/full/320/5883/1588c](http://www.sciencemag.org/cgi/content/full/320/5883/1588c)

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*S. Bowles*



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### PLANT SCIENCE

Auxin Gradients Are Associated with Polarity Changes in Trees 1610

*E. M. Kramer et al.*

In quaking aspen trees that have been injured, gradients of the hormone auxin redirect the wood grain as the wound heals.

## REPORTS

### ASTRONOMY

Strong Limit on a Variable Proton-to-Electron Mass Ratio from Molecules in the Distant Universe 1611

*M. T. Murphy, V. V. Flambaum, S. Muller, C. Henkel*

Absorbed radio emissions from a distant quasar provide an estimate of a fundamental constant, the proton/electron mass ratio, over time and limit its possible variations.

### PHYSICS

Single-Cycle Nonlinear Optics 1614

*E. Goulielmakis et al.*

Ionizing neon atoms with light pulses generates shorter light bursts, less than 100 attoseconds long, that can be used to test electron interactions and strong-field theories.

### METEORITICS

The Formation Conditions of Chondrules and Chondrites 1617

*C. M. O'D. Alexander, J. N. Grossman, D. S. Ebel, F. J. Ciesla*

The high sodium content of grains from the early solar system implies that they formed in parts of the solar nebula with unexpectedly high densities of dust, limiting volatilization.

### GEOCHEMISTRY

Iron Isotope Fractionation During Magmatic Differentiation in Kilauea Iki Lava Lake 1620

*F.-Z. Teng, N. Dauphas, R. T. Helz*

Iron isotopes fractionated between crystals and melt during crystallization of a lava lake, despite temperatures exceeding 1000° Celsius, perhaps influenced by differing iron oxidation.

>> *Perspective p. 1600*

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CLIMATE CHANGE

Natural Variability of Greenland Climate, Vegetation, and Ice Volume During the Past Million Years 1622

*A. de Vernal and C. Hillaire-Marcel*

A 1-million-year pollen record shows that the southern part of the Greenland ice sheet melted enough during some past warm episodes so that forests grew.

>> *Perspective p. 1595*

CLIMATE CHANGE

Elevation Changes in Antarctica Mainly Determined by Accumulation Variability 1626

*M. M. Helsen et al.*

Satellite data since 1995, corrected for the conversion of snow to denser ice, imply that ice sheets grew slowly in the East Antarctic but decreased around the Amundsen Sea.

>> *Perspective p. 1596*

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Natural Selection Shapes Genome-Wide Patterns of Copy-Number Polymorphism in *Drosophila melanogaster* 1629

*J. J. Emerson, M. Cardoso-Moreira, J. O. Borevitz, M. Long*

A high-resolution analysis of gene copy number in *Drosophila* species shows that most variations are deleterious but a few for resistance to toxins are being positively selected.

EVOLUTION

Phylogeny-Aware Gap Placement Prevents Errors in Sequence Alignment and Evolutionary Analysis 1632

*A. Löytynoja and N. Goldman*

An algorithm that treats insertions and deletions as distinct events in genomic data improves sequence alignments, allowing more accurate phylogenetic studies.

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A Molecular Clutch Disables Flagella in the *Bacillus subtilis* Biofilm 1636

*K. M. Blair et al.*

One bacterial protein synthesized during the production of a biofilm matrix acts as a clutch to disable the flagellum while the microbe is constrained in the biofilm.

>> *Perspective p. 1599; Science Podcast*

NEUROSCIENCE

Tuned Responses of Astrocytes and Their Influence on Hemodynamic Signals in the Visual Cortex 1638

*J. Schummers, H. Yu, M. Sur*

Astrocytes in the visual cortex respond to visual stimuli, showing receptive field properties (response kinetics, orientation, and localization) similar to those of neurons.

>> *Perspective p. 1597*

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Proliferating Cells Express mRNAs with Shortened 3' Untranslated Regions and Fewer MicroRNA Target Sites 1643

*R. Sandberg et al.*

Dividing immune cells tend to synthesize messenger RNAs with shorter 3' regulatory regions, possibly because less control is required over RNA functions.

MICROBIOLOGY

Evolution of Mammals and Their Gut Microbes 1647

*R. E. Ley et al.*

Genomic sampling of the microbes in the feces of 60 mammals show that herbivores harbor the most diversity and that individuals of the same species have the same flora.

MICROBIOLOGY

Ankyrin Repeat Proteins Comprise a Diverse Family of Bacterial Type IV Effectors 1651

*X. Pan, A. Lührmann, A. Satoh, M. A. Laskowski-Arce, C. R. Roy*

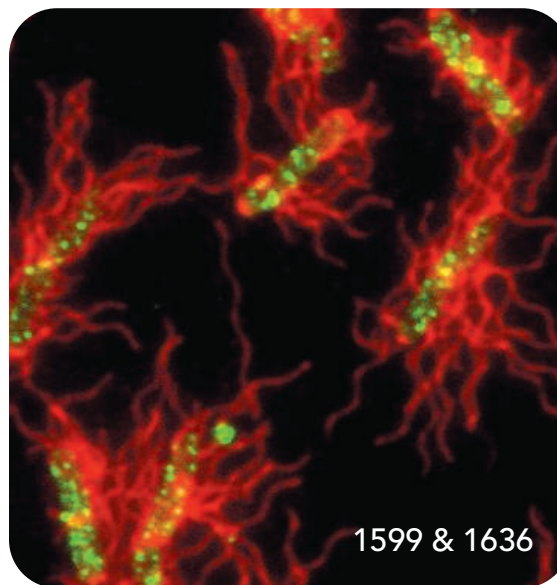
A microbial protein containing ankyrin repeats is injected into host cells through a specialized secretion system where it prevents microtubule-dependent vesicular fusion.

CELL BIOLOGY

Bora and the Kinase Aurora A Cooperatively Activate the Kinase Plk1 and Control Mitotic Entry 1655

*A. Seki, J. A. Coppinger, C.-Y. Jang, J. R. Yates III, G. Fang*

Mitosis begins in mammalian cells when a protein accumulates between cell divisions and interacts with a second protein to initiate a cascade of kinase activation.



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A heterotrimeric G protein.

## SCIENCE SIGNALING

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THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

### REVIEW: Dissociation of Heterotrimeric G Proteins in Cells

*N. A. Lambert*

G proteins may function as activated heterotrimers, as well as dissociated subunits.

### PERSPECTIVE: Does Contractile Ca<sup>2+</sup> Control Calcineurin-NFAT Signaling and Pathological Hypertrophy in Cardiac Myocytes?

*S. R. Houser and J. D. Molkenin*

Are calcium signaling pathways in the heart regulated by bulk cytoplasmic calcium or by calcium in specialized microdomains?

### PERSPECTIVE: A Cunning Stunt—An Alternative Mechanism of Eukaryotic Translation Initiation

*S. J. Morley and M. J. Coldwell*

Translation of cellular inhibitor of apoptosis 2 transcripts appears to involve a ribosome shunting mechanism, permitting translation in periods of stress.



## SCIENCE ONLINE FEATURE

### THE GONZO SCIENTIST: Slaying Monsters for Science

An article and video highlight the first scientific conference held in Azeroth, the online universe of the role-playing game World of Warcraft.

[www.sciencemag.org/sciext/gonzoscientist/](http://www.sciencemag.org/sciext/gonzoscientist/)

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HIGHLIGHTS FROM OUR DAILY NEWS COVERAGE

### How Is a Lizard Like a Motorcycle?

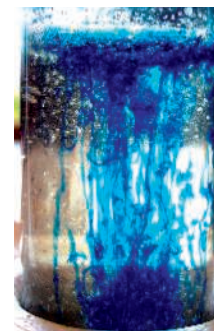
Study answers century-old mystery of why lizards “pop a wheelie” while running.

### Life Cooked Up in Outer Space?

Meteorite fragments contain makings of DNA.

### The Importance of Being Frightened

Wide eyes and flared nostrils may have saved our ancestors on more than one occasion.



Finding opportunities in toxins.

## SCIENCE CAREERS

[www.sciencereers.org/career\\_development](http://www.sciencereers.org/career_development)

FREE CAREER RESOURCES FOR SCIENTISTS

### In Toxicology, Opportunities Abound

*B. Vastag*

Toxicology encompasses a wide range of disciplines and offers a wide range of jobs.

### Tooling Up: What Really Matters in a Job Talk

*D. Jensen*

The key to giving a good job talk is giving what your audience is looking for.

### Training in Academia—and Industry

*E. Pain*

Physicist Sylvain Schwartz has won acclaim from both the private sector and the ivory tower.

### Held-Over Feature: Sustaining Forests in a Changing World

*E. Pain*

*Science Careers* reviews career opportunities in forest ecology.

## SCIENCE PODCAST

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