

SPECIAL SECTION

## Metabolism

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- 1349 Circadian Integration of Metabolism and Energetics  
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>> *Science Translational Medicine* p. 1281 and *Science Signaling* at [www.sciencemag.org/special/metabolism/](http://www.sciencemag.org/special/metabolism/)



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*F. S. Collins et al.*

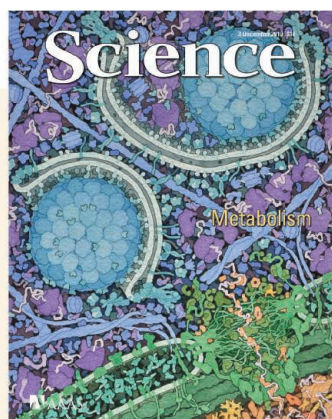
### PERSPECTIVES

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### COVER

Autophagy, the process by which cells digest their own components, takes place in vesicles called autophagosomes (white membrane structures), the size of which are determined by the amount of a protein called Atg8. Basal amounts of Atg8 (small membrane-associated spheres) generate a small vesicle (middle left), whereas larger amounts cause formation of a full-fledged autophagosome (upper right). Autophagy provides fuel for cellular metabolism, the topic of the special section beginning on page 1337.

Painting: *David S. Goodsell*; Scientific Design: *Zhou Du and Daniel J. Klionsky*

### DEPARTMENTS

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## RESEARCH ARTICLE

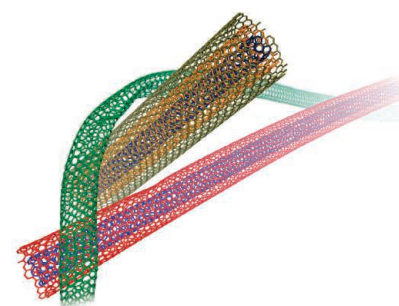
- 1359 **How Learning to Read Changes the Cortical Networks for Vision and Language**  
S. Dehaene et al.  
Reading changes the mind.

## REPORTS

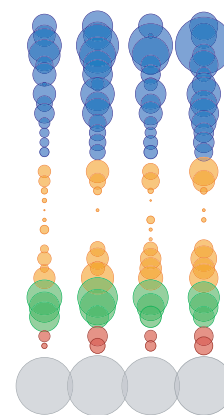
- 1364 **Carbon Nanotubes with Temperature-Invariant Viscoelasticity from  $-196^{\circ}$  to  $1000^{\circ}\text{C}$**   
M. Xu et al.  
A dense carbon-nanotube network shows nearly constant viscoelastic properties over an exceptionally wide temperature range.  
>> *Perspective p. 1332*
- 1368 **Video-Rate Molecular Imaging in Vivo with Stimulated Raman Scattering**  
B. G. Saar et al.  
Raman spectra can be acquired rapidly from samples that otherwise would scatter the usable signal.  
>> *Science Podcast*
- 1371 **The Role of Particle Morphology in Interfacial Energy Transfer in CdSe/CdS Heterostructure Nanocrystals**  
N. J. Borys et al.  
Single-particle spectroscopy suggests that non-uniform geometries favor efficient charge separation for light harvesting.
- 1375 **A Cryptic Sulfur Cycle in Oxygen-Minimum-Zone Waters off the Chilean Coast**  
D. E. Canfield et al.  
Bacterial sulfur reduction and oxidation accompanies nitrogen cycling where oxygen levels at depth are low.  
>> *Perspective p. 1326*
- 1378 **Dynamical Response of the Tropical Pacific Ocean to Solar Forcing During the Early Holocene**  
T. M. Marchitto et al.  
Enhanced solar activity caused the tropical Pacific to cool into a La Niña-like state during the mid-Holocene.
- 1381 **Plasticity of Animal Genome Architecture Unmasked by Rapid Evolution of a Pelagic Tunicate**  
F. Denoëud et al.  
A metazoan genome departs from the organization that appears rigidly established in other animal phyla.
- 1385 **Rewiring of Genetic Networks in Response to DNA Damage**  
S. Bandyopadhyay et al.  
A network comparison of genetic interactions mapped at two conditions reveals genetic responses to DNA damage in yeast.  
>> *Perspective p. 1327*

- 1390 **BID, BIM, and PUMA Are Essential for Activation of the BAX- and BAK-Dependent Cell Death Program**  
D. Ren et al.  
Proapoptotic proteins act directly on mitochondrial "gatekeeper" proteins to initiate apoptotic events during mouse development.  
>> *Perspective p. 1330*
- 1393 ***Arabidopsis* Type I Metacaspases Control Cell Death**  
N. S. Coll et al.  
An ancient link between cell death control and innate immune receptor function has been discovered in plants.
- 1397 **An Antagonistic Pair of *FT* Homologs Mediates the Control of Flowering Time in Sugar Beet**  
P. A. Pin et al.  
A homolog of a *flowering time* gene has evolved a flowering repression function, affecting the seasonal cold response in beets.
- 1400 **Alleviating Neuropathic Pain Hypersensitivity by Inhibiting PKM $\zeta$  in the Anterior Cingulate Cortex**  
X.-Y. Li et al.  
Nerve injury increases the activity of an enzyme in the brain and contributes to chronic pain-related cortical sensitization.
- 1404 **Micro-Optical Sectioning Tomography to Obtain a High-Resolution Atlas of the Mouse Brain**  
A. Li et al.  
Acquisition of light microscopic data at 1-micrometer resolution for an entire mouse brain has been developed.
- 1408 **Paradoxical False Memory for Objects After Brain Damage**  
S. M. McTighe et al.  
Impaired recognition may be due to treating novel objects as familiar, rather than treating familiar objects as novel.  
>> *Perspective p. 1331*
- 1410 **Frequent Mutation of *BAP1* in Metastasizing Uveal Melanomas**  
J. W. Harbour et al.  
A gene implicated in the control of protein degradation is mutated at high frequency in a metastatic eye cancer.
- 1413 **Direct Exchange of Electrons Within Aggregates of an Evolved Syntrophic Coculture of Anaerobic Bacteria**  
Z. M. Summers et al.  
Direct cell-to-cell electron transfer occurs between two related species of bacteria.

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## SCIENCEONLINE

## SCIENCEEXPRESS

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

### A Bacterium That Can Grow by Using Arsenic Instead of Phosphorus

*F. Wolfe-Simon et al.*

A bacterium has been found that can swap a toxic metalloid for a key molecular building block in its nucleic acids and enzymes.

10.1126/science.1197258

>> *News story p. 1302; Science Podcast*

### Cytoplasmic Partitioning of P Granule Components Is Not Required to Specify the Germline in *C. elegans*

*C. M. Gallo et al.*

Germ granules do not need to be segregated asymmetrically during cell division to specify germ cell fate.

10.1126/science.1193697

### Vernalization-Mediated Epigenetic Silencing by a Long Intronic Noncoding RNA

*J. B. Heo and S. Sung*

Spring flowering enabled by a winter chill is regulated by interplay between protein-coding and noncoding RNA transcripts.

10.1126/science.1197349

### Large Variations in Southern Hemisphere Biomass Burning During the Last 650 Years

*Z. Wang et al.*

Large variations in the degree of biomass burning in the Southern Hemisphere occurred during the past 650 years.

10.1126/science.1197257

### SPORE SERIES WINNER

#### Science 101: Building the Foundations for Real Understanding

*A. Thanukos et al.*

10.1126/science.1186994

## SCIENCENOW

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

Highlights From Our Daily News Coverage

### Black Hole May Offer Clues to Extra Dimensions

Controversial idea relies on string theory and warping of spacetime.

### The Curious Case of the Backwardly Aging Mouse

Restoring chromosome caps reverses signs of aging in rodents.

### Earth Oceans Were Homegrown

New model suggests that our seas did not come from comets and asteroids.

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

### RESEARCH ARTICLE: The Extracellular Domain of Fibroblast Growth Factor Receptor 3 Inhibits Ligand-Independent Dimerization

*L. Chen et al.*

The extracellular domain of a receptor tyrosine kinase has opposing effects on dimerization, depending on whether ligand is present or not.

### PERSPECTIVE: Compartment-Specific Control of Signaling from a DNA-Sensing Immune Receptor

*A. Engel and G. M. Barton*

The endosomal compartment in which TLR9 is activated determines which cytokines are produced.

## GLOSSARY

Find out what BAPTA, CaSR, and DOCK mean in the world of cell signaling.

### NETWATCH: Peptide Atlas

Access a database of peptides identified in mass spectrometry analyses; in Protein Databases.

### NETWATCH: BioInteractive

Take advantage of online videos and interactive lessons for teaching and learning about biology; in Educator Sites.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

### Battling Cyber Threats

*S. Carpenter*

A critical shortage of highly skilled cybersecurity technicians and engineers means wide-ranging opportunities for scientists.

### Becoming 'MacGyvers'

*S. Carpenter*

For University of Tulsa Cyber Corps students, homework means picking through Dumpsters and hacking computer systems.

### Taken for Granted: Choosing Between Science and Caring?

*B. L. Benderly*

Research suggests that many able women view careers in hard science as inimical to important values.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

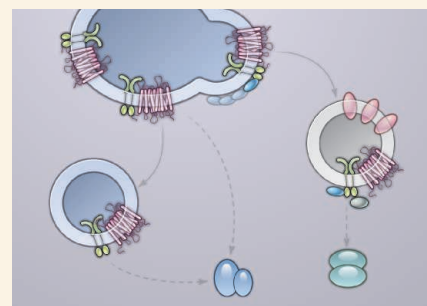
### REVIEW: The Role of JNK Proteins in Metabolism

*S. N. Vallerie and G. S. Hotamisligil*

To combat metabolic diseases, therapeutic c-Jun N-terminal kinase (JNK) inhibitors must target multiple cell types.

>> *Metabolism section p. 1337 and*

[www.sciencemag.org/special/metabolism/](http://www.sciencemag.org/special/metabolism/)



SCIENCE SIGNALING  
Trafficking inflammation.

### RESEARCH ARTICLE: IL-22<sup>+</sup> CD4<sup>+</sup> T Cells Are Associated with Therapeutic *Trichuris trichiura* Infection in an Ulcerative Colitis Patient

*M. J. Broadhurst et al.*

Infection with a nematode worm decreases inflammation in an ulcerative colitis patient.

### RESEARCH ARTICLE: Replacing the Enzyme $\alpha$ -L-Iduronidase at Birth Ameliorates Symptoms in the Brain and Periphery of Dogs with Mucopolysaccharidosis Type I

*A. D. Dierenfeld et al.*

Replacing  $\alpha$ -l-iduronidase at birth ameliorates symptoms in dogs with a lysosomal storage disorder.

## SCIENCE PODCAST

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Free Weekly Show

Download the 3 December *Science* Podcast to hear about a bacterium that uses arsenic instead of phosphorus, imaging the skin in vivo, science in Brazil, and more.

## SCIENCE INSIDER

[news.sciencemag.org/scienceinsider](http://news.sciencemag.org/scienceinsider)

Science Policy News and Analysis

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