

SPECIAL SECTION

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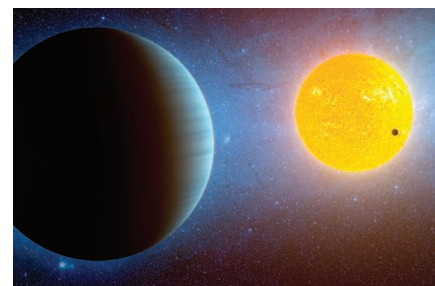
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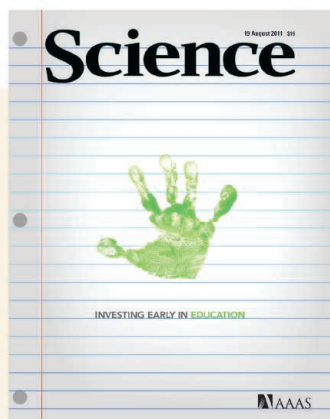
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Prior to beginning formal schooling, young children can learn a great deal, forming affiliations with favorite topics and experiences. What are these children best able to learn? What value does this early learning hold for later-life experiences? The special section beginning on p. 951 focuses on science that can guide decisions about when, how, and what to teach in these early years.

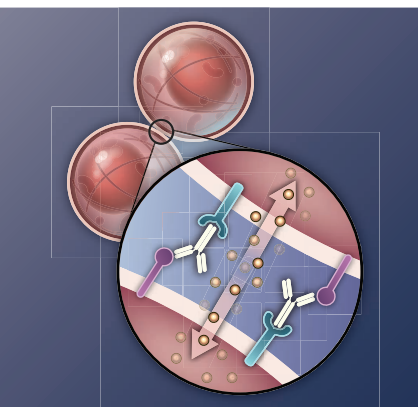
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### DEPARTMENTS

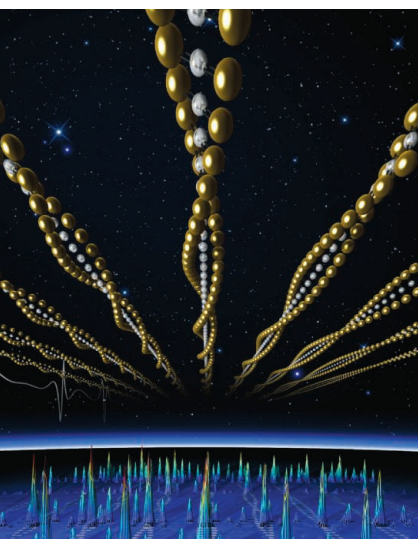
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## RESEARCH ARTICLES

- 984** Partitioning Regulatory Mechanisms of Within-Host Malaria Dynamics Using the Effective Propagation Number  
*C. J. E. Metcalf et al.*  
As malaria progresses, red blood cell availability and immune control change depending on the initial dose of parasites.  
>> *Perspective p. 943*
- 988** A Large and Persistent Carbon Sink in the World's Forests  
*Y. Pan et al.*  
Net average global annual uptake of atmospheric carbon dioxide by forests was 1.1 petagrams of carbon, roughly one-sixth of fossil fuel emissions.

## REPORTS

- 993** Detection of Emerging Sunspot Regions in the Solar Interior  
*S. Ilonidis et al.*  
Helioseismic observations allow the detection of sunspots before they emerge at the surface of the Sun.
- 996** Quantum Simulation of Frustrated Classical Magnetism in Triangular Optical Lattices  
*J. Struck et al.*  
An optical lattice of trapped atoms provides a tractable and tunable setup to study complex magnetic interactions.
- 999** Visualizing Individual Nitrogen Dopants in Monolayer Graphene  
*L. Zhao et al.*  
Nitrogen atoms that replace carbon atoms in the graphene lattice strongly modify the local electronic structure.
- 1003** Guided Growth of Millimeter-Long Horizontal Nanowires with Controlled Orientations  
*D. Tsivion et al.*  
Long, horizontal gallium nitride nanowires are controllably grown on different faces of a sapphire substrate.
- 1008** A Main Group Metal Sandwich: Five Lithium Cations Jammed Between Two Corannulene Tetraanion Decks  
*A. V. Zabula et al.*  
Characterization of the lithium-ion arrangement between two carbon sheets may ultimately aid in the design of battery electrodes.
- 1011** CRASY: Mass- or Electron-Correlated Rotational Alignment Spectroscopy  
*C. Schröter et al.*  
A technique merging rotational spectroscopy with mass spectrometry facilitates analysis of a complex isotopic mixture.  
>> *Perspective p. 947*

- 1015** Race, Ethnicity, and NIH Research Awards  
*D. K. Ginther et al.*  
NIH research project grants from 2000 to 2006 show evidence of racial/ethnic disparities in the probability of receiving an award.  
>> *News story p. 925; Policy Forum p. 940; Science Careers article p. 917*
- 1019** Three Periods of Regulatory Innovation During Vertebrate Evolution  
*C. B. Lowe et al.*  
Patterns of vertebrate gene regulation have changed during the course of evolution.  
>> *Perspective p. 946*
- 1024** Rapid Range Shifts of Species Associated with High Levels of Climate Warming  
*I.-C. Chen et al.*  
A meta-analysis shows that species are shifting their distributions in response to climate change at an accelerating rate.  
>> *Science Podcast*
- 1026** Aneuploidy Drives Genomic Instability in Yeast  
*J. M. Sheltzer et al.*  
Extra chromosomes cause general genomic instability in yeast.  
>> *Perspective p. 942; Report p. 1039*
- 1030** Inhibitory Fcγ Receptor Engagement Drives Adjuvant and Anti-Tumor Activities of Agonistic CD40 Antibodies  
*F. Li and J. V. Ravetch*  
Engagement of an inhibitory receptor improves the anti-tumor efficacy of a monoclonal antibody.  
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- 1034** An Interaction-Based Approach to Enhancing Secondary School Instruction and Student Achievement  
*J. P. Allen et al.*  
"Just the facts" is not enough.  
>> *Science Podcast*
- 1037** Graduate Students' Teaching Experiences Improve Their Methodological Research Skills  
*D. F. Feldon et al.*  
Teaching is not wasted time.
- 1039** Mutational Inactivation of STAG2 Causes Aneuploidy in Human Cancer  
*D. A. Solomon et al.*  
Tumors harbor mutations that disrupt chromatid separation during cell division, leading to chromosomal abnormalities.  
>> *Perspective p. 942; Report p. 1026*

## SCIENCEONLINE

## SCIENCEEXPRESS

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

### Human Sperm Binding Is Mediated by the Sialyl-Lewis<sup>x</sup> Oligosaccharide on the Zona Pellucida

*P.-C. Pang et al.*

Fertilization in humans is initiated by binding of spermatozoa to a selectin ligand on the egg's extracellular matrix.

10.1126/science.1207438

### Unfolded Proteins Are Ire1-Activating Ligands That Directly Induce the Unfolded Protein Response

*B. M. Gardner and P. Walter*

Misfolded secretory proteins activate a quality control pathway by binding a sensor in the endoplasmic reticulum.

10.1126/science.1209126

### Recently Formed Polyploid Plants Diversify at Lower Rates

*I. Mayrose et al.*

The doubling of genomes does not cause increased plant speciation unless the progenitor lineages are highly fit.

10.1126/science.1207205

### Ice Flow of the Antarctic Ice Sheet

*E. Rignot et al.*

A high-resolution map of ice motion in Antarctica shows the details of ice movement in a warming climate.

10.1126/science.1208336

### Soil Nitrite as a Source of Atmospheric HONO and OH Radicals

*H. Su et al.*

Biogenic nitrite in soils is an important source of atmospheric HONO and OH.

10.1126/science.1207687

## SCIENCE NOW

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

Highlights From Our Daily News Coverage

### Iconic Fishes Face New Threat

Western trout are likely to be hammered by climate change, with native species hit particularly hard.

<http://scim.ag/iconic-fish>

### Fukushima Reactor Damage Picked Up in California Winds

Trace radioactive elements offer clues to radiation within the Japanese power plant.

<http://scim.ag/reactor-wind>

### 'Earth-Mars' Collision May Have Happened in Alien Solar System

Did something whack a dim star's planet—and create a new moon?

<http://scim.ag/earth-mars>

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

**16 August issue:** <http://scim.ag/ss081611>

### RESEARCH ARTICLE: Yeast Dynamically Modify Their Environment to Achieve Better Mating Efficiency

*M. Jin et al.*

By reshaping the pheromone gradient through proteolysis, yeast find partners of the opposite "sex" for mating.

### PRESENTATION: miR-221/222 Targeting of Trichorhinophalangeal 1 (TRPS1) Promotes Epithelial-to-Mesenchymal Transition in Breast Cancer

*S. Stinson et al.*

MicroRNAs miR-221 and miR-222 are associated with a clinically aggressive form of breast cancer and promote epithelial-to-mesenchymal transition.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

**17 August issue:** <http://scim.ag/stm081711>

### COMMENTARY: Evaluating Preclinical Efficacy

*M. A. Atkinson*

Translation of modern type 1 diabetes treatments from mouse to humans depends on implementation of therapeutic efficacy standards.

### COMMENTARY: Biomedical Innovation—A Risky Business at Risk

*R. S. Stack and R. A. Harrington*

Biomedical innovation needs a new regulatory framework that better balances the benefits and risks to the public of pioneering products.

### RESEARCH ARTICLE: Computational Repositioning of the Anticonvulsant Topiramate for Inflammatory Bowel Disease

*J. T. Dudley et al.*

### RESEARCH ARTICLE: Discovery and Preclinical Validation of Drug Indications Using Compendia of Public Gene Expression Data

*M. Sirota et al.*

### PERSPECTIVE: The Emergence of Genome-Based Drug Repositioning

*Y. A. Lussier and J. L. Chen*

Genome-wide methods of mRNA signature analyses permit the high-throughput evaluation of medications for drug repurposing.

### RESEARCH ARTICLE: Stem Cell-Mediated Transfer of a Human Artificial Chromosome Ameliorates Muscular Dystrophy

*F. S. Tedesco et al.*

Combining gene delivery using a human artificial chromosome with stem cell transplantation ameliorates muscular dystrophy in a mouse model.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

### Overcoming the R01 Race Gap

*M. Price*

A new finding says black scientists win NIH R01 grants 10 percent less often than whites; here's how they can improve the odds.

<http://scim.ag/R01RaceGap>

>> *News story p. 925; Policy Forum p. 940;*

*Report p. 1015*

### Translational Research in Early Childhood Education

*S. Carpenter*

Two researchers combine neuroscience and education to discover interventions for children with learning difficulties.

<http://scim.ag/NeuroEducation>

>> *Education section p. 951 and www.sciencemag.org/special/education2011/*

### Tooling Up: Clinical Trials Careers

*D. Jensen*

A recent book describes several clinical career paths that can be entered by people without clinical experience.

[http://scim.ag/TU\\_ClinicalTrials](http://scim.ag/TU_ClinicalTrials)

## SCIENCE PODCAST

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

Free Weekly Show

On the 19 August *Science* Podcast: shifting species ranges in response to climate change, improving learning through social interactions, searching for exoplanets, and more.

## SCIENCE INSIDER

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

Science Policy News and Analysis

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