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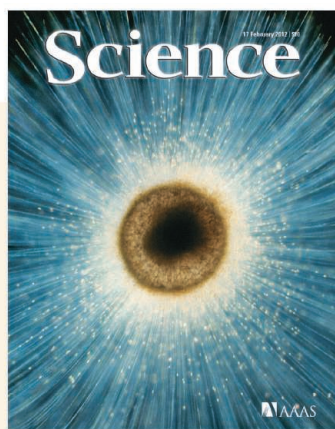
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## COVER

*Orbulina universa*, a planktonic foraminifera captured live from surface waters off Santa Catalina Island, California. Symbiotic dinoflagellates inhabit the calcite spines (length ~2.5 millimeters) radiating out from a spherical calcite shell (diameter ~0.5 millimeters). After four weeks, the shells sink to the sea floor and become part of the deep-sea microfossil assemblage. The geochemical compositions of these fossils are used to reconstruct past changes in seawater chemistry (see page 818).

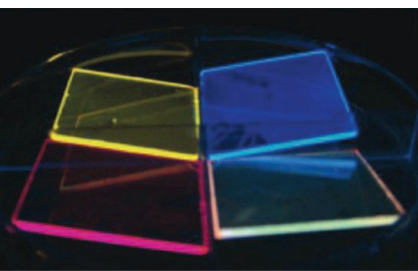
Photo: Howard J. Spero, University of California, Davis

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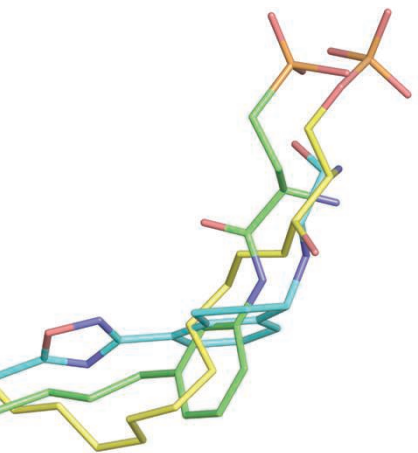
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## RESEARCH ARTICLES

- 818 Lithium Isotope History of Cenozoic Seawater: Changes in Silicate Weathering and Reverse Weathering  
*S. Misra and P. N. Froelich*  
Historical changes in the lithium isotope ratio in seawater imply episodes of tectonic uplift and carbon dioxide drawdown.  
>> *Perspective p. 810*
- 823 A Systematic Survey of Loss-of-Function Variants in Human Protein-Coding Genes  
*D. G. MacArthur et al.*  
Validation of predicted nonfunctional alleles in the human genome affects the medical interpretation of genomic analyses.  
>> *Perspective p. 806; Science Podcast*

## REPORTS

- 828 Unraveling the Spin Polarization of the  $\nu = 5/2$  Fractional Quantum Hall State  
*L. Tiemann et al.*  
Nuclear magnetic resonance shows that an exotic state of matter may have the properties necessary for error-free quantum computing.
- 831 A Logic-Gated Nanorobot for Targeted Transport of Molecular Payloads  
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Cargoes stored in folded DNA origami are released when aptamers in the structure bind target protein molecules.
- 835 Supported Iron Nanoparticles as Catalysts for Sustainable Production of Lower Olefins  
*H. M. Torres Galvis et al.*  
A class of iron catalysts selectively transforms gasified biomass into the building blocks of common plastics.
- 838 Plate Motions and Stresses from Global Dynamic Models  
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Geodynamic modeling predicts where the mantle drives or resists the motion of overlying tectonic plates.

- 843 *Cyanophora paradoxa* Genome Elucidates Origin of Photosynthesis in Algae and Plants  
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An ancient algal genome suggests a unique origin of the plastid in the ancestor to plants, algae, and glaucophytes.  
>> *Perspective p. 809*
- 848 RNA Editing Underlies Temperature Adaptation in  $K^+$  Channels from Polar Octopuses  
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Octopus potassium channels function efficiently at different temperatures due to RNA editing and not genetic differences.  
>> *Perspective p. 805*
- 851 Crystal Structure of a Lipid G Protein-Coupled Receptor  
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A channel in a lipid-dependent G protein-coupled receptor allows a ligand to access its binding site from within the plasma membrane.
- 856 Epithelial Nitration by a Peroxidase/NOX5 System Mediates Mosquito Antiplasmodial Immunity  
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Expression of nitric oxide synthase followed by peroxidase activity makes *Plasmodium* visible to the insect's complement system.
- 859 Structural Basis of TLR5-Flagellin Recognition and Signaling  
*S. Yoon et al.*  
Bacterially derived flagellin binds to an innate immune receptor to form a tail-to-tail heterodimeric signaling complex.
- 864 Survival Analysis of Faculty Retention in Science and Engineering by Gender  
*D. Kaminski and C. Geisler*  
Individual assistant professors hired since 1990 at 14 U.S. universities were tracked from time of hire to time of departure.  
>> *Science Podcast*

## SCIENCEONLINE

## SCIENCEEXPRESS

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

**Lin28b Reprograms Adult Bone Marrow Hematopoietic Progenitors to Mediate Fetal-like Lymphopoiesis**

J. Yuan et al.

The RNA binding protein Lin28 drives fetal modes of immune cell development.

10.1126/science.1216557

**The Transcription Factor c-Maf Controls Touch Receptor Development and Function**

H. Wende et al.

A mutation known to cause cataracts also disables a specialized mechanosensory receptor in mice and humans.

10.1126/science.1214314

**Influence of Synaptic Vesicle Position on Release Probability and Exocytotic Fusion Mode**

H. Park et al.

Tracking of individual synaptic vesicles reveals that kiss-and-run fusion is concentrated near the center of the synapse.

10.1126/science.1216937

**Observation of Quantum Criticality with Ultracold Atoms in Optical Lattices**

X. Zhang et al.

Trapped low-temperature atoms model the transition between insulating and superfluid states in a more complex material.

10.1126/science.1217990

**<sup>182</sup>W Evidence for Long-Term Preservation of Early Mantle Differentiation Products**

M. Touboul et al.

Tungsten isotopes in ancient volcanic rocks suggest sluggish mixing processes in the primitive mantle.

10.1126/science.1216351

**Surveillance of Animal Influenza for Pandemic Preparedness**

J. S. M. Peiris et al.

10.1126/science.1219936

>> *News story p. 785; Policy Forums pp. 799, 801, and 802; see all H5N1 coverage online at <http://scim.ag/h5n1>*

## TECHNICALCOMMENTS

**Comment on "A Diverse Assemblage of Late Cretaceous Dinosaur and Bird Feathers from Canadian Amber"**

C. J. Dove and L. C. Straker

Full text at [www.sciencemag.org/cgi/content/full/335/6070/796-b](http://www.sciencemag.org/cgi/content/full/335/6070/796-b)

**Response to Comment on "A Diverse Assemblage of Late Cretaceous Dinosaur and Bird Feathers from Canadian Amber"**

R. C. McKellar et al.

Full text at [www.sciencemag.org/cgi/content/full/335/6070/796-c](http://www.sciencemag.org/cgi/content/full/335/6070/796-c)

## SCIENCENOW

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

Highlights From Our Daily News Coverage

**Embryos Starved of Oxygen May Be 'Programmed' for Heart Disease**

A rat study suggests antioxidants could help.

[http://scim.ag/Embryos\\_Oxygen](http://scim.ag/Embryos_Oxygen)

**Is Agriculture Sucking Fresh Water Dry?**

Crops account for 92% of fresh water used each year, according to a new global analysis.

[http://scim.ag/Fresh\\_Water](http://scim.ag/Fresh_Water)

**A Piranha-Proof Fish**

Unique scales keep arapaima from becoming lunch.

<http://scim.ag/Piranha-Proof>

## SCIENCE SIGNALING

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

The Signal Transduction Knowledge Environment

**14 February issue: <http://scim.ag/ss021412>**

**RESEARCH ARTICLE: Selective TRIF-Dependent Signaling by a Synthetic Toll-Like Receptor 4 Agonist**

W. S. Bowen et al.

A single change in a synthetic lipid A mimetic may reduce the toxicity of this vaccine adjuvant.

**RESEARCH ARTICLE: MNK2 Inhibits eIF4G**

Activation Through a Pathway Involving Serine-Arginine-Rich Protein Kinase in Skeletal Muscle

S.-I. Hu et al.

In muscle, the kinase-dependent and -independent activities of MNK2 exert a negative effect on protein synthesis pathways.

**TEACHING RESOURCE: Measurement of cAMP in an Undergraduate Teaching Laboratory, Using ALPHAscreen Technology**

J. D. Bartho et al.

Students measure the changes in cyclic AMP, a second messenger molecule, with a light-based assay.

**ST NETWATCH: Minimum Information for Biological and Biomedical Investigations (MIBBI)**

This site provides checklists that specify the metadata required for experimental data sets.

**ST NETWATCH: Protein Information Resource (PIR)**

Access tools for integrating genomic and proteomic information from various databases.

## PODCAST

M. Peters-Golden and A. M. VanHook

The protein phosphatase activity of PTEN impairs macrophage phagocytosis of a fungal pathogen by promoting actin depolymerization.

## SCIENCE TRANSLATIONAL MEDICINE

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

Integrating Medicine and Science

**15 February issue: <http://scim.ag/stm021512>**

**RESEARCH ARTICLE: MicroRNA-21 Promotes Fibrosis of the Kidney by Silencing Metabolic Pathways**

B. N. Chau et al.

MicroRNA-21 contributes to fibrosis in the kidney by posttranscriptionally regulating lipid metabolism genes.

**RESEARCH ARTICLE: T-Type Calcium Channel Blockers That Attenuate Thalamic Burst Firing and Suppress Absence Seizures**

E. Tringham et al.

T-type calcium channel blockers attenuate neural activity in the thalamus and suppress seizures in a genetic model of epilepsy.

**RESEARCH ARTICLE: Phosphorylated  $\alpha$ -Synuclein in Parkinson's Disease**

Y. Wang et al.

An assay for detecting phosphorylated  $\alpha$ -synuclein in CSF may help to diagnose Parkinson's disease and determine disease severity.

**PERSPECTIVE: Viral and Inflammatory Triggers of Neurodegenerative Diseases**

M. Deleidi and O. Isacson

Immune pathways induced by viral infections render neurons vulnerable to subsequent degeneration.

## SCIENCE CAREERS

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

Free Career Resources for Scientists

**Tooling Up: The Big Disconnect**

D. Jensen

In today's biomedical industry, pinpoint hiring is the rule.

[http://scim.ag/TU\\_Disconnect](http://scim.ag/TU_Disconnect)

**Perspective: Bridging Your Research Into Public Health**

K. Chan

A public health researcher and former bench scientist offers advice on how to implement your science in the real world.

<http://scim.ag/KeeChan>

## SCIENCE PODCAST

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

Free Weekly Show

On the 17 February *Science* Podcast: the gender breakdown in academic faculty, identifying mutations that give rise to disease, budgeting for science in the United States, and more.

## SCIENCE INSIDER

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

Science Policy News and Analysis

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