



## COVER

Tomato (*Solanum lycopersicum*) domestication and selection resulted in an explosion of different fruit shapes and sizes, as exemplified by heirloom varieties. Wild ancestors of tomatoes such as *S. pimpinellifolium*, the smallest fruit shown here, were round (middle row, second from left). See page 1527.

*Image: Kelly Krause/Science;*  
*photos: Esther van der Knaap*

## DEPARTMENTS

- 1451 Science Online
- 1453 This Week in *Science*
- 1459 Editors' Choice
- 1464 Contact *Science*
- 1465 Random Samples
- 1467 Newsmakers
- 1547 New Products
- 1548 Science Careers

## EDITORIAL

- 1457 The IPCC Must Maintain Rigor  
*by Susan Solomon and Martin Manning*

## NEWS OF THE WEEK

- Two Papers From Korean Lab Found to Lack 'Scientific Truth' 1468
- \$300 Million in Private Money for New Investigators 1469
- Physicist Wins Open Illinois Seat 1470
- Indian Government Offers Helping Hand to Women Scientists 1470
- Hiding From Biting Insects in Plain Scent 1471  
*>> Science Express Report by M. Ditzien et al.*
- SCIENCESCOPE** 1471
- Proposed Frog Ban Makes a Splash 1472
- Spanish Scientists Question Accreditation Plan 1472
- U.K.'s Royal Society Ventures Into Funding Start-Up Companies 1473

## NEWS FOCUS

- Dueling Visions for a Hungry World 1474
- NSF Fellowships Called Powerful Tool for Building the Pipeline 1477
- Blood-Matching Goes Genetic 1478
- Cryptologists Cook Up Some Hash for New 'Bake-Off' Hash of the Future? 1480



1474

## LETTERS

- The Right Pitch for Saxophonists *P. King* 1483
- Second Basket's Negative Impact *C.-C. Carbon*
- Going Public with the Scientific Process *R. Cronje*
- Hoyle's Role in B<sup>2</sup>FH *G. Burbidge*

## CORRECTIONS AND CLARIFICATIONS 1484

## BOOKS ET AL.

- Reading Popular Physics Disciplinary Skirmishes and Textual Strategies *E. Leane, reviewed by D. Kaiser* 1485
- Elizabeth Blackburn and the Story of Telomeres Deciphering the Ends of DNA *C. Brady, reviewed by M. A. Goldman* 1486

## POLICY FORUM

- Inappropriate Use and Portrayal of Chimpanzees *S. R. Ross et al.* 1487

## PERSPECTIVES

- Observing Our Origins *F. J. Ciesla* 1488  
*>> Report p. 1504*
- Customized Signaling Circuits *P. M. Pryciak* 1489  
*>> Report p. 1539*
- The New Diamond Age? *P. W. May* 1490
- This Coincidence Cannot Be Accidental *D. J. Scalapino* 1492  
*>> Report p. 1509*
- Standing on the Shoulders of Giants *F. Coward* 1493
- A Quiescent Working Memory *S. Fusi* 1495  
*>> Report p. 1543*



1485

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CONTENTS continued >>

## SCIENCE EXPRESS

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

### PHYSICS

#### Coherent Dynamics of a Single Spin Interacting with an Adjustable Spin Bath

*R. Hanson, V. V. Dobrovitski, A. E. Feiguin, O. Gywat, D. D. Awschalom*

Simulations successfully show how the spin of a nitrogen vacancy in diamond is coupled to those of surrounding nitrogen impurities and how coherence between them is lost.

10.1126/science.1155400

### CHEMISTRY

#### Gate-Variable Optical Transitions in Graphene

*F. Wang et al.*

Application of electrical biases to single or double layers of graphene change its infrared reflectivity, mimicking aspects of transistors and opening up optoelectronic applications.

10.1126/science.1152793

### CLIMATE CHANGE

#### Impact of Artificial Reservoir Water Impoundment on Global Sea Level

*B. F. Chao, Y. H. Wu, Y. S. Li*

Accounting for water impounded globally in artificial lakes that were filled during the past 80 years raises estimates of natural contributions to recent sea level.

10.1126/science.1154580



### MOLECULAR BIOLOGY

#### Nutritional Control of Reproductive Status in Honeybees via DNA Methylation

*R. Kucharski, J. Maleszka, S. Foret, R. Maleszka*

Epigenetic modifications that involve methylation cause female honeybee larvae to become queens rather than workers when they are fed royal jelly.

10.1126/science.1153069

### NEUROSCIENCE

#### Insect Odorant Receptors Are Molecular Targets of the Insect Repellent DEET

*M. Ditzen, M. Pellegrino, L. B. Vosshall*

The widely used insect repellent DEET acts by inhibiting olfactory neurons that respond to odors such as those that attract insects to their hosts.

>> *News story p. 1471*

10.1126/science.1153121

## REVIEW

### ANTHROPOLOGY

#### The Late Pleistocene Dispersal of Modern Humans in the Americas 1497

*T. Goebel, M. R. Waters, D. H. O'Rourke*

## BREVIA

### ECOLOGY

#### Predators Induce Cloning in Echinoderm Larvae 1503

*D. Vaughn and R. R. Strathmann*

Sand dollar larvae respond to mucus from fish predators by rapid asexual reproduction, producing an increased number of smaller individuals that may be less visible.

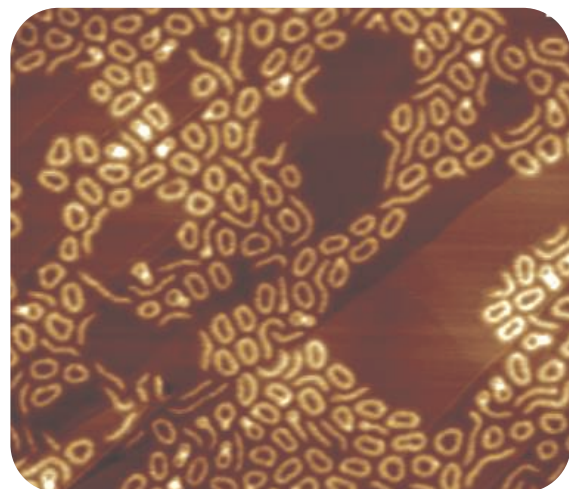


PHOTO CREDIT (TOP): GREG VOGEL, AD/CONTROLS

1512

## REPORTS

### ASTRONOMY

#### Organic Molecules and Water in the Planet Formation Region of Young Circumstellar Disks 1504

*J. S. Carr and J. R. Najita*

Simple organic molecules and water are abundant in the inner disk of a star like our early Sun, implying that organic synthesis is occurring there.

>> *Perspective p. 1488*

### PHYSICS

#### Superconductivity in Hydrogen Dominant Materials: Silane 1506

*M. I. Erements, I. A. Trojan, S. A. Medvedev, J. S. Tse, Y. Yao*

Under pressure, the insulator silane (SiH<sub>4</sub>) transforms to a metallic phase and, at even higher pressures and low temperatures, becomes superconducting.

### PHYSICS

#### Energy Gaps and Kohn Anomalies in Elemental Superconductors 1509

*P. Aynajian et al.*

High-resolution neutron-scattering experiments reveal behavior in pure lead and niobium superconductors beyond that described by the standard theoretical framework.

>> *Perspective p. 1492*

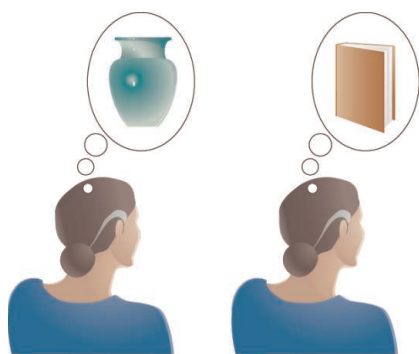
### CHEMISTRY

#### Synthesis of Macrocyclic Copolymer Brushes and Their Self-Assembly into Supramolecular Tubes 1512

*M. Schappacher and A. Deffieux*

A three-block polymer can generate long cyclic polymers in solution, which can be further functionalized to form polymer brushes and tubular assemblies.

CONTENTS continued >>



1495 &  
1543

## REPORTS CONTINUED...

### GEOCHEMISTRY

#### Splitting of the 520-Kilometer Seismic Discontinuity and Chemical Heterogeneity in the Mantle 1515

A. Saikia, D. J. Frost, D. C. Rubie

A reaction in calcium-rich rocks in Earth's mantle can explain a seismic signal that varies geographically and with depth, providing a means to map mantle compositions.

### GEOCHEMISTRY

#### The Chlorine Isotope Composition of Earth's Mantle 1518

M. Bonifacie et al.

Analysis of ocean basalts imply that Earth's mantle has a different chlorine isotopic ratio than crust or seawater, perhaps reflecting a late addition of material to Earth.

### PALEONTOLOGY

#### Caribbean Reef Development Was Independent of Coral Diversity over 28 Million Years 1521

K. G. Johnson, J. B. C. Jackson, A. F. Budd

An analysis of fossil and modern Caribbean corals shows that, for the last 28 million years, coral reef growth and persistence have not required high coral diversity.

### BIOCHEMISTRY

#### Amyloid Fibrils of the HET-s(218–289) Prion Form a $\beta$ Solenoid with a Triangular Hydrophobic Core 1523

C. Wasmer et al.

A structural model of a yeast prion shows that the amyloid fibrils form a left-handed  $\beta$  solenoid stabilized by hydrophobic and polar interactions and salt bridges.

### GENETICS

#### A Retrotransposon-Mediated Gene Duplication Underlies Morphological Variation of Tomato Fruit 1527

H. Xiao et al.

The gene causing elongated tomatoes arose from an unusual, transposon-mediated duplication that provided a new regulatory environment that increased its expression.

### GENETICS

#### Evidence for Karyogamy and Exchange of Genetic Material in the Binucleate Intestinal Parasite *Giardia intestinalis* 1530

M. K. Poxleitner et al.

The unusual lack of accumulated mutations in asexual *Giardia* can be explained by the exchange of plasmid DNA between its two nuclei during the cyst phase.

### MICROBIOLOGY

#### Direct Visualization of Horizontal Gene Transfer 1533

A. Babić et al.

Visualization of DNA exchange between two bacteria reveals that the process is highly efficient, is mediated by the pilus, and occurs about once per replication cycle.

### MEDICINE

#### Neurokinin 1 Receptor Antagonism as a Possible Therapy for Alcoholism 1536

D. T. George et al.

A drug that inhibits a neural signaling pathway linked to behavioral stress may be a useful therapy in preventing relapse in alcoholics.

### CELL BIOLOGY

#### Using Engineered Scaffold Interactions to Reshape MAP Kinase Pathway Signaling Dynamics 1539

C. J. Bashor, N. C. Helman, S. Yan, W. A. Lim

A yeast signaling pathway acquires new regulatory properties (such as adaptation) when additional protein-protein interaction sites are engineered into a scaffolding protein.

>> Perspective p. 1489

### NEUROSCIENCE

#### Synaptic Theory of Working Memory 1543

G. Mongillo, O. Barak, M. Tsodyks

Stronger synapses induced by calcium currents are responsible for working memory rather than the more metabolically expensive action potential firing, as had been thought. >> Perspective p. 1495

### SPECIAL FEATURE

## Financing Your Research From Industry

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Playing Well With Industry	1548
Business Financing for Your Research	1549
Finding Industry Funding	1550



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CONTENTS continued >>>



Water waster?

## SCIENCE NOW

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**Future Cars May Save Gas But Waste Water**  
Plug-in vehicles could strain resources of drought-stricken regions.

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**Mathematicians Debate the Hole Truth**

Who was the first to improve on a widely used classic formula?



From drifter to researcher.

## SCIENCE CAREERS

[www.sciencereers.org](http://www.sciencereers.org) CAREER RESOURCES FOR SCIENTISTS

From the Archives: The Drifter

*I. Chen*

After 2 years of wandering, Gary Ruvkun settled into a productive research career.

>> See also *Financing Your Research From Industry* feature, p. 1548



Find a drug, any drug.

## SCIENCE SIGNALING

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**ST NETWATCH: DrugBank**

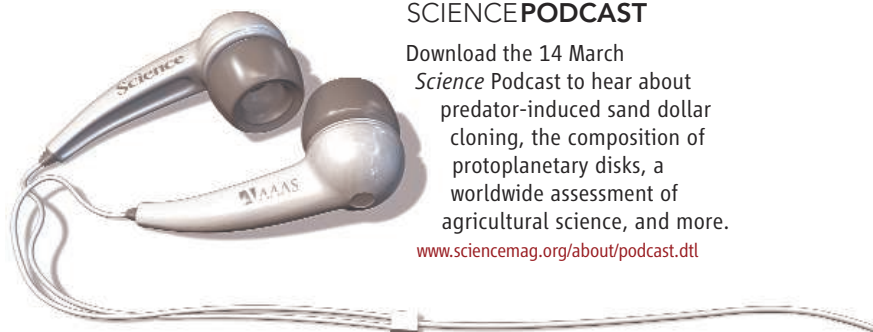
DrugBank is a useful tool for researchers using pharmacological agents to study signaling pathways; in Bioinformatics Resources.

**ST NETWATCH: MINT, the Molecular INTERaction Database**

Explore your favorite protein's potential binding partners with the MINT database; in Protein Databases.

**ST NETWATCH: Ask a Scientist**

This Web site from the Howard Hughes Medical Institute lets users submit their questions directly to scientists; in Educator Sites.



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