CONTENTS

SPECIAL SECTION

Breakthrough of the Year

INTRODUCTION
1431 2013 Breakthrough of the Year

WINNER
1432 Cancer Immunotherapy

RUNNERS-UP
1434 Genetic Microsurgery for the Masses
1434 CLARITY Makes It Perfectly Clear
1436 Human Cloning at Last
1436 Dishing Up Mini-Organs
1438 Cosmic Particle Accelerators Identified
1438 Newcomer Juices Up the Race to Harness Sunlight
1440 To Sleep, Perchance to Clean
1440 Your Microbes, Your Health
1442 In Vaccine Design, Looks Do Matter

>> Editorial p. 1417; Science Careers; Science Podcast; slideshow and videos at http://scim.ag/Breakthrough13

EDITORIAL
1417 Cancer Immunotherapy
Marcia McNutt
>> Breakthrough of the Year section p. 1431

NEWS OF THE WEEK
1422 A roundup of the week’s top stories

NEWS & ANALYSIS
1424 Mega-Eruptions Drove the Mother of Mass Extinctions
1425 Money Woes Cloud Future of Workhorse U.S. Telescopes
1426 U.S. Budget Deal Offers Researchers Some Sequester Relief
1427 Amid Superconductor Debate, Clash of Physics Titans Resumes
1428 Scientists Campaign Against Killer Robots
1430 Swine Flu Connection Provides Clues About Narcolepsy

>> Science Translational Medicine
Research Article by A. K. De la Herrán-Arita et al.

LETTERS
1445 Sea-Level Rise by 2100
J. A. Church et al.
Credit for Impact Theory
H. J. Melosh et al.
Social Security and Medicare in the Black
T. M. Gruenenfelder
Mercury Toxicity in Children
P. J. Landrigan et al.

1446 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.
1448 Knowledge in the Time of Cholera
O. Whooley, reviewed by J. H. Warner
1449 Birds and People
M. Cocker, reviewed by H. T. Armistead

EDUCATION FORUM
1450 Open Learning at a Distance: Lessons for Struggling MOOCs
P. McAndrew and E. Scanlon

PERSPECTIVES
1452 How Cooperation Defeats Cheats
C. N. Spottiswoode
>> Report p. 1506
1453 A Common Pathway for a Rare Disease?
S. B. Vafai and V. K. Mootha
>> Report p. 1524
1454 No Barriers to Cellulose Breakdown
A. Berlin
>> Report p. 1513
1456 Genomic Clues to the Ancestral Flowering Plant
K. Adams
>> Research Articles pp. 1467 and 1468; Report p. 1516

CONTENTS continued >>

ON THE WEB THIS WEEK
>> Science Podcast
Listen to a special show on this year’s breakthrough, runners-up, and the top stories from our daily news site.

>> Breakthrough Online
Check out all the science highlights from 2013, including videos on the breakthrough, our genomes-of-the-year slideshow, and a special year-end podcast at www.sciencemag.org.

COVER
Antibodies (pink) zoom toward a T cell (gray, with CTLA-4 receptor proteins shown in light blue), giving the T cell a push to attack tumor cells. In 2013, new therapies targeting the immune system to treat cancer surged ahead, with promising but still preliminary results in people with many forms of the disease. See the Breakthrough of the Year special section beginning on page 1431 and at http://scim.ag/Breakthrough13.

Image: Valerie Altonian/Science

DEPARTMENTS
1415 This Week in Science
1418 Editors’ Choice
1420 Science Staff
1464 AAAS News & Notes
1529 New Products
1530 Science Careers

www.sciencemag.org SCIENCE VOL 342 20 DECEMBER 2013
Published by AAAS
1499

SCIENCE PRIZE ESSAY
1462 DNA Barcoding from NYC to Belize
S. E. Harris and M. Bellino

RESEARCH ARTICLES
1467 The Amborella Genome and the Evolution of Flowering Plants
Amborella Genome Project
The Amborella genome retains features of the ancestral angiosperm and illuminates flowering plant genomic evolution.
Research Article Summary; for full text: http://dx.doi.org/10.1126/science.1241089

1468 Horizontal Transfer of Entire Genomes via Mitochondrial Fusion in the Angiosperm Amborella
D. W. Rice et al.
Much of the mitochondrial DNA genome of the flowering plant Amborella trichopoda originated from other organisms.
>> Perspective p. 1456; Report p. 1516

1473 Constraining Exoplanet Mass from Transmission Spectroscopy
J. de Witt and S. Seager
The mass of an exoplanet can be derived from the exoplanet's atmospheric transit.

1477 Crystal Structure of a Soluble Cleaved HIV-1 Envelope Trimer
J.-P. Julien et al.
Key structural features dictate how the HIV envelope protein functions and interacts with the human immune system.

1484 Cryo-EM Structure of a Fully Glycosylated Soluble Cleaved HIV-1 Envelope Trimer
D. Lyumkis et al.

1502 Unexpected Stable Stoichiometries of Sodium Chlorides
W. Zhang et al.
Several phases in the Na-Cl system are stable at high pressures and temperatures.
>> Perspective p. 1459

1506 Brood Parasitism and the Evolution of Cooperative Breeding in Birds
W. E. Feeney et al.
The skewed global distribution of cooperatively breeding birds may result from their coevolution with brood parasites.
>> Perspective p. 1452

1508 CS7BL/6N Mutation in Cytoplasmic FMRP Interacting protein 2 Regulates Cocaine Response
W. Kumar et al.
Acute locomotor responses to cocaine differ significantly in the most widely used inbred strains of laboratory mice.

1513 Revealing Nature’s Cellulase Diversity: The Digestion Mechanism of C. bescii
R. Brunecky et al.
Electron microscopy reveals that a cellulose-degrading enzyme operates by dripping down, as well as by roaming the surface.
>> Perspective p. 1454

1516 Assembly and Validation of the Genome of the Nonmodel Basal Angiosperm Amborella
S. Chamala et al.
Fluorescence in situ hybridization allows for next-generation sequencing of a large, difficult genome.
>> Perspective p. 1456; Research Articles pp. 1467 and 1468

1518 CRL4 Complex Regulates Mammalian Oocyte Survival and Reprogramming by Activating of TET Proteins
C. Yu et al.
Continuing female fertility in mammals requires the function of a ubiquitin ligase complex in oocytes.

1521 Serial Femtosecond Crystallography of G Protein–Coupled Receptors
W. Liu et al.
The structure of a human serotonin receptor was solved using a free-electron laser to analyze microcrystals.

1524 miTOR Inhibition Alleviates Mitochondrial Disease in a Mouse Model of Leigh Syndrome
S. C. Johnson et al.
A drug in clinical use for other disorders delays progression of an untreated mitochondrial disease in knockout mice.
>> Perspective p. 1453

CONTENTS
Editor's Summary

This copy is for your personal, non-commercial use only.

**Article Tools**  Visit the online version of this article to access the personalization and article tools:  [http://science.sciencemag.org/content/342/6165](http://science.sciencemag.org/content/342/6165)

**Permissions**  Obtain information about reproducing this article:  [http://www.sciencemag.org/about/permissions.dtl](http://www.sciencemag.org/about/permissions.dtl)