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

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 Altounian/Science

DEPARTMENTS
1415 This Week in Science
1418 Editors’ Choice
1420 Science Staff
1464 AAAS News & Notes
1529 New Products
1530 Science Careers
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 Wit and S. Seager
The mass of an exoplanet can be derived based on the properties of its atmosphere.

1477 Crystal Structure of a Soluble Cleaved HIV-1 Envelope Trimer
J.-P. Julien et al.

1484 Cryo-EM Structure of a Fully Glycosylated Soluble Cleaved HIV-1 Envelope Trimer
D. Lyumkis et al.
Key structural features dictate how the HIV envelope protein functions and interacts with the human immune system.

REPORTS

1490 Detection of Berry’s Phase in a Bulk Rashba Semiconductor
H. Murakawa et al.
Transport measurements indicate a nontrivial spin texture stemming from strong spin-orbit coupling in the material BiTeI.

1494 Photon-Mediated Interactions Between Distant Artificial Atoms
A. F. van Loo et al.
Interaction between two separated superconducting qubits can be mediated and controlled by microwaves.

1496 Relaxation Mechanism of the Hydrated Electron
M. H. Elkins et al.
Spectroscopy of excited-state hydrated electrons in a liquid jet implicates nonadiabatic relaxation.

1499 Dynamical Resonances Accessible Only by Reagent Vibrational Excitation in the F + HD→HF + D Reaction
T. Wang et al.
A protocol for efficient vibrational excitation enabled discovery of an unusual reaction trajectory in a well-studied system.

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. Fenney et al.
The skewed global distribution of cooperatively breeding birds may result from their coevolution with brood parasites.
>> Perspective p. 1452

1508 C57BL/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 Caldicellulosiruptor besci
R. Brunecky et al.
Electron microscopy reveals that a cellulose-degrading enzyme operates by drilling 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 Activation 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 mTOR 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 untreatable mitochondrial disease in knockout mice.
>> Perspective p. 1453