CONTENTS

SPECIAL SECTION

Breakthrough of the Year

WINNER
1524 The Discovery of the Higgs Boson

RUNNERS-UP
1525 A Home Run for Ancient DNA
1526 Genomic Cruise Missiles
1527 Crash Project Opens a Door in Neutrino Physics
1528 Genomics Beyond Genes
1529 Scary Engineering Tames Martian Terror
1530 First Protein Structure From an X-ray Laser
1531 Brain-Machine Interfaces Start to Get a Grip
1532 Making Eggs From Stem Cells

OTHER FEATURES
1526 Italian Quake Verdicts Rattle Researchers
1528 Areas to Watch
1532 Scorecard
1533 A Year On, the H5N1 Debate Remains Infectious, With No End in Sight
1534 The Year in News

>> Editorial p. 1511; Articles pp. 1558 to 1582; Science Careers story by E. Pain; Science Podcast; and videos online at www.sciencemag.org/special/btoy2012

EDITORIAL
1511 The Breakthroughs of 2012
Bruce Alberts
>> Breakthrough of the Year section p. 1524

NEWS OF THE WEEK
1516 A roundup of the week’s top stories

NEWS & ANALYSIS
1519 NIF Report Asks for More Time to Achieve Ignition
1520 An Annus Horribilis for Anthropology?
1521 Sutter’s Mill Meteorite Produces Mother Lode of Research
>> Research Article p. 1583
1522 Fall Meeting of the American Geophysical Union
   No Lake Mud for Curiosity Rover to Investigate?
   Tying Megaeruptions to a Mass Extinction
   Long After the Fact
   Buildup to Quakes Spied in Both Model and Real World
   Snapshots From the Meeting

LETTERS
1537 Dam Threatens Mekong Ecology
   G. R. Lanza
   Mobilizing Religion and Conservation in Asia
   S. M. Awoyemi et al.
   Shark Sanctuaries: Substance or Spin?
   L. N. K. Davidson
1539 CORRECTIONS AND CLARIFICATIONS
1539 TECHNICAL COMMENT ABSTRACTS

BOOKS ET AL.
1540 The Secrets of Alchemy
   L. M. Principe, reviewed by A. Grafton
1541 Death assembled by R. Harris

EDUCATION FORUM
1542 Interdisciplinary Graduate Training in Teaching Labs
   R. D. Vale et al.

PERSPECTIVES
1545 Visualizing the Influenza Genome
   Y. J. Tao and W. Zheng
>> Reports pp. 1631 and 1634
1546 Tackling Meningitis in Africa
   H. Thorsteinsdottir and T. W. Sælen
>> Research Articles pp. 1587 and 1593
1549 Cardiac Regeneration
   A. Rosenzweig
>> Research Article p. 1599
1550 Symmetry Meets Topology
   X.-L. Qi
>> Report p. 1604
1551 Modeling the Formation of Porphyry-Copper Ores
   S. E. Ingebritsen
>> Report p. 1613
1553 Retrospective: Keith Campbell (1954–2012)
   I. Wilmut

CORRECTIONS AND CLARIFICATIONS
1539

TECHNICAL COMMENT ABSTRACTS

BOOKS

EDUCATION FORUM

CONTENTS continued >>

COVER
Mosaic of the CMS and ATLAS detectors (as in 2007), part of the Large Hadron Collider at CERN. In 2012, research teams used these detectors to fingerprint decay products from the long-sought Higgs boson and determine its mass, successfully testing a key prediction of the standard model of particle physics. See the Breakthrough of the Year special section beginning on page 1524, three Articles beginning on page 1558, and www.sciencemag.org/special/btoy2012.

Photos: Maximilien Brice and Claudia Marcelloni/CERN
SCIENCE PRIZE ESSAY
1554  How We Got Here: An Inquiry-Based Activity About Human Evolution
R. M. Price

ARTICLES
1558  The Higgs Boson
Glossary
1560  Journey in the Search for the Higgs Boson: The ATLAS and CMS Experiments at the Large Hadron Collider
M. Della Negra et al.
1569  A New Boson with a Mass of 125 GeV Observed with the CMS Experiment at the Large Hadron Collider
The CMS Collaboration
1576  A Particle Consistent with the Higgs Boson Observed with the ATLAS Detector at the Large Hadron Collider
The ATLAS Collaboration
>> Breakthrough of the Year section p. 1524

RESEARCH ARTICLES
1583  Radar-Enabled Recovery of the Sutter’s Mill Meteorite, a Carbonaceous Chondrite Regolith Breccia
P. Jenniskens et al.
Analysis of this rare meteorite implies that the surfaces of C-class asteroids can be more complex than previously assumed.
>> News story p. 1521
1587  The Evolutionary Landscape of Alternative Splicing in Vertebrate Species
N. L. Barbosa-Morais et al.
The patterns and complexity of messenger RNA splicing across vertebrates cluster by species rather than by organ.
1593  Evolutionary Dynamics of Gene and Isoform Regulation in Mammalian Tissues
J. Merkin et al.
Messenger RNA alternative splicing is highly variable among vertebrates and links to kinase signaling pathways.
>> Perspective p. 1547
1599  C/EBP Transcription Factors Mediate Epicardial Activation During Heart Development and Injury
G. N. Huang et al.
Transcriptional mechanisms controlling gene expression in the heart’s outer layer are exploited for cardiac repair.
>> Perspective p. 1549

REPORTS
1604  Symmetry-Protected Topological Orders in Interacting Bosonic Systems
X. Chen et al.
Counterparts of topological insulators are predicted to exist in interacting bosonic systems.
>> Perspective p. 1550
1606  Sign-Problem–Free Quantum Monte Carlo of the Onset of Antiferromagnetism in Metals
E. Berg et al.
An effective lattice theory enables an efficient computational solution to an otherwise intractable problem.
1609  Optomechanical Dark Mode
C. Dong et al.
The formation of a mechanical dark mode can be used to isolate an optomechanical system from thermal noise.
1613  Porphyry-Copper Ore Shells Form at Stable Pressure-Temperature Fronts Within Dynamic Fluid Plumes
P. Weis et al.
A numerical model attributes ore metal accumulation in porphyry deposits to fluid plumes draining from large magma chambers.
>> Perspective p. 1551
1616  Apatite 4He/3He and (U-Th)/He Evidence for an Ancient Grand Canyon
R. M. Flowers and K. A. Farley
The Colorado River carved the Grand Canyon to nearly its modern depth 60 million years earlier than was generally believed.
1619  Multiplex Targeted Sequencing Identifies Recurrently Mutated Genes in Autism Spectrum Disorders
B. J. O’Roak et al.
Large-scale human autism candidate gene resequencing implicates de novo mutations in six genes in ~1% of sporadic cases.
1622  Genome-Wide Detection of Single-Nucleotide and Copy-Number Variations of a Single Human Cell
C. Zong et al.
A whole-genome amplification method with reduced bias compares a single cell with its descendants.
1627  Probing Meiotic Recombination and Aneuploidy of Single Sperm Cells by Whole-Genome Sequencing
S. Lu et al.
A whole-genome amplification method with reduced bias yields a personal meiotic recombination map.
1631  Organization of the Influenza Virus Replication Machinery
A. Moeller et al.
Electron microscopic analysis of a reconstituted RNA-protein complex outlines pathways of transcription.
1634  The Structure of Native Influenza Virion Ribonucleoproteins
R. Arranz et al.
Electron microscopic analysis of a purified RNA-protein complex links its structure to the influenza life cycle.
>> Perspective p. 1545

CONTENTS continued >>
A single protein in male mouse urine makes females return to old haunts. A previously unknown module that mediates membrane binding is identified in the scaffold KSR. The anti-apoptotic protein c-FLIP blocks multiple cell death pathways in mice. REVIEW: Extracellular Phosphorylation and Phosphorylated Proteins—Not Just Curiosities But Physiologically Important. Extracellular proteins and extracellular protein domains can be phosphorylated.