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
CONTENTS

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

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

REPORTS

1551 & 1613

pages 1547, 1587, & 1593

CONTENTS continued >>
ONLINE HIGHLIGHTS

SCIENCEEXPRESS
www.scienceexpress.org
Publication Ahead of Print

Reconstitution of the Vital Functions of Munc18 and Munc13 in Neurotransmitter Release
C. Mo et al.
10.1126/science.1230473

Comparative Analysis of Bat Genomes Provides Insight into the Evolution of Flight and Immunity
G. Zhang et al.
10.1126/science.1230835

An Update of Wallace’s Zoogeographic Regions of the World
B. G. Holt et al.
10.1126/science.1228282

Cyclic GMP-AMP Is an Endogenous Second Messenger in Innate Immune Signaling by Cytosolic DNA
J. Wu et al.
10.1126/science.1229963

Cyclic GMP-AMP Synthase Is a Cytosolic DNA Sensor That Activates the Type I Interferon Pathway
L. Sun et al.
10.1126/science.1232458

Olefin Cyclopropanation via Carbene Transfer Catalyzed by Engineered Cytochrome P450 Enzymes
P. S. Coelho et al.
10.1126/science.1231434

Boson Sampling on a Photonic Chip
J. B. Spring et al.
10.1126/science.1231692

Photonic Boson Sampling in a Tunable Circuit
M. A. Broome et al.
10.1126/science.1231440

TECHNICAL COMMENTS
Comment and Response on “The Local Structure of Amorphous Silicon”
Comment: S. Roorda and L. J. Lewis
http://dx.doi.org/10.1126/science.1221738
Response: M. M. J. Treacy and K. B. Barisенко
http://dx.doi.org/10.1126/science.1222571

SCIENCE NOW
www.sciencenow.org
Highlights From Our Daily News Coverage

Cloud Forest Trees Drink From the Fog
Plants take up a surprising amount of moisture from the air.
http://scim.ag/Moisture_Air

Reved-Up Protein Fights Aging
Boosting a protein that keeps chromosomes in order protects mice from cancer and increases life span.
http://scim.ag/Protein_Aging

Pee Marks the Spot
A single protein in male mouse urine makes females return to old haunts.
http://scim.ag/Single-Protein

RESEARCH ARTICLE: IGFBP7 Binds to the IGF-1 Receptor and Blocks Its Activation by Insulin-like Growth Factors
V. Evdokimova et al.
By inactivating the IGF1R, IGFBP7 suppresses growth and promotes cell death.

RESEARCH ARTICLE: c-FLIP Maintains Tissue Homeostasis by Preventing Apoptosis and Programmed Necrosis
X. Piao et al.
The anti-apoptotic protein c-FLIP blocks multiple cell death pathways in mice.

RESEARCH ARTICLE: A CC-SAM, for Coiled-Coil–Sterile α Motif, Domain Targets the Scaffolding Protein KSR1 to Specific Sites in the Plasma Membrane
D. Kovel et al.
A previously unknown module that mediates membrane binding is identified in the scaffold KSR.

REVIEW: Extracellular Phosphorylation and Phosphorylated Proteins—Not Just Curiosities But Physiologically Important
G. Yokol and V. Vogel
Extracellular proteins and extracellular protein domains can be phosphorylated.

SCIENCE SIGNALING
www.sciencesignaling.org
Integrating Medicine and Science 19 December issue: http://scim.ag/stm121912

COMMENTARY: To Share or Not To Share—That Is Not the Question
L. Ohno-Machado
Sharing clinical and biomedical data could accelerate translational research.

REVIEW: Hidden Killers—Human Fungal Infections
G. D. Brown et al.
Lack of rapid diagnostic tests, drugs, and vaccines impedes treatment and prevention of invasive fungal infections.

RESEARCH ARTICLE: Genetic Correction of Human Induced Pluripotent Stem Cells from Patients with Spinal Muscular Atrophy
S. Corti et al.
Induced pluripotent stem cell–derived motor neurons from spinal muscular atrophy patients show phenotype rescue after genetic correction.

RESEARCH ARTICLE: Long-Term Follow-Up After Gene Therapy for Canavan Disease
P. Leone et al.
Gene therapy for Canavan disease results in a decrease in pathologically elevated N-acetyl-aspartate concentrations in the brain and long-term clinical stabilization.

RESEARCH ARTICLE: Multimodal Actions of Neural Stem Cells in a Mouse Model of ALS—A Meta-Analysis
Y. D. Teng et al.
A meta-analysis reports the beneficial effects of transplanting mouse or human neural stem cells into the spinal cord of the SOD1G93A mouse, a model of ALS.

SCIENCE CAREERS
www.sciencecareers.org/career_magazine

Breakthrough of the Year: Seekers of the Higgs Boson
E. Pain
Science Careers talks to three young investigators who contributed to this year’s monumental discovery.

SCIENCE PODCAST
www.sciencemag.org/multimedia/podcast
Free Weekly Show for 21 December 2012
A special year-in-review show featuring the Breakthrough of the Year and Runners-Up and science news highlights from 2012.