In the first decade of the millennium, rapid progress has transformed whole areas of research (see the Insights of the Decade section on page 1612). Meanwhile, the Breakthrough of the Year goes to the first mechanical devices to reach the quantum ground state, a feat achieved by physicists at the University of California, Santa Barbara (see the Breakthrough section on page 1604). Also see related online content at www.sciencemag.org/special/insights2010/.

Credit: Yael Fitzpatrick and Matthew Twombly/Science
1639 Being Glassy Without Being Hard to Solve
F. Ricci-Tersenghi

1641 Retrospective: Britton Chance
(1913–2010)
P. L. Dutton

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1642 A Giant Planet Around a Metal-Poor Star of Extragalactic Origin
J. Setiawan et al.
A planet is observed to orbit a star whose properties are different from those of all other known planet-hosting stars.

1645 Experimental Spin Ratchet
M. V. Costache and S. O. Valenzuela
A superconducting-based single-electron device is used to control the flow of electronic spin currents.

1648 Spin Transfer Torques in MnSi at Ultralow Current Densities
F. Jonietz et al.
A complicated spin texture lattice in a bulk material rotates under the influence of a tiny electrical current.

1652 Electronic Spin Storage in an Electrically Readable Nuclear Spin Memory with a Lifetime >100 Seconds
D. R. McCormey et al.
An electrically readable spin memory in silicon has been developed with storage times exceeding 100 seconds.

1656 Oxygen Doping Modifies Near-Infrared Band Gaps in Fluorescent Single-Walled Carbon Nanotubes
S. Ghosh et al.
Contrast can be improved in bioimaging applications by separating the emission and absorption wavelengths.

1660 Entropically Stabilized Local Dipole Formation in Lead Chalcogenides
E. S. Basin et al.
Upon heating, lead telluride and lead sulfide show the formation of a less symmetric, dipolar structure.

1663 Large Variations in Southern Hemisphere Biomass Burning During the Last 650 Years
Z. Wang et al.
Large variations in the degree of biomass burning in the Southern Hemisphere occurred during the past 650 years.

1666 Structural Basis of Biological N₂O Generation by Bacterial Nitric Oxide Reductase
T. Hino et al.
A structural comparison gives insight into the features that allow conversion between nitric oxide and oxygen reduction.

1670 Greatwall Phosphorylates an Inhibitor of Protein Phosphatase 2A That Is Essential for Mitosis
S. Mochida et al.
An inhibitor of protein phosphatase 2A is identified as a component of the machinery controlling cell division.

1673 The Substrate of Greatwall Kinase, Arpp19, Controls Mitosis by Inhibiting Protein Phosphatase 2A
A. Gharbi-Ayachi et al.
The protein kinase Greatwall controls cell division by phosphorylating and activating an inhibitor of protein phosphatase 2A.

1677 Cholinergic Interneurons Control Local Circuit Activity and Cocaine Conditioning
I. B. Witten et al.
Silencing giant interneurons and thereby exciting medium spiny neurons during cocaine-induced activity disrupts cocaine reward.

1682 New Genes in Drosophila Quickly Become Essential
S. Chen et al.
One-third of evolutionary young genes is essential to fruit flies.

1685 Cytoplasmic Partitioning of P Granule Components Is Not Required to Specify the Germline in C. elegans
C. M. Gallo et al.
Germ granules do not need to be segregated asymmetrically during cell division to specify germ cell fate.

1688 Glucose and Weight Control in Mice with a Designed Ghrelin O-Acyltransferase Inhibitor
B. P. Barnett et al.
A drug inhibiting the activation of ghrelin, a peptide that promotes weight gain, has beneficial metabolic effects in mice.

1693 The Cellular and Physiological Mechanism of Wing-Body Scaling in Manduca sexta
H. F. Nijhout and L. W. Grunert
The central nervous system and the hormone ecdysone govern wing-size scaling in the tobacco hornworm.

1695 Fetal and Adult Hematopoietic Stem Cells Give Rise to Distinct T Cell Lineages in Humans
J. E. Mold et al.
Distinct fetal T cell lineages help explain the tolerogenic properties of the fetus and immune responsiveness at birth.

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The Genetic Landscape of the Childhood Cancer Medulloblastoma
D. Williams Parsons et al.
Genomic analysis of a childhood cancer reveals markedly fewer mutations than what is typically seen in adult cancers.
10.1126/science.119056

Structure of DNMT1-DNA Complex Reveals a Role for Autoinhibition in Maintenance DNA Methylation
J. Song et al.
The eukaryote maintenance DNA methyltransferase discriminates against de novo CpG methylation sites.
10.1126/science.1195380

Passive Origins of Stomatal Control in Vascular Plants
T. J. Brodribb and S. A. M. McAdam
The transition from passive to active metabolic control of stomata and plant water balance occurred about 360 million years ago.
10.1126/science.1197985

Time-Resolved Holography with Photoelectrons
Y. Huismans et al.
The interference pattern produced by photoelectrons provides holographic snapshots of the photoionization process.
10.1126/science.1198450

Comment on “The Incidence of Fire in Amazonian Forests with Implications for REDD”
J. K. Balch et al.
Full text at www.sciencemag.org/cgi/content/full/330/6011/1627-b

Response to Comment on “The Incidence of Fire in Amazonian Forests with Implications for REDD”
E. A. Olofsson
Full text at www.sciencemag.org/cgi/content/full/330/6011/1627-c

Highlights From Our Daily News Coverage
Cosmic Radiation Features Could Suggest Our Universe Is Not Alone
Data may provide evidence of a ‘multiverse.’

Sperm May Hold Cure for Diabetes
Researchers grow insulin-producing cells from sperm stem cell precursors.

Violent Origin for Saturn’s Rings
New study may have solved a centuries-old mystery.

The Signal Transduction Knowledge Environment
The Signaling Transduction Knowledge Environment

A Conceptual Molecular Network for Chemotactic Behaviors Characterized by Feedback of Molecules Cycling Between the Membrane and the Cytosol
M. Osuji et al.
Simulations and observations of migrating cells suggest a model for feedback loops that regulate chemotaxis.

Aspacing Out Metacaspases and Caspas—Proteases of Many Trades
P. V. Bachov et al.
The substrates of the metacaspase type of proteases are beginning to be identified.

The intersectin family of scaffolding proteins links signaling and endocytic pathways.

Free Career Resources for Scientists
Breakthrough of the Year: Bridging the Quantum and the Classical Worlds
E. Pain
Ph.D. student Aaron O’Connell was able to induce and measure quantum effects in the motion of a micrometer-sized mechanical oscillator.

Engineering Solutions to Biomedical Problems
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There are many ways for classically trained engineers to work at the interface of engineering and medicine.

Tooling Up: Little ‘r,’ Big ‘D’
D. Jensen
If you want to work in industry in this economy, tweak your CV to emphasize the ‘development’ side of R&D.

Integrating Medicine and Science
Genomic Information—Improving PSA Tests with PSA Values Using Sequence Variants Associated with PSA Levels
J. Gudmundsson et al.

Personalized Prostate Cancer Screening—Improving PSA Tests with Genomic Information
J. S. Witte
Sequence variants in the human genome are associated with serum levels of prostate-specific antigen.

Frequent and Focal FGFR1 Amplification Associates with Therapeutically Tractable FGFR1 Dependency in Squamous Cell Lung Cancer
J. Weiss et al.
A new oncogenic aberration in smoking-associated lung cancer may be the disease’s first relatively high-frequency therapeutic target.