The Heavily Connected Brain

INTRODUCTION
577 Connection, Connection, Connection …

REVIEWS
578 Cortical High-Density Counterstream Architectures
N. T. Markov et al.
Review Summary; for full text:
http://dx.doi.org/10.1126/science.1238406

579 Structural and Functional Brain Networks:
From Connections to Cognition
H.-J. Park and K. Friston
Review Summary; for full text:
http://dx.doi.org/10.1126/science.1238411

LETTERS
558 Health and Obesity: A New Normal?
M. E. Deutsch
Health and Obesity: Not Just Skin Deep
E. Arner and P. Arner
Emerging Arsenic Threat in Canada
V. D. Martinez et al.

559 Life in Science: Zombiology

559 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.
560 The Sports Gene
D. Epstein, reviewed by D. Greenbaum et al.

561 When People Come First
J. Biehl and A. Petryna, Eds., reviewed by N. S. Berry

POLICY FORUM
562 Doctoral Students and U.S. Immigration Policy
K. E. Maskus et al.

564 Our Fallen Genomes
E. Z. Macosko and S. A. McCarroll

565 Dust Unto Dust
M. C. Scholes and R. J. Scholes

SPECIAL SECTION
The Heavily Connected Brain

EDITORIAL
533 Seize the Neuroscience Moment
Alan I. Leshner

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

NEWS & ANALYSIS
542 New Experiment Torpedoes Lightweight Dark Matter Particles
543 RNA Helps Resurrect Ancient DNA
544 Industry Lobbying Derails Trawling Ban in Europe
545 French Mathematician Tapped to Head Key Funding Agency
546 Structural Biology Triumph Offers Hope Against a Childhood Killer
HIV Surface Proteins Finally Caught Going Au Naturel

NEWS FOCUS
548 Short-Circuiting Depression

552 Dark Matter’s Dark Horse

ON THE WEB THIS WEEK

A Pathway to Flowering—Why Staying Cool Matters
O. Nilsson

Storing Quantum Information in Schrödinger’s Cats
P. J. Leek

Quantized Electronic Heat Flow
B. Rothman and C. Flindt

Rhythmic Respiration
G. Rey and A. B. Reddy

Retrospective: David H. Hubel (1926–2013)
R. H. Wurtz

CONTENTS continued

COVERAGE
Fiber pathways of a female human brain mapped noninvasively with diffusion magnetic resonance imaging. The image shows an axial view from above (front is at top). Major pathways of the human frontal lobes, and their organization as orthogonal grids, are shown here (cerebral association pathways, vertical; transverse pathways, horizontal). For a description of cortical networks, see the special section beginning on page 577.

Image: Van J. Wedeen, Aapo Nummenmaa, Ruopeng Wang, and Lawrence L. Wald/Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, with support of NIH Human Connectome Project and NSF

DEPARTMENTS
531 This Week in Science
535 Editors’ Choice
538 Science Staff
641 New Products
642 Science Careers
SCIENCE PRIZE ESSAY

573 Space Bats: Multidimensional Spatial Representation in the Bat
M. M. Yartsev

RESEARCH ARTICLES

590 On and Off Retinal Circuit Assembly by Divergent Molecular Mechanisms
L. O. Sun et al.
Work in mice reveals how motion-detection circuitry is established during visual system development.
Research Article Summary; for full text: http://dx.doi.org/10.1126/science.1241974

591 Circadian Clock NAD+ Cycle Drives Mitochondrial Oxidative Metabolism in Mice
C. B. Peek et al.
The coenzyme nicotinamide adenine dinucleotide mechanistically links the circadian clock to control of energy production by mitochondria.
Research Article Summary; for full text: http://dx.doi.org/10.1126/science.1243417

592 Structure-Based Design of a Fusion Glycoprotein Vaccine for Respiratory Syncytial Virus
J. S. McLellan et al.
Molecular engineering of a childhood virus surface protein significantly improves protective responses in mice and macaques.
>> News story p. 546

REPORTS

598 Evolution of the Magnetic Field Structure of the Crab Pulsar
A. Lyne et al.
Long-term measurements show the systematic evolution of the radiation pattern of one of the youngest neutron stars known.

601 Quantum Limit of Heat Flow Across a Single Electronic Channel
S. Jezouin et al.
The unit of heat carried by electrons is measured using noise thermometry and found to be consistent with predictions.
>> Perspective p. 569

604 Parameter Space Compression Underlies Emergent Theories and Predictive Models
B. B. Machta et al.
An information-theoretical approach is used to distinguish the important parameters in two archetypical physics models.

607 Deterministically Encoding Quantum Information Using 100-Photon Schrödinger Cat States
B. Vlastakis et al.
A scheme is demonstrated for coherently mapping the state of a single superconducting qubit onto a large number of photons.
>> Perspective p. 568

611 Real-Space Identification of Intermolecular Bonding with Atomic Force Microscopy
J. Zhang et al.
An atomic force microscope tip bearing a single carbon monoxide molecule was used to resolve hydrogen bonding contacts between molecules.

614 One-Dimensional Electrical Contact to a Two-Dimensional Material
L. Wang et al.
Metal contacts to graphene along its edge improve bonding and, in turn, electronic performance.

617 Pacific Ocean Heat Content During the Past 10,000 Years
Y. Rosenthal et al.
Marine records show how ocean heat content has varied in step with climate over the past 10,000 years.

621 Reconstructing the Microbial Diversity and Function of Pre-Agricultural Tallgrass Prairie Soils in the United States
N. Fierer et al.
Analysis of microbota in prairie soil reliefs offers insights into the ecological function of a near-extinct biome.
>> Perspective p. 565

624 Structural Basis for flg22-Induced Activation of the Arabidopsis FLS2-BAK1 Immune Complex
Y. Sun et al.
The molecular basis for how a plant heterodimeric receptor responds to bacterial infection signals is elucidated.

628 Regulation of Temperature-Responsive Flowering by MADS-Box Transcription Factor Repressors
J. H. Lee et al.
A warm spring favors early flowering by invoking less transcriptional repression by a floral repressor complex.
>> Perspective p. 566

632 Mosaic Copy Number Variation in Human Neurons
M. J. McConnell et al.
Single-cell genomics reveals that individual adult human neurons acquire diverse individual genomes.
>> Perspective p. 564; The Heavily Connected Brain section p. 577

637 Resident Neural Stem Cells Restrict Tissue Damage and Neuronal Loss After Spinal Cord Injury in Mice
H. Sabelstrøm et al.
Glia scarring helps to maintain the integrity of the injured spinal cord in mice.
>> The Heavily Connected Brain section p. 577; Science Podcast

CONTENTS