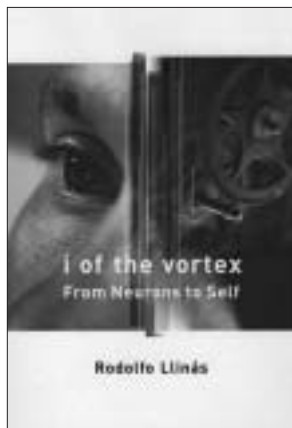




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I OF THE VORTEX

From Neurons to Self

Rodolfo R. Llinás, *New York University School of Medicine*

In *I of the Vortex*, Rodolfo Llinás, a founding father of modern brain science, presents an original view of the evolution and nature of mind.

According to Llinás, the “mindness state” evolved to allow predictive interactions between mobile creatures and their environment. To move through the environment safely, a creature must anticipate the outcome of each movement on the basis of incoming sensory data. Thus the capacity to predict is most likely the ultimate brain function. One could even say that Self is the centralization of prediction.

At the heart of Llinás’s theory is the concept of oscillation. Many neurons possess electrical activity, manifested as oscillating variations

in the minute voltages across the cell membrane. On the crests of these oscillations occur larger electrical events that are the basis for neuron-to-neuron communication. Like cicadas chirping in unison, a group of neurons oscillating in phase can resonate with a distant group of neurons. This simultaneity of neuronal activity is the neurobiological root of cognition. Although the internal state that we call the mind is guided by the senses, it is also generated by the oscillations within the brain. Thus, in a certain sense, one could say that we live in a kind of virtual reality.

Please visit <http://mitpress.mit.edu/IoftheVortex> to view color images.

“One of this year’s most important books about action, consciousness, and self.”

—Rüdiger Vaas, *Journal of Consciousness Studies*

“Anyone interested in new ways of thinking about the organization of the brain would do well to give [I of the Vortex] a look.

— Ilya Farber, *Nature*

A Bradford Book

2000 • 264 pp. • 33 illus. • paper • \$16.95/£11.50
0-262-62163-0

The MIT Press

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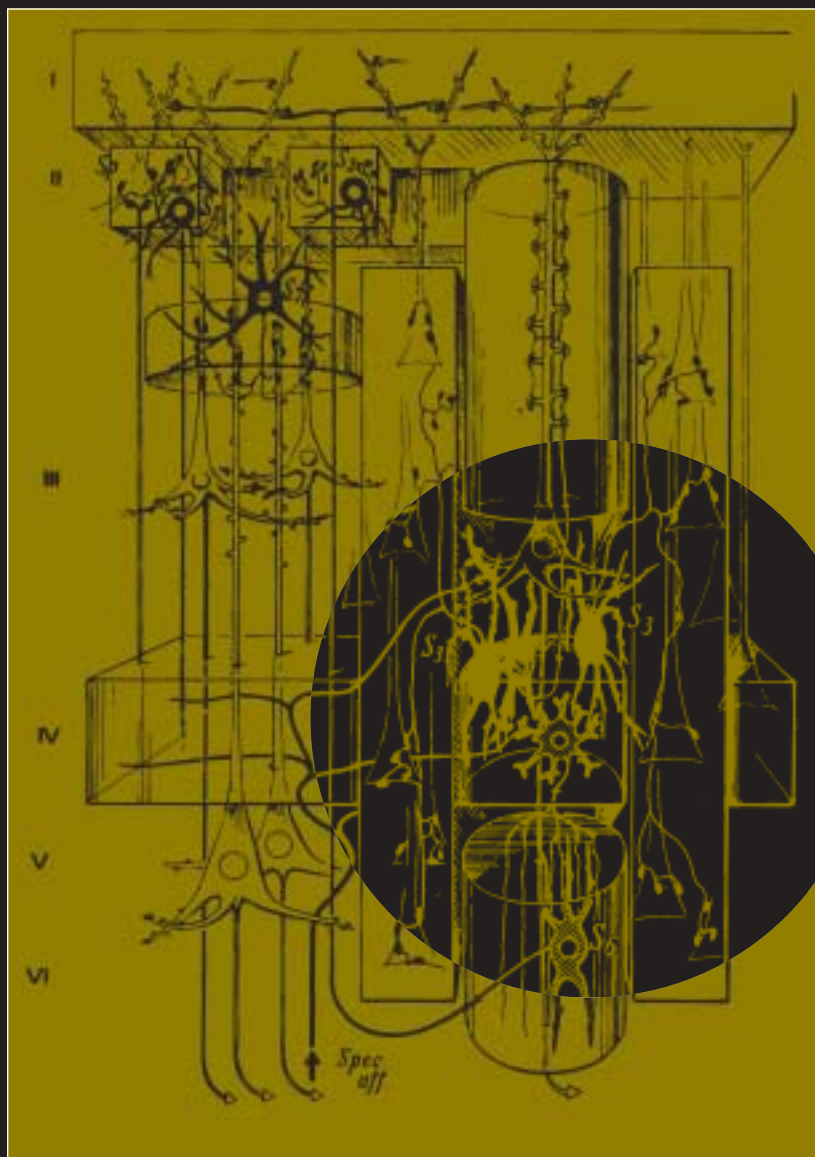
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Neuroscience



Spring 2002

The MIT Press

NEW

BEHAVIORAL ENDOCRINOLOGY**Second Edition**

edited by Jill B. Becker, *University of Michigan*,
S. Marc Breedlove, *Michigan State University*, David Crews,
University of Texas at Austin, and Margaret M. McCarthy,
University of Maryland School of Medicine

This popular behavioral endocrinology text provides detailed information on what hormones are, how they affect cells, and how such effects can alter the behavior of animals, including humans. Presenting a broad continuum of levels of analysis, from molecular to evolutionary, the book discusses how genes work, the structure of cells, the interactions of endocrine organs, the behavior of individuals, the structure of social hierarchies, and the evolution of mating systems.

The second edition, while maintaining the strengths of the first edition, has been thoroughly revised to reflect recent developments in genetics and molecular biology and related social concerns. It contains four new chapters: on the use of molecular biology techniques in behavioral endocrinology, on psychoneuroimmunology, on hormonal influences on sensorimotor function, and on cognitive function in nonhuman animals.

A Bradford Book

June 2002 • 775 pp. • 196 illus. • paper • \$45.00/£30.95
0-262-52321-3

Cloth • \$110.00/£75.95
0-262-02511-6 **T**

Catalog cover: Sketch of cortical columns, their various neurons, and the endings of a specific afferent fiber. (Reprinted from Brain Research, Vol. 95, Szentágothai, "The module-concept in cerebral cortex architecture," pp. 475-496, copyright 1975, with permission of Elsevier Science.)

Table of Contents:**I. INTRODUCTION**

1. Introduction to Behavioral Endocrinology, J.B. Becker and S. M. Breedlove
2. Molecular Approaches to Behavioral Endocrinology, M. M. McCarthy and D. Crews
3. Sexual Differentiation of the Brain and Behavior, S. M. Breedlove and E. Hampson

II. HORMONES AND REPRODUCTIVE BEHAVIORS

4. Neuroendocrinology of Sexual Behavior in the Female, M. M. McCarthy and J. B. Becker
5. Neuroendocrinology of Sexual Behavior in the Male, M. J. Baum
6. Hormonal Influences on Human Sexual Behavior, C. S. Carter
7. Diversity of Hormone-Behavior Relations in Reproductive Behavior, D. Crews
8. Hormonal Influences on Courtship Behaviors, D. Kelly and E. Brenowitz
9. Hormones and Parental Behavior, L. J. Young and T. R. Insel

III. HORMONES AND REGULATORY FUNCTIONS

10. Neuroendocrine and Behavioral Influences on the Immune System, C. L. Coe
11. Neuroendocrinology of the Stress Response, R. Sapolsky
12. Hormones and Biological Rhythms, M. Gorman and T. M. Lee

IV. HORMONAL INFLUENCES ON SENSORIMOTOR FUNCTION AND COGNITION

13. Hormonal Influences on Sensorimotor Function, J. B. Becker
14. Hormonal Influences on Cognitive Function in Non-Human Animals, C. L. Williams
15. Sex Differences in Human Brain and Cognition: The Influence of Sex Steroids in Early and Adult Life, E. Hampson

V. RECIPROCAL REGULATION OF HORMONES AND BEHAVIOR

16. Hormones and Ingestive Behaviors, S. M. Breedlove
17. Hormonal Regulation of Behavior — Insights from Invertebrates, J. Truman
18. Environmental Factors Influencing Hormone Secretion, R. Silver and L. Kriegsfeld

Texts recommended for course adoption are designated **T** throughout the catalog.

NEW

MICROARRAYS FOR THE NEUROSCIENCES**An Essential Guide**

edited by Daniel H. Geschwind, *University of California at Los Angeles School of Medicine*, and Jeffrey P. Gregg, *University of California at Davis School of Medicine*

The effort to sequence the human genome has generated a new discipline, “functional genomics,” or the study of the relationship between the genetic code and its biologic potential. Gene expression studies are made possible not only by the decoding of the human genome, but by the development of new technologies. The preeminent technology in this area, DNA microarrays, is helping to revolutionize the field of neuroscience. Rather than looking at one gene at a time, researchers using DNA microarrays can monitor the expression patterns of large numbers of genes simultaneously. Bridging the traditional gap between molecular neurobiology and systems neurobiology, DNA microarray technology has the potential to elevate molecular genetic studies of the nervous system to the system level.

This book provides a comprehensive guide to the use of DNA microarrays in neuroscience and provides approaches that are applicable to other complex biological systems. Human nervous system tissue is remarkably complex. The number of cell types, the architecture, the developmental program, and the importance of environmental factors in development and functioning all pose particular challenges to the researcher using gene expression studies. After an overview of the technology, the book discusses array scanning and image application, statistical methods for array analysis, specific applications of gene expression studies in the central nervous system, the use of postmortem human tissue, and novel methods for using microarray data to develop hypotheses about regulatory networks.

A Bradford Book
2002 • 288 pp. • 75 illus., 8 color • \$55.00/£37.95
0-262-07229-7
Cellular and Molecular Neuroscience series

“Gene expression profiling has clearly emerged as an effective new technology for studying the brain. This very useful volume provides the first comprehensive guide to this new technology for neuroscientists.”

— Fred H. Gage, Adler Professor,
Laboratory of Genetics, The Salk
Institute for Biological Studies

“The nuts and bolts of utilizing gene microarray technology, from production to complex data analysis, are presented in an eminently digestible and technically current fashion. Having experienced the difficulties in fashioning a technical book, I am impressed with the thoroughness and attention to experimental and analytical detail that Geschwind and Gregg have incorporated with their collaborators.”

— Pat Levitt, Director, John F. Kennedy
Center for Research on Human
Development, Vanderbilt University

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NEW

SYNESTHESIA**A Union of the Senses
Second Edition**Richard E. Cytowic, *founder of Capitol Neurology*

Most people link senses only by way of metaphoric speech, saying, for example, that red is a “warm” color or that a certain cheese tastes “sharp.” But a minority of individuals, known as synesthetes, experience the phrase “I see what you’re saying” as literally true. In addition to studying the phenomenon for its own sake, neuroscientists are interested in what synesthesia might reveal about consciousness, the working of nonsynesthetic brains, subjective-objective relations, and the relationship between reason and emotion.

In this classic text, Richard Cytowic quickly disposes of earlier criticisms that the phenomenon cannot be “real,” demonstrating that it is indeed brain-based. Following a historical introduction, he lays out the phenomenology of synesthesia in detail and gives criteria for clinical diagnosis and an objective “test of genuineness.” He reviews theories and experimental procedures to localize the plausible level of the neuraxis at which synesthesia operates. In a discussion of brain development and neural plasticity, he addresses the possible ubiquity of neonatal synesthesia, the construction of metaphor, and whether everyone is unconsciously synesthetic. In the closing chapters, Cytowic considers synesthetes’ personalities, the apparent frequency of the trait among artists, and the subjective and illusory nature of what we take to be objective reality, particularly in the visual realm.

The second edition has been extensively revised, reflecting the recent flood of interest in synesthesia and new knowledge of human brain function and development. More than two-thirds of the material is new.

A Bradford Book
May 2002 • 391 pp. • 103 illus. • \$55.00/£37.95
0-262-03296-1

THE MAN WHO TASTED SHAPESRichard E. Cytowic, *founder of Capitol Neurology*

The ten people in one million who are synesthetes are born into a world where one sensation (such as sound) conjures up one or more others (such as taste or color). Although scientists have known about synesthesia for two hundred years, until now the condition has remained a mystery. Extensive experiments with more than forty synesthetes led Richard Cytowic to an explanation of synesthesia — and to a new conception of the organization of the mind, one that emphasized the primacy of emotion over reason.

Through his research, Cytowic came to explore a deeper reality that he believes exists in all individuals, but usually below the surface of awareness. In this medical detective adventure, he reveals the brain to be an active explorer, not just a passive receiver, and offers a new view of what it means to be human.

A Bradford Book
1998 • 252 pp. • 15 illus. • paper • \$21.95/£14.95
0-262-53152-6
(Not available in UK or Eire)

**THE NEUROLOGICAL SIDE
OF NEUROPSYCHOLOGY**Richard E. Cytowic, *founder of Capitol Neurology*

The Neurological Side of Neuropsychology is a primer for neurology residents, graduate students, and established professionals from other fields who wish to enter behavioral neurology. It provides a clear and coherent introduction to contemporary neurological ideas, carefully contrasting the conventional hierarchical model of brain organization to the newer multiplex model that scientists from biological backgrounds currently use.

Instead of presenting laundry lists of arcane maladies along with a key of “where in the brain the responsible lesion is,” or a compendium of tests for a given situation — the received wisdom that students are required to memorize — Cytowic gives students the historical and conceptual tools they need not only to get up to speed regarding present knowledge, but to go forward.

A Bradford Book
1996 • 316 pp. • 51 illus. • \$75.00/£51.50
0-262-03231-7 **T**

NEURAL COMPUTATION

THEORETICAL NEUROSCIENCE

Computational and Mathematical Modeling of Neural Systems

Peter Dayan, *Gatsby Computational Neuroscience Unit, University College London* and L. F. Abbott, *Brandeis University*

Theoretical neuroscience provides a quantitative basis for describing what nervous systems do, determining how they function, and uncovering the general principles by which they operate. This text introduces the basic mathematical and computational methods of theoretical neuroscience and presents applications in a variety of areas including vision, sensory-motor integration, development, learning, and memory.

The book is divided into three parts. Part I discusses the relationship between sensory stimuli and neural responses, focusing on the representation of information by the spiking activity of neurons. Part II discusses the modeling of neurons and neural circuits on the basis of cellular and synaptic biophysics. Part III analyzes the role of plasticity in development and learning. An appendix covers the mathematical methods used, and exercises are available on the book's Web site.

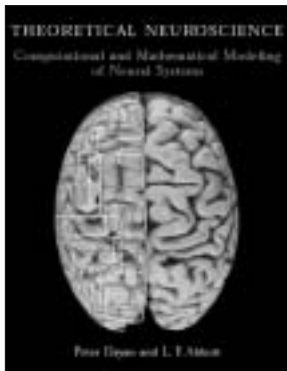


Table of Contents:

1. Neural Encoding I: Firing Rates and Spike Statistics
2. Neural Encoding II: Reverse Correlation and Visual Receptive Fields
3. Neural Decoding
4. Information Theory
5. Model Neurons I: Neuroelectronics
6. Model Neurons II: Conductances and Morphology
7. Network Models
8. Plasticity and Learning
9. Classical Conditioning and Reinforcement Learning
10. Representational Learning
11. Mathematical Appendix
12. References

2001 • 576 pp. • 165 illus. • \$50.00/£34.50
0-262-04199-5 

"Immensely satisfying. . . . This book will serve as guidepost, as a lighthouse. . . . Theoretical Neuroscience succeeds admirably as a textbook for a course on computational neuroscience, collective computation or sensory coding. . . . Well designed. . . . [It] is the ideal companion to a class taught at the senior undergraduate or graduate level to computationally minded neuro-, cognitive, or computer scientists. I will certainly use it in this capacity and warmly recommend it to anyone else."

— Christof Koch, *Nature Neuroscience*

"Dayan and Abbott inspire us with a work of tremendous breadth, and each chapter is more exciting than the next. Everyone with an interest in neuroscience will want to read this book. A truly remarkable effort by two of the leaders in the field."

— P. Read Montague, Professor,
Division of Neuroscience, and Director,
Center for Theoretical Neuroscience,
Baylor College of Medicine

"Theoretical Neuroscience provides a rigorous introduction to how neurons code, compute, and adapt. It is a remarkable synthesis of advances from many areas of neuroscience into a coherent computational framework. This book sets the standards for a new generation of modelers."

— Terrence J. Sejnowski,
Howard Hughes Medical Institute
Investigator, The Salk Institute
for Biological Studies

NEURAL COMPUTATION

NEW

THE NEURAL SIMULATION LANGUAGE

A System for Brain Modeling

Alfredo Weitzenfeld, *Instituto Tecnológico Autónomo de México*, Michael A. Arbib, *University of Southern California*, and Amanda Alexander, *University of Southern California*

The Neural Simulation Language (NSL), developed by Alfredo Weitzenfeld, Michael Arbib, and Amanda Alexander, provides a simulation environment for modular brain modeling. NSL is an object-oriented language offering object-oriented protocols applicable to all levels of neural simulation. One of NSL's main strengths is that it allows for realistic modeling of the anatomy of macroscopic brain structures.

The book is divided into two parts. The first part presents an overview of neural network and schema modeling, a brief history of NSL, and a detailed discussion of the new version, NSL 3.0. It includes tutorials on several basic schema and neural network models. The second part presents models built in NSL by researchers from around the world, including those for conditional learning, face recognition, associative search networks, and visuomotor coordination. Each chapter provides an explanation of a model, an overview of the NSL 3.0 code, and a representative set of simulation results.

"Weitzenfeld, Arbib, and Alexander provide an excellent and durable resource — NSL — for the seasoned neural modeler. As the book amply illustrates, NSL offers great versatility for diverse applications in the study of the brain, from vision to learning to motor behavior and beyond."

—Ronald C. Arkin, Professor and Director of the Mobile Robot Laboratory, College of Computing, Georgia Institute of Technology

A Bradford Book
May 2002 • 460 pp. • 227 illus.
Paper • \$55.00/£37.95
0-262-73149-5

THE HANDBOOK OF BRAIN THEORY AND NEURAL NETWORKS

edited by Michael A. Arbib, *University of Southern California*

In hundreds of articles by experts from around the world, and in overviews and "road maps" prepared by the editor, *The Handbook of Brain Theory and Neural Networks* charts the immense progress made in recent years in many specific areas related to great questions: How does the brain work? How can we build intelligent machines?

While many books discuss limited aspects of one subfield or another of brain theory and neural networks, the *Handbook* covers the entire sweep of topics — from detailed models of single neurons, analyses of a wide variety of biological neural networks, and connectionist studies of psychology and language, to mathematical analyses of a variety of abstract neural networks, and technological applications of adaptive, artificial neural networks.

Expository material makes the book accessible to readers with varied backgrounds while still offering a clear view of the recent, specialized research on specific topics.

"Impressive. . . . After four years of life in hardback, this mammoth book has been recently released in paperback. This release constitutes a very welcome reduction in price, making it within the reach of graduate students and other people with less than fabulous salaries. . . . Overall. . . 'Just excellent. Best source book in computational and theoretical neuroscience, for sure'."

—Matteo Carandini, *Trends in Neurosciences*

A Bradford Book
1995 • 1136 pp. • 600 illus.
Paper • \$95.00/£65.50
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NEURAL COMPUTATION

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ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 14**Proceedings of the 2001 Neural Information Processing Systems (NIPS) Conference.**

edited by Thomas G. Dietterich, *Oregon State University*, Suzanna Becker, *McMaster University*, and Zoubin Ghahramani, *University College London*

The annual conference on Neural Information Processing Systems (NIPS) is the flagship conference on neural computation. The conference is interdisciplinary, with contributions in algorithms, learning theory, cognitive science, neuroscience, vision, speech and signal processing, reinforcement learning and control, implementations, and diverse applications. Only about 30 percent of the papers submitted are accepted for presentation at NIPS, so the quality is exceptionally high. These proceedings contain all of the papers that were presented at the 2001 conference.

A Bradford Book

May 2002 • 1600 pp. (2 volumes, not sold separately) • \$90.00/£61.95

0-262-04208-8

Neural Information Processing series

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS**Proceedings of the First 12 Conferences**

edited by Michael I. Jordan, *University of California, Berkeley*, Yann LeCun, *AT&T Lab-Research*, and Sara A. Solla, *Northwestern University*

This CD-ROM contains the entire proceedings of the twelve Neural Information Processing Systems conferences from 1988 to 1999. The files are available in the DjVu image format developed by Yann LeCun and his group at AT&T Labs. The CD-ROM includes free browsers for all major platforms.

2001 • CD-ROM • \$65.00/£44.95

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Neural Information Processing series

NEW

PROBABILISTIC MODELS OF THE BRAIN**Perception and Neural Function**

edited by Rajesh P. N. Rao, *University of Washington*, Bruno A. Olshausen, *University of California, Davis*, and Michael S. Lewicki, *Carnegie Mellon University*

Neurophysiological, neuroanatomical, and brain imaging studies have helped to shed light on how the brain transforms raw sensory information into a form that is useful for goal-directed behavior. A fundamental question that is seldom addressed by these studies, however, is why the brain uses the types of representations it does and what evolutionary advantage, if any, these representations confer. It is difficult to address such questions directly via animal experiments. A promising alternative is to use probabilistic principles such as maximum likelihood and Bayesian inference to derive models of brain function.

This book surveys some of the current probabilistic approaches to modeling and understanding brain function. Although most of the examples focus on vision, many of the models and techniques are applicable to other modalities as well. The book presents top-down computational models as well as bottom-up neurally motivated models of brain function. The topics covered include Bayesian and information-theoretic models of perception, probabilistic theories of neural coding and spike timing, computational models of lateral and cortico-cortical feedback connections, and the development of receptive field properties from natural signals.

A Bradford Book

2002 • 345 pp. • \$50.00/£34.50

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Neural Information Processing series

COMPUTATIONAL EXPLORATIONS IN COGNITIVE NEUROSCIENCE**Understanding the Mind by Simulating the Brain**

Randall C. O'Reilly, and Yuko Munakata

(Please see page 15 for descriptive copy.)

A Bradford Book

2000 • 512 pp. • 213 illus. • paper • \$55.00/£37.95

0-262-65054-1



NEURAL COMPUTATION

GRAPHICAL MODELS

Foundations of Neural Computation

edited by Michael I. Jordan, *University of California, Berkeley* and Terrence J. Sejnowski, *Salk Institute of Biological Studies and University of California, San Diego*

Graphical models use graphs to represent and manipulate joint probability distributions. The clean mathematical formalism of the graphical models framework makes it possible to understand a wide variety of network-based approaches to computation, and in particular to understand many neural network algorithms and architectures as instances of a broader probabilistic methodology. It also makes it possible to identify novel features of neural network algorithms and architectures and to extend them to more general graphical models.

This book exemplifies the interplay between the general formal framework of graphical models and the exploration of new algorithms and architectures. The selections range from foundational papers of historical importance to results at the cutting edge of research.

A Bradford Book
2001 • 400 pp. • paper • \$32.95/£22.50
0-262-60042-0
Computational Neuroscience series

NEURAL CODES AND DISTRIBUTED REPRESENTATIONS

Foundations of Neural Computation

edited by Laurence Abbott, *Brandeis University*, and Terrence J. Sejnowski, *Salk Institute for Biological Studies and the University of California, San Diego*

Neural Codes and Distributed Representations focuses on issues of broad interest to neuroscientists and modelers. The topics addressed are: how neurons encode information through action potential firing patterns, how populations of neurons represent information, and how individual neurons use dendritic processing and biophysical properties of synapses to decode spike trains. The papers encompass a wide range of levels of investigation, from dendrites and neurons to networks and systems.

A Bradford Book
1999 • 358 pp. • paper • \$35.00/£23.95
0-262-51100-2
Computational Neuroscience series

SELF-ORGANIZING MAP FORMATION

Foundations of Neural Computation

edited by Klaus Obermayer, *Technical University of Berlin* and Terrence J. Sejnowski, *Salk Institute of Biological Studies and University of California, San Diego*

This book provides an overview of self-organizing map formation, including recent developments. It consists of five sections. The first section looks at attempts to model the organization of cortical maps and at the theory and applications of the related artificial neural network algorithms. The second section analyzes topographic maps and their formation via objective functions. The third section discusses cortical maps of stimulus features. The fourth section discusses self-organizing maps for unsupervised data analysis. The fifth section discusses extensions of self-organizing maps, including two surprising applications of mapping algorithms to standard computer science problems: combinatorial optimization and sorting.

A Bradford Book
2001 • 394 pp. • paper • \$34.95/£23.95
0-262-65060-6
Computational Neuroscience series

UNSUPERVISED LEARNING

Foundations of Neural Computation

edited by Geoffrey Hinton, *University College, London*, and Terrence J. Sejnowski, *Salk Institute for Biological Studies and the University of California, San Diego*

This volume focuses on neural network learning algorithms that do not require an explicit teacher. The goal of unsupervised learning is to extract an efficient internal representation of the statistical structure implicit in the inputs. These algorithms provide insights into the development of the cerebral cortex and implicit learning in humans. They are also of interest to engineers working in areas such as computer vision and speech recognition who seek efficient representations of raw input data.

A Bradford Book
1999 • 350 pp. • paper • \$35.00/£23.95
0-262-58168-X
Computational Neuroscience series

NEURAL COMPUTATION

METHODS IN NEURONAL MODELING

From Ions to Networks Second Edition

edited by Christof Koch, *California Institute of Technology* and Idan Segev, *Hebrew University*

The field of neuroscience has grown dramatically since the first edition of this book was published nine years ago. Half of the chapters of the second edition are completely new; the remaining ones have all been thoroughly revised. *Methods in Neuronal Modeling* serves as a handbook of computational methods and techniques for modeling the functional properties of single and groups of nerve cells.

Many chapters provide an opportunity for interactive tutorials and simulation programs. They can be accessed via Christof Koch's Website <http://www.klab.caltech.edu>

"Research on brain function will only converge on a unified explanation when models are effectively constrained by biological detail at a cellular level. Methods in Neuronal Modeling provides an important step in that process."

— Michael E. Hasselmo, *Science*

A Bradford Book
1998 • 844 pp. • 174 illus. • \$75.00/£51.50
0-262-11231-0
Computational Neuroscience series

THE COMPUTATIONAL BRAIN

Patricia S. Churchland and Terrence J. Sejnowski, both of the *University of California, San Diego*

"This book provides an intriguing journey from synapses to psychophysics."

— Mike May, *American Scientist*

The Computational Brain is the first unified and broadly accessible book to bring together computational concepts and behavioral data within a neurobiological framework. Churchland and Sejnowski address the foundational ideas of the emerging field of computational neuroscience, examine a diverse range of neural network models, and consider future directions of the field.

A Bradford Book
1992 • 560 pp. • 366 illus. • paper • \$29.95/£20.50
0-262-53120-8 **T**
Computational Neuroscience series

FAST OSCILLATIONS IN CORTICAL CIRCUITS

Roger D. Traub, *University of Birmingham, UK*, John G. R. Jefferys, *University of Birmingham, UK*, and Miles A. Whittington, *Imperial College, London, UK*

In *Fast Oscillations in Cortical Circuits*, the authors use a combination of electrophysiological and computer modeling techniques to analyze how large networks of neurons can produce both epileptic seizures and functionally relevant synchronized oscillations. Specific topics covered include single hippocampal pyramidal cells, hippocampal interneurons, synaptic interactions, gamma oscillations in brain slices as well as in vivo, the mechanisms of oscillation-synchronization (both local and long-range), the switch from gamma to beta frequencies and its implications for memory, and the significance of gamma oscillations for brain function.

A Bradford Book
1999 • 308 pp. • 94 illus. • \$60.00/£41.50
0-262-20118-6
Computational Neuroscience series

SPIKES

Exploring the Neural Code

Fred Rieke, *University of Washington*, David Warland, *Harvard University*, Rob de Ruyter van Steveninck, *NEC Research Institute*, and William Bialek, *NEC Research Institute*

What does it mean to say that a certain set of spikes is the right answer to a computational problem? In what sense does a spike train convey information about the sensory world? *Spikes* begins by providing precise formulations of these and related questions about the representation of sensory signals in neural spike trains. The answers to these questions are then pursued in experiments on sensory neurons.

"A joy to read. . . . This book will undoubtedly become a classic. The ideas presented in it have already begun (in no small part through the work of the authors) to reshape our views of the neural code. This book will make them accessible to a much wider audience."

—Anthony Zador, *Science*

A Bradford Book
1996 • 416 pp. • 88 illus. • paper • \$30.00/£20.50
0-262-68108-0
Computational Neuroscience series

NEURAL COMPUTATION

NEW

NEUROTECHNOLOGY FOR BIOMIMETIC ROBOTS

edited by Joseph Ayers, *Northeastern University*,
Joel L. Davis, *Office of Naval Research*, and
Alan Rudolph, *DARPA*

The goal of neurotechnology is to confer the performance advantages of animal systems on robotic machines. Biomimetic robots differ from traditional robots in that they are agile, relatively cheap, and able to deal with real-world environments. The engineering of these robots requires a thorough understanding of the biological systems on which they are based, at both the biomechanical and physiological levels.

This book provides an in-depth overview of the field. The areas covered include myomorphic actuators, which mimic muscle action; neuromorphic sensors, which, like animal sensors, represent sensory modalities such as light, pressure, and motion in a labeled-line code; biomimetic controllers, based on the relatively simple control systems of invertebrate animals; and the autonomous behaviors that are based on an animal's selection of behaviors from a species-specific behavioral "library." The ultimate goal is to develop a truly autonomous robot, one able to navigate and interact with its environment solely on the basis of sensory feedback without prompting from a human operator.

A Bradford Book
July 2002 • 648 pp. • 200 illus. • \$65.00/£44.95
0-262-01193-X

THE SIX CORE THEORIES OF MODERN PHYSICS

Charles F. Stevens, *The Salk Institute*

Reviewing all the key areas of physics in one place, *The Six Core Theories of Modern Physics* provides a brief, clear, and self-contained summary of the basic theoretical structures of classical mechanics, electricity and magnetism, quantum mechanics, statistical physics, special relativity, and modern field theories. In addition, the mathematics required for these areas is conveniently summarized in the first chapter.

A Bradford Book
1995 • 248 pp. • paper • \$18.95/£12.95
0-262-69188-4 **T**

BEYOND THE COGNITIVE MAP

From Place Cells to Episodic Memory

A. David Redish, *University of Arizona in Tucson*

A. David Redish takes the approach that understanding the role of the hippocampus in space will make it possible to address its role in less easily quantifiable areas such as memory. Basing his investigation on the study of rodent navigation, he places the hippocampus in its anatomical context as part of a greater functional system.

Redish draws on the extensive experimental and theoretical work of the last 100 years to paint a coherent picture of rodent navigation. His presentation encompasses multiple levels of analysis, from single-unit recording results to behavioral tasks to computational modeling. From this foundation, he proposes a novel understanding of the role of the hippocampus in rodents that can shed light on the role of the hippocampus in primates, explaining data from primate studies and human neurology.

"This is an astonishing piece of work."

— Richard G. M. Morris, Center for Neuroscience,
University of Edinburgh, Scotland

A Bradford Book
1999 • 550 pp. • 51 illus. • \$52.00/£35.95
0-262-18194-0

FOUNDATIONS OF CELLULAR NEUROPHYSIOLOGY

Daniel Johnston and Samuel Miao-Sin Wu, *both of Baylor College of Medicine*

This text for graduate and advanced undergraduate students in neuroscience, physiology, biophysics, and computational neuroscience provides comprehensive, mathematically sophisticated descriptions of modern principles of cellular neurophysiology. It is the only neurophysiology text that gives detailed derivations of equations, worked examples, and homework problem sets (with complete answers).

A Bradford Book
1995 • 705 pp. • 325 illus. • \$79.95/£54.95
0-262-10053-3 **T**

THE INTACT AND SLICED BRAIN

Mircea Steriade, *Laval University, Quebec City*

In this book Mircea Steriade cautions against the tendency of some neuroscientists to infer global brain functions such as arousal and sleep, epileptic events, and even conscious thinking from the properties of single cells. Based on his lifetime of research on intact brains, Steriade emphasizes the need to understand isolated networks within the context of the whole mammalian brain and to understand the brain of a behaving animal in terms of its fully dissected circuits. As much as knowledge of brain anatomy and function has progressed, Steriade is highly skeptical about the quest to relate consciousness to specific neuronal types.

The book's sections are Changing Concepts of Localization of Brain Function, Evolution of Methods in Brain Studies, Similar and Contrasting Results from Studies in the Intact and Sliced Brain, Building Blocks of Synaptic Networks Underlying Normal and Paroxysmal States, and Of Neurons and Consciousness.



A Bradford Book
2001 • 322 pp. • 154 illus. • 15 color • \$55.00/£37.95
0-262-19456-2

HANDBOOK OF FUNCTIONAL NEUROIMAGING OF COGNITION

edited by Roberto Cabeza, *Duke University* and Alan Kingstone, *University of British Columbia*

With its strong theoretical focus, this book serves as an essential resource on the functional neuroimaging of cognitive processes and on the latest discoveries obtained through positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) techniques. It is organized into three sections.

The first covers the history and methods of PET and fMRI, as well as cognitive networks, showing how the brain regions involved in the different cognitive processes interact. The second part, the book's core, covers PET and fMRI findings in specific domains: attention, language, visual recognition, semantic memory, episodic memory, and working memory. The third part covers the effects of aging on brain activity during cognitive performance and also examines research with neuropsychologically impaired patients.

A Bradford Book
2001 • 412 pp. • 57 illus. • \$65.00/£44.95
0-262-03280-5

FUNDAMENTALS OF NEURAL NETWORK MODELING**Neuropsychology and Cognitive Neuroscience**

edited by Randolph W. Parks, *University of Mississippi*, Daniel S. Levine, *University of Texas at Arlington*, and Debra L. Long, *University of California, Davis*

This book provides an introduction to the neural network modeling of complex cognitive and neuropsychological processes. It is intended to make the neural network approach accessible to practicing neuropsychologists, psychologists, neurologists, and psychiatrists.

The book is divided into four parts. Part I provides an extensive but basic overview of neural network modeling, including its history, present, and future trends. It also includes chapters on attention, memory, and primate studies. Part II discusses neural network models of behavioral states such as alcohol dependence, learned helplessness, depression, and waking and sleeping. Part III presents neural network models of neuropsychological tests such as the Wisconsin Card Sorting Task, the Tower of Hanoi, and the Stroop Test. Finally, part IV describes the application of neural network models to dementia: models of acetylcholine and memory, verbal fluency, Parkinson's disease, and Alzheimer's disease.

A Bradford Book
1998 • 416 pp. • 94 illus. • \$69.95/£48.50
0-262-16175-3
Computational Neuroscience series

NEUROSCIENCE

JOURNEY FROM COGNITION TO BRAIN TO GENE

Perspectives from Williams Syndrome

edited by Ursula Bellugi, *Salk Institute for Biological Studies* and Marie St. George, *University of California, San Diego*

A blueprint for the investigation of neurodevelopmental disorders, this book presents the work of a team of scientists using a multidisciplinary, integrated approach

to link genes with human behavior. Using Williams syndrome as a model, leading researchers in neuroanatomy, neurocognition, neurophysiology, and molecular genetics have built bridges between disciplines to link higher cognitive

functions, their underlying neurobiological bases, and their molecular genetic underpinnings. One of the book's many strengths is that the scientists from each discipline studied the same individuals with Williams syndrome. As the book shows, Williams syndrome is a fascinating disorder because of the "peaks and valleys" among cognitive domains: severe intellectual deficits but remarkably spared and effusive language; specific impairment in spatial construction but great strength in face processing and sociability. By capitalizing on these dissociations in higher cognitive functioning, the book provides a model for the study of brain-behavior relationships as well as for the mapping of brain and behavior phenotypes to the genome and beyond.



CONTRIBUTORS: R. Adolphs, T. Alvarez, L. Appelbaum, U. Bellugi, D. Burian, X.-N. Chen, M. Chiles, S. Eliez, A. Galaburda, H. Hirota, W. Jones, J. Korenberg, Z. Lai, L. Lichtenberger, A. Lincoln, R. Matsuoka, D. Mills, H. Neville, J. Reilly, A. Reiss, B. Roe, M. St. George, J. E. Schmitt, E. Straus.

A Bradford Book
2001 • 150 pp. • 57 illus., 7 color
Paper • \$25.00/£16.95
0-262-52312-4

PATIENT-BASED APPROACHES TO COGNITIVE NEUROSCIENCE

edited by Martha J. Farah, *University of Pennsylvania* and Todd E. Feinberg, *Beth Israel Medical Center, New York, and Albert Einstein College of Medicine*

The cognitive disorders that follow brain damage are an important source of insight into the neural bases of human thought. Although cognitive neuroscience is sometimes equated with cognitive neuroimaging, the patient-based approach to cognitive neuroscience is responsible for most of what we now know about the brain systems underlying perception, attention, memory, language, and higher-order forms of thought including consciousness. This volume brings together state-of-the-art reviews of the patient-based approach to these and other central issues in cognitive neuroscience, written by leading authorities.

Part I covers the history, principles, and methods of patient-based neuroscience: lesion method, imaging, computational modeling, and anatomy. Part II

covers perception and vision: sensory agnosias, disorders of body perception, attention and neglect, disorders of perception and awareness, and misidentification syndromes. Part III covers language: aphasia, language disorders in children,



specific language impairments, developmental dyslexia, acquired reading disorders, and agraphia. Part IV covers memory: amnesia and semantic memory impairments. Part V covers higher cognitive functions: frontal lobes, callosal disconnection (split brain), skilled movement disorders, acalculia, dementia, delirium, and degenerative conditions including Alzheimer's disease, Parkinson's disease, and Huntington's disease.

A Bradford Book
2000 • 425 pp. • 100 illus.
Paper • \$45.00/£30.95
0-262-56123-9 **T**
Issues in Clinical and Cognitive Neuropsychology series

NEW

THE PARALLEL BRAIN**The Cognitive Neuroscience of the Corpus Callosum**

edited by Eran Zaidel, *University of California, Los Angeles*, and Marco Iacoboni, *UCLA School of Medicine*

Hemispheric specialization is involved in every aspect of sensory, cognitive, and motor systems integration. Study of the corpus callosum, the bands of tissue uniting the brain's two hemispheres, is central to understanding neuroanatomy, neurophysiology, and behavior. It also brings the tools of hemispheric specialization to a fundamental problem of cognitive neuroscience: modularity and intermodular communication.

This book summarizes current research on the human corpus callosum. It also provides a comprehensive introduction to cognitive neuroscience. Rather than viewing the field through the various systems of the mind/brain such as perception, action, emotion, memory, language, and problem solving, it takes a case studies approach. Focusing on the central problem of simple reaction time, it examines the most basic possible sequence of perception-decision-action. The task is to press a button with one hand as soon as a patch of light is detected in the peripheral visual field. When the patch appears in the visual field opposite the responding hand, there must be interhemispheric transfer prior to response. But transfer of what — a visual input code? A cognitive decision code? A motor response code? Combining animal models, normal human studies, and clinical evidence, the authors apply anatomical, physiological, and behavioral perspectives to this question. The emerging view is that the corpus callosum consists of many parallel interhemispheric channels for communication and control, and that every transfer channel is context-dependent and modulated by attention.

A Bradford Book
May 2002 • 576 pp. • 166 illus., 16 color
\$100.00/£68.95
0-262-24044-0

Issues in Clinical and Cognitive Neuropsychology series

THE TWO SIDES OF PERCEPTION

Richard B. Ivry, *University of California, Berkeley* and Lynn C. Robertson, *Veterans Administration and University of California, Davis*

Anatomically, the central nervous system looks remarkably symmetrical — from the relatively simple structures of the spinal cord to the extensively convoluted folds of the cerebral hemispheres. At



the functional level, however, there are striking differences between the left and right hemispheres.

After a historical introduction, Ivry and Robertson offer a cognitive neuroscience perspective on hemispheric specialization in perception. They propose that the two

hemispheres differ in how they filter task-relevant sensory information. Building on the idea that the hemispheres construct asymmetric representations, the hypothesis provides a novel account of many laterality effects. A notable feature of the authors' work is their attempt to incorporate hemispheric specialization in vision, audition, music, and language within a common framework. In support of their theory, they review studies involving both healthy and neurologically impaired individuals. They also provide a series of simulations to demonstrate the underlying computational principles of their theory. Their work thus describes both the cognitive and neurological architecture of hemispheric asymmetries in perception.

A Bradford Book
1997 • 360 pp. • 107 illus. • \$65.00/£44.95
0-262-09034-1
Cognitive Neuroscience series

COGNITIVE NEUROSCIENCE

Forthcoming!

FOUNDATIONS IN SOCIAL NEUROSCIENCE

edited by John T. Cacioppo, *University of Chicago*, Gary G. Berntson, Ralph Adolphs, C. Sue Carter, Richard J. Davidson, Martha K. McClintock, Bruce S. McEwen, Michael J. Meaney, Daniel L. Schacter, Esther M. Sternberg, Steve S. Suomi, and Shelley E. Taylor

A full understanding of the biology and behavior of humans cannot be complete without the collective contributions of the social sciences, cognitive sciences, and neurosciences. This book collects eighty-two of the foundational articles in the emerging discipline of social neuroscience.

The book addresses five main areas of research: multilevel integrative analyses of social behavior, using the tools of neuroscience, cognitive science, and social science to examine specific cases of social interaction; the relationships between social cognition and the brain, using noninvasive brain imaging to document brain function in various social situations; rudimentary biological mechanisms for motivation, emotion, and attitudes, and the shaping of these mechanisms by social factors; the biology of social relationships and interpersonal processes; and social influences on biology and health.

A Bradford Book

July 2002 • 1288 pp. • 277 illus. • paper • \$55.00/£37.95
0-262-53195-X

Cloth • \$135.00/£92.95

0-262-03291-0

Social Neuroscience series

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i. Motivation and Emotion	i. Deleterious Influences
ii. Attitudes and Preferences	ii. Salubrious Influences

Winner in Psychology, 1999, AAP/PSP Awards

THE MIT ENCYCLOPEDIA OF THE COGNITIVE SCIENCES

edited by Robert A. Wilson, *University of Illinois, Urbana-Champaign*, and Frank C. Keil, *Yale University*

Since the 1970s the cognitive sciences have offered multidisciplinary ways of understanding the mind and cognition. *The MIT Encyclopedia of the Cognitive Sciences* (MITECS) is a landmark, comprehensive reference work that represents the methodological and theoretical diversity of this changing field.

At the core of the encyclopedia are 471 concise entries, from Acquisition and Adaptationism to Wundt and X-bar Theory. Each article, written by a leading researcher in the field, provides an accessible introduction to an important concept in the cognitive sciences, as well as references or further readings. Six extended essays, which collectively serve as a roadmap to the articles, provide overviews of each of six major areas of cognitive science: Philosophy; Psychology; Neurosciences; Computational Intelligence; Linguistics and Language; and Culture, Cognition, and Evolution. For both students and researchers, MITECS is an indispensable guide to the current state of the cognitive sciences.

"This major work is an impressive and extremely useful volume which stands as an outstanding contribution to the furthering of cognitive science because of its accessibility, comprehensiveness and scope."

— Paul Rogers, *Journal of Consciousness Studies*

A Bradford Book

1999 • 1056 pp. • 100 illus. • paper • \$65.00/£44.95
0-262-73144-4

Online subscriptions available to individuals:
<http://cognet.mit.edu/MITECS>
\$25.00 for 6 months/ \$45.00 for 12 months

COGNITIVE NEUROSCIENCE

Winner in Single Volume Reference: Science category, 2001, AAP/PSP Awards

HANDBOOK OF DEVELOPMENTAL COGNITIVE NEUROSCIENCE

edited by Charles A. Nelson and Monica Luciana, *both of the University of Minnesota*

The publication of this handbook testifies to the rapid growth of developmental cognitive neuroscience as a distinct field. Brain imaging and recording technologies, along with well-defined behavioral tasks — the essential methodological tools of cognitive neuroscience — are now being used to study development. Whereas earlier methodologies allowed scientists to study only adult brains, recent technological advances have yielded methods that can be safely used to study structure-function relations and their development in children's brains. These new techniques combined with more refined cognitive models account for the progress and heightened activity in developmental cognitive neuroscience research.

The handbook contains forty-one original contributions exploring basic aspects of neural development, sensory and sensorimotor systems, language, cognition, and emotion. Aided by recent results in neurobiology establishing that the human brain remains malleable and plastic throughout much of the lifespan, the contributors also explore the implications of lifelong neural plasticity for brain and behavioral development.

A Bradford Book
2001 • 776 pp. • 261 illus., 27 color • \$95.00/£65.50
0-262-14073-X
Developmental Cognitive Neuroscience series

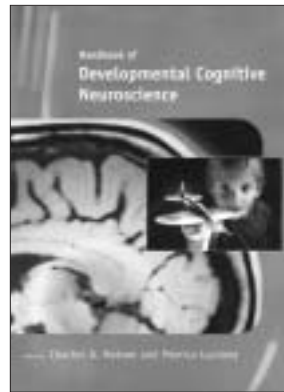


Table of Contents:

- I. Fundamentals of Developmental Neurobiology
- II. Methodological Paradigms
- III. Neural Plasticity of Development
- IV. Sensory and Sensorimotor Systems
- V. Language
- VI. Cognition
- VII. Neurodevelopmental Aspects of Clinical Disorders
- VIII. Emotion and Cognition Interactions

NEURODEVELOPMENTAL DISORDERS

edited by Helen Tager-Flusberg, *University of Massachusetts and Senior Scientist at the Eunice Kennedy Shriver Center*

Until recently, genetic, neuroanatomical, and psychological investigations on neurodevelopmental disorders were carried out independently. Now, tremendous advances across all disciplines have brought us toward a new scientific frontier: the integration of molecular genetics with a developmental cognitive neuroscience. The goal is to understand the basic mechanisms by which genes and environmental processes contribute to the development of specific structures and regions of the brain.

This handbook-style volume explores these advances from the perspective of developmental disorders in children. Research on children with known genetic disorders offers insights into the genetic mechanisms that underlie neural development and organization, as expressed in variations in cognitive profiles. The contributions provide in-depth analyses of a broad range of neurodevelopmental disorders, including those resulting from whole chromosome defects (Down and Turner syndromes), those related to defects in a single gene (fragile-X syndrome) or a small number of genes (Williams syndrome), and complex genetic disorders (dyslexia, autism). Contributors from the fields of teratology and brain injury provide additional perspectives.

A Bradford Book
1999 • 602 pp. • 72 illus. • \$85.00/£58.50
0-262-20116-X
Developmental Cognitive Neuroscience series

COGNITIVE NEUROSCIENCE

William James Book Award, 2002

THE NEW COGNITIVE NEUROSCIENCES

Second Edition

Michael S. Gazzaniga, Editor-in-Chief, *Dartmouth College*

The first edition of *The Cognitive Neurosciences* was in large part responsible for the huge growth in research that followed its publication. Indeed one could say that the book helped to define the field. Cognitive neuroscience, one of the most fascinating areas of the cognitive sciences, studies the relationship between the structural and physiological mechanisms of the brain/nervous system and the psychological reality of mind.

Unlike an encyclopedia or similar reference work, *The New Cognitive Neurosciences* contains long, research-based articles that look ahead to future developments in the field. The book's organization reflects the way researchers tend to group themselves. Thus the different sections function as stand-alones, almost like mini-textbooks. The second edition reflects the many advances that have taken place — particularly in imaging and recording techniques. The majority of the chapters are new, and those from the first edition have been completely rewritten and updated. The book contains 48 color plates of the latest in brain imagery.

"An encyclopedic achievement. . . . This book is, indeed, a monumental 'recueil' of inductive and deductive neuroscience for anyone to use and admire."

— Joaquín M. Fuster, *Neuron*

"The New Cognitive Neurosciences is a magnificent accomplishment. It covers topics from ions to consciousness, from reflexes to social psychology. It is authoritative and encyclopedic, but also lively and unafraid of controversy. Michael Gazzaniga, the MIT Press, and the community of cognitive neuroscientists are to be congratulated for assembling this landmark of twentieth century science and thrilling preview of what we will learn in the twenty-first."

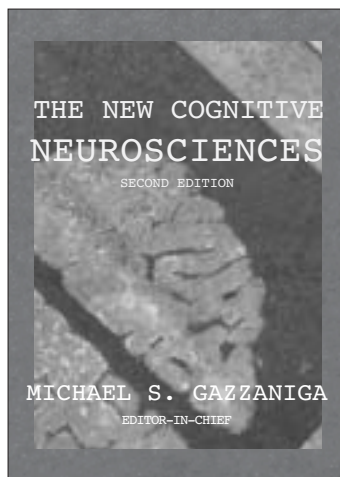
— Steven Pinker, Director, Center for Cognitive Neuroscience, MIT, and author of *How the Mind Works*

A Bradford Book

2000 • 8 1/2 x 11 • 1434 pp. • 592 illus.

48 in color • \$135.00/£92.95

0-262-07195-9



Sections and section editors:

Plasticity, Ira B. Black
 Development, Pasko Rakic
 Sensory Systems, J. Anthony Movshon
 and Colin Blakemore
 Motor, Emilio Bizzi
 Attention, Michael I. Posner
 Memory, Endel Tulving
 Language, Willem J. M. Levelt
 Thought and Memory, Edward E. Smith
 and Stephen M. Kosslyn
 Emotion, Joseph E. LeDoux
 Evolution, Leda Cosmides and
 John Tooby
 Consciousness, Daniel L. Schacter

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COGNITIVE NEUROSCIENCE

**COMPUTATIONAL EXPLORATIONS
IN COGNITIVE NEUROSCIENCE****Understanding the Mind by
Simulating the Brain**

Randall C. O'Reilly, *University of Colorado, Boulder*
and Yuko Munakata, *University of Denver*
Foreword by James L. McClelland

The goal of computational cognitive neuroscience is to understand how the brain embodies the mind by using biologically based computational models comprising networks of neuronlike units. This text, based on a course taught by Randall O'Reilly and Yuko Munakata over the past several years, provides an in-depth introduction to the main ideas in the field. The neural units in the simulations use equations based directly on the ion channels that govern the behavior of real neurons, and the neural networks incorporate anatomical and physiological properties of the neocortex. Thus the text provides the student with knowledge of the basic biology of the brain as well as the computational skills needed to simulate large-scale cognitive phenomena.



The text consists of two parts. The first part covers basic neural computation mechanisms: individual neurons, neural networks, and learning mechanisms. The second part covers large-scale brain area organization and cognitive phenomena: perception and attention, memory, language, and higher-level cognition. The second part is relatively self-contained and can be used separately for mechanistically oriented cognitive neuroscience courses. Integrated throughout the text are more than forty different simulation models, many of them full-scale research-grade models, with friendly interfaces and accompanying exercises. The simulation software (PDP++, available for all major platforms) and simulations can be downloaded free of charge from the Web. Exercise solutions are available, and the text includes full information on the software.

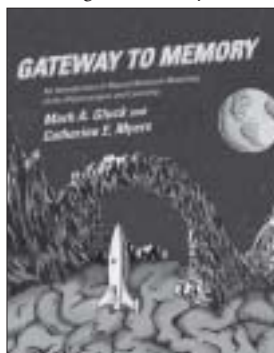
A Bradford Book
2000 • 512 pp. • 213 illus. • paper • \$55.00/£37.95
0-262-65054-1 **T**

GATEWAY TO MEMORY**An Introduction to Neural Network Modeling
of the Hippocampus and Learning**

Mark A. Gluck and Catherine E. Myers, *both at
Rutgers University-Newark*

This book is for students and researchers who have a specific interest in learning and memory and want to understand how computational models can be integrated into experimental research on the hippocampus and learning. It emphasizes the function of brain structures as they give rise to behavior, rather than the molecular or neuronal details. It also emphasizes the process of modeling, rather than the mathematical details of the models themselves.

The book's first part provides a tutorial introduction to topics in neuroscience, the psychology of learning and memory, and the theory of neural network models. The second part, the core of the book, reviews computational models of how the hippocampus cooperates with other brain structures — including the entorhinal cortex, basal forebrain, cerebellum, and primary sensory and motor cortices — to support learning and memory in both animals and humans.



The book assumes no prior knowledge of computational modeling or mathematics. For those who wish to delve more deeply into the formal details of the models, there are optional “mathboxes” and appendices. The book also includes extensive references

and suggestions for further reading.

“Gateway to Memory is an exciting and badly needed text that integrates computational and neurobiological approaches to memory. Authoritative and clearly written, this book will be valuable for students and researchers alike.”

— Daniel L. Schacter, Professor and Chair of
Psychology, Harvard University, and author of
Searching for Memory

A Bradford Book
2000 • 464 pp. • paper • \$19.95/£13.95
0-262-57152-8 **T**
Issues in Clinical and Cognitive Neuroscience series

COGNITIVE NEUROSCIENCE

LANGUAGE, BRAIN, AND COGNITIVE DEVELOPMENT

Essays in Honor of Jacques Mehler

edited by Emmanuel Dupoux, *Ecole des Hautes Etudes en Sciences Sociales, Paris, and the Centre National de la Recherche Scientifique*

The contributions to this collection, written in honor of Jacques Mehler, a founder of the field of psycholinguistics, assess the progress of cognitive science. The book is organized into four sections in addition to the introduction: thought, language, neuroscience, and brain and biology.

CONTRIBUTORS: F.-X. Alario, A. C. Bachoud Lévi, R. Baillargeon, D. Bavelier, T. G. Bever, N. Block, L. L. Bonatti, L. Bosch, A. Caramazza, S. Carey, A. Christophe, L. Cohen, S. Cordes, A. Costa, A. Cutler, S. Dehaene, G. Dehaene-Lambertz, E. Dupoux, S. Franck, U. Frauenfelder, U. Frith, A. M. Galaburda, M. Garrett, R. Gelman, P. Hallé, M. Hauser, S. Hespos, P. N. Johnson-Laird, P. W. Juszczyk, R. Kolinsky, W. J. M. Levelt, J. C. Marshall, J. McQueen, M. Miozzo, J. Morais, J. Morton, M. Nespore, H. Neville, E. L. Newport, D. Norris, C. Pallier, I. Peretz, M. Piatelli-Palmarini, S. Pinker, M. I. Posner, Z. Pylyshyn, N. Schiller, N. Sebastián-Gallés, J. Segui, E. Spelke, D. Sperber.

A Bradford Book
2001 • 562 pp. • 21 illus. • \$55.00/£37.95
0-262-04197-9

COGNITIVE MODELING

edited by Thad A. Polk and Colleen M. Seifert,
both at the University of Michigan

Computational modeling plays a central role in cognitive science. This book provides a comprehensive introduction to computational models of human cognition. It covers major approaches and architectures, both neural network and symbolic; major theoretical issues; and specific computational models of a variety of cognitive processes, ranging from low-level (e.g., attention and memory) to higher-level (e.g., language and reasoning). The articles included in the book provide original descriptions of developments in the field. The emphasis is on implemented computational models rather than on mathematical or nonformal approaches, and on modeling empirical data from human subjects.

A Bradford Book
June 2002 • 840 pp. • 309 illus. • paper • \$45.00/30.95
0-262-66116-0
Cloth • \$100.00/£68.95
0-262-16198-2

IMAGE, LANGUAGE, BRAIN

edited by Alec Marantz, *Massachusetts Institute of Technology*, Yasushi Miyashita, *University of Tokyo School of Medicine*, and Wayne O'Neil, *Massachusetts Institute of Technology*

Recent attempts to unify linguistic theory and brain science have grown out of recognition that a proper understanding of language in the brain must reflect the steady advances in linguistic theory of the last forty years. The first Mind Articulation Project Symposium addressed two main questions: How can the understanding of language from linguistic research be transformed through the study of the biological basis of language? And how can our understanding of the brain be transformed through this same research? The best model so far of such mutual constraint is research on vision.

The papers in this volume discuss the current status of the cognitive/neuroscience synthesis in research on vision, whether and how linguistics and neuroscience can be integrated, and how integrative brain mechanisms can be studied through the use of noninvasive brain-imaging techniques.

2001 • 400 pp. • 36 illus. • \$55.00/£37.95
0-262-13371-7

THE ALGEBRAIC MIND

Integrating Connectionism and Cognitive Science

Gary F. Marcus, *New York University*

In *The Algebraic Mind*, Gary F. Marcus integrates two competing theories about how the mind works, one which says that the mind is a computer-like manipulator of symbols, and another which says that the mind is a large network of neurons working together in parallel. Refuting the conventional wisdom that says that if the mind is a large neural network it cannot simultaneously be a manipulator of symbols, Marcus shows how neural systems could be organized so as to manipulate symbols, why such systems explain language and cognition better than systems that eschew symbols, how such systems could evolve, and how they might unfold developmentally within the womb.

A Bradford Book
2001 • 225 pp. • 48 illus. • \$27.95/£19.50
0-262-13379-2
Learning, Development, and Conceptual Change series

COGNITIVE NEUROSCIENCE

THE ATTENTIVE BRAIN

edited by Raja Parasuraman, *Catholic University of America*

A central thesis of this book on the cognitive neuroscience of attention is that attention is not a single entity, but a finite set of brain processes that interact mutually and with other brain processes in the performance of perceptual, cognitive, and motor skills.

After an introductory Part I, the book consists of three parts. Part II describes the major neuroscience methods and the computational modeling of attention. Part III looks at three major components of attention from the cognitive neuroscience perspective: selection, vigilance, and control. Finally, part IV discusses the application of findings from the previous sections to the analysis of normal and abnormal development and to pathologies of attention such as schizophrenia and attention deficit disorders.

A Bradford Book
1998 • 604 pp. • 105 illus. • paper • \$42.00/£28.95
0-262-66112-8

THE PSYCHOLOGY OF ATTENTION

Harold E. Pashler, *University of California, San Diego*

In the past two decades, attention has been one of the most investigated areas of research in perception and cognition. *The Psychology of Attention* presents a systematic review of the main lines of research on attention; the topics range from perception of threshold stimuli to memory storage and decision making. The book develops empirical generalizations about the major issues and suggests possible underlying theoretical principles.

Harold E. Pashler argues that widely assumed notions of processing resources and automaticity are of limited value in understanding human information processing. He proposes a central bottleneck for decision making and memory retrieval, and describes evidence that distinguishes this limitation from perceptual limitations and limited-capacity short-term memory.

A Bradford Book
1997 • 512 pp. • 43 illus. • paper • \$28.00/£19.50
0-262-66156-X

THE COGNITIVE NEUROSCIENCE OF CONSCIOUSNESS

edited by Stanislas Dehaene, *Institut national de la santé et de la recherche médicale (INSERM), Orsay, France*

This book investigates the philosophical, empirical, and theoretical bases on which a cognitive neuroscience of consciousness can be founded. The research questions reviewed include: Does perception occur without awareness? Can the neural bases of perceptual awareness be visualized with brain-imaging methods? What do unilateral neglect and extinction tell us about conscious and unconscious processing? What is the contribution of brainstem nuclei to conscious states? How can we identify mental processes uniquely associated with consciousness? An introductory chapter proposes a theoretical framework for building a cognitive neuroscience of consciousness, and two concluding chapters evaluate the progress made so far.

CONTRIBUTORS: N. Block, A. Damasio, S. Dehaene, D. Dennett, J. Driver, J. D. Eastwood, A. I. Jack, N. Kanwisher, P. M. Merikle, L. Naccache, J. Parvizi, T. Shallice, D. Smilek, P. Vuilleumier.

A Bradford Book
2002 • 237 pp. • paper • \$40.00/£27.50
0-262-54131-9
Cognition Special Issues

MEMORY IN THE CEREBRAL CORTEX

An Empirical Approach to Neural Networks in the Human and Nonhuman Primate

Joaquín M. Fuster, *University of California, Los Angeles*

"Fuster's Memory in the Cerebral Cortex is a brilliant example of an integrative, neural theory of memory by one of the pioneers of memory physiology. . . . I recommend it most highly."

—Matthew L. Shapiro, *Contemporary Psychology*

A Bradford Book
1994 • 376 pp. • 108 illus. • paper • \$30.00/£20.50
0-262-56124-7

NEUROPSYCHOLOGY

ROOTS OF SOCIAL SENSIBILITY AND NEURAL FUNCTION

Jay Schulkin, *American College of Obstetricians and Gynecologists, Georgetown University School of Medicine and National Institute of Mental Health*

We are social animals, with evolved mechanisms to discern the beliefs and desires of others. This social reason is linked to the concept of intentionality, the ability to attribute beliefs and desires to others. In this book Jay Schulkin explores social reason from philosophical, psychological, and cognitive neuroscientific perspectives. He argues for a pragmatist approach, in which the role of experience — that is, interaction with others — is central to any consideration of action in the social world. Unlike some philosophers of mind, Jay Schulkin considers social reason to be a real feature of the information processing system in the brain, in addition to a useful cognitive tool in predicting behavior. Throughout the book, he incorporates neurobiological evidence for a domain-specific system for social cognition.

A Bradford Book
2000 • 149 pp. • 44 illus. • \$35.00/£23.95
0-262-19447-3

THE SUBTLETY OF EMOTIONS

Aaron Ben-Ze'ev, *University of Haifa*

Why do we cry at the movies? What is the best way to manage destructive feelings such as jealousy? Although emotions pervade our lives, their nature, causes, and effects have only recently been studied by social scientists and philosophers. Despite growing scientific interest in the subject, empirical findings have not yet caught up with our intuitive knowledge. In this book Aaron Ben-Ze'ev carries out what he calls "a careful search for general patterns in the primeval jungle of emotions." In an engaging, informal style he draws on a variety of theoretical approaches and popular sources to produce a coherent account of emotions in all their subtlety.

A Bradford Book
1999 • 640 pp. • 2 illus. • paper • \$19.95/£13.95
0-262-52319-1

CONTROL OF COGNITIVE PROCESSES

Attention and Performance XVIII

edited by Stephen Monsell, *University of Exeter, England* and Jon Driver, *University College London*

One of the most challenging problems facing cognitive psychology and cognitive neuroscience is to explain how mental processes are voluntarily controlled, allowing the computational resources of the brain to be selected flexibly and deployed to achieve changing goals. The thirty-two contributions in this book discuss evidence from psychological experiments with healthy and brain-damaged subjects, functional imaging, electrophysiology, and computational modeling. Four sections focus on specific forms of control: of visual attention, of perception-action coupling, of task-switching and dual-task performance, and of multistep tasks. The other three sections extend the interdisciplinary approach, with chapters on the neural substrate of control, studies of control disorders, and computational simulations.

A Bradford Book
2000 • 698 pp. • 122 illus. • \$95.00/£65.50
0-262-13367-9

Attention and Performance series

STRONG FEELINGS

Emotion, Addiction, and Human Behavior

Jon Elster, *Columbia University*

Emotion and addiction lie on a continuum between simple visceral drives such as hunger, thirst, and sexual desire at one end and calm, rational decision making at the other. Although emotion and addiction involve visceral motivation, they are also closely linked to cognition and culture. They thus provide the ideal vehicle for Jon Elster's study of the interrelation between three explanatory approaches to behavior: neurobiology, culture, and choice.

The book is organized around parallel analyses of emotion and addiction in order to bring out similarities as well as differences. Elster's study sheds fresh light on the generation of human behavior.

A Bradford Book
1999 • 272 pp. • 8 illus. • paper • \$16.95/£11.50
0-262-55036-9

The Jean Nicod Lectures series

(Not available in Belgium, France, or Switzerland)

CELLULAR AND MOLECULAR NEUROSCIENCE

NEW

THE DYNAMIC NEURON

John Smythies, *University of California, San Diego; Institute of Neurology, Queen Square, London; and Visiting Professor, Harvard Medical School*

The traditional model of synapses as fixed structures has been replaced by a dynamic one in which synapses are constantly being deleted and replaced. This book, written by a leading researcher on the neurochemistry of schizophrenia, integrates material from neuroscience and cell biology to provide a comprehensive account of our current knowledge of the neurochemical basis of synaptic plasticity.

The book presents the evidence for synaptic plasticity, an account of the dendritic spine and the glutamate synapse with a focus on redox mechanisms, and the biochemical basis of the Hebbian synapse. It discusses the role of endocytosis, special proteins, and local protein synthesis. Additional topics include volume transmission, arachidonic acid signaling, hormonal modulation, and psychological stress. Finally, the book considers pharmacological and clinical implications of current research, particularly with reference to schizophrenia and Alzheimer's disease.

"This book provides an extensive review of the topic with much original perspective and discussion. Smythies' maverick statements are supported by reasonable evidence and argument."

— Ashley Bush, Harvard University

"A refreshing treatment of an important area of neuroscience."

— Mike Leski, Department of Psychiatry, Harvard Medical School and McLean Hospital

A Bradford Book

June 2002 • 168 pp. • 15 illus. • \$35.00/£23.95
0-262-19473-2

ADVANCES IN SYNAPTIC PLASTICITY

edited by Michel Baudry, *University of Southern California*, Joel L. Davis, *Office of Naval Research*, and Richard F. Thompson, *University of Southern California*

Many neurons exhibit plasticity; that is, they can change structurally or functionally, often in a lasting way. Plasticity is evident in such diverse phenomena as learning and memory, brain development, drug tolerance, sprouting of axon terminals after a brain lesion, and various cellular forms of activity-dependent synaptic plasticity such as long-term potentiation and long-term depression. This book reports on the most recent trends in the field. The levels of analysis range from molecular to cellular and network, the unifying theme being the nature of the relationships between synaptic plasticity and information processing and storage.

A Bradford Book

1999 • 312 pp. • 96 illus. • \$70.00/£48.50
0-262-02460-8

CULTURING NERVE CELLS

Second Edition

edited by Gary Banker and Kimberly Goslin, *both of Oregon Health Sciences University*

This book, completely revised and updated from the first edition, is in many ways a do-it-yourself manual for culturing nerve cells, complete with recipes and protocols. But it also provides an understanding of the principles behind the protocols. In effect the contributors invite you into their labs and provide much of the information you would obtain from such a visit.

The authors of the introductory chapters present the nuts-and-bolts principles of growing nerve cells. The authors of the following chapters discuss the culturing of specific cell types. They explain how their experimental goals have shaped their particular cell culture approach and the advantages and disadvantages of the cell culture systems they have developed.

A Bradford Book

1998 • 580 pp. • 120 illus., 11 color • \$85.00/£58.50
0-262-02438-1

Cellular and Molecular Neuroscience series

CELLULAR AND MOLECULAR NEUROSCIENCE

FORM AND FUNCTION IN THE BRAIN AND SPINAL CORD

Perspectives of a Neurologist

Stephen G. Waxman, M.D., Ph.D., *Yale University School of Medicine*

Foreword by W. I. McDonald

This book reflects Stephen Waxman's three decades of research on the form and functions of the brain and spinal cord. Building on his experience as a neuroscientist studying model systems as primitive as eels and as a neurologist studying humans, Waxman discusses a wide variety of topics, including the design principles that optimize neural function; molecular and cellular substrates of behavior; the role of glial cells in the brain; the molecular basis for pain; plasticity in the brain and spinal cord; strategies for promoting functional recovery in disorders such as multiple sclerosis, spinal cord injury, and stroke; and prospects for rebuilding the brain and spinal cord. The pieces provide example after example of the elegance of design of the nervous system, of the intricate interplay between structure and function in health and disease, and of the rich borderland between neuroscience and neurology.

A Bradford Book
2001 • 582 pp. • 167 illus. • \$45.00/£30.95
0-262-23210-3

NEURAL TRANSPLANTATION

An Introduction

William J. Freed, *National Institute of Drug Abuse's Addiction Research Center*

Although there are many scientific and philosophical reasons to study the brain, for William J. Freed, "the most compelling reason to study the brain is to be able to repair the brains of individuals with nervous system injury or disease." Advances in repairing the nervous system, as well as new data on brain development, growth, and plasticity, have revolutionized the field of brain research and given rise to the technology of brain tissue transplantation. In this book Freed discusses both what may and what may not be possible.

The book covers two aspects of neural tissue transplantation research. One involves the transplantation of particular cells to repair or augment specific neuronal systems. The other line of research concerns regeneration from injury, especially of the spinal cord. After providing basic background on transplantation, brain structure, and development, the book discusses Parkinson's disease, the use of transplants to influence localized brain functions, circuit reconstruction, and genetic engineering and other future technologies.

A Bradford Book
1999 • 459 pp. • 70 illus. • \$65.00/£44.95
0-262-06208-9
Cellular and Molecular Neuroscience series

NEUROPEPTIDES

Regulators of Physiological Processes

Fleur L. Strand, *New York University*

In recent years there has been increasing interest and, subsequently, active research in neuropeptides. These neuroactive molecules coordinate, integrate, and regulate physiological processes in all organisms, throughout all phases of development. Acting as neurohormones, neurotransmitters, and/or neuromodulators, they maintain physiological homeostasis and influence important behavioral patterns. This textbook is the first to bring together and synthesize the neuropeptide research of the past decade in such a comprehensive, scholarly manner.

The book is divided into two parts. In Part I the author defines the basic principles of neuropeptide action, including their biosynthesis, processing, transport, distribution, and interactions with receptors and second messenger systems. Strand also discusses the intimate interaction between the neuropeptides, stress, and the immune system. In Part II she discusses the regulatory functions of the families of neuropeptides in sufficient detail to provide both the advanced student and senior investigator with a thorough understanding of the most important neuropeptides. The text also contains a complete and up-to-date reference/reading list.

1999 • 8 x 9 double-column format • 658 pp.
270 illus. • \$72.00/£49.50
0-262-19407-4 **T**
Cellular and Molecular Neuroscience series

COMPUTATIONAL MOLECULAR BIOLOGY

NEW

CURRENT TOPICS IN COMPUTATIONAL MOLECULAR BIOLOGY

edited by Tao Jiang, *University of California, Riverside*, Ying Xu, *Oak Ridge National Laboratory*, and Michael Q. Zhang, *Watson School of Biological Sciences, Cold Spring Harbor Laboratory*

This survey of computational molecular biology covers traditional topics such as protein structure modeling and sequence alignment, and more recent ones such as expression data analysis and comparative genomics. It combines algorithmic, statistical, database, and AI-based methods for studying biological problems. The book also contains an introductory chapter, as well as one on general statistical modeling and computational techniques in molecular biology. Each chapter presents a self-contained review of a specific subject.

CONTRIBUTORS: H. S. Chan, A. Diemand, N. El-Mabrouk, S. Goto, N. Guex, X. Huang, T. Jiang, M. Kanehisa, H. Kaya, P. Kearney, M. Li, J. Liu, B. Ma, R. Nussinov, M. Peitsch, D. Sankoff, T. Schwede, R. Shamir, R. Sharon, S. Shimizu, I. Shindyalov, T. Smith, V. Solovyev, L. Wang, Z. Wang, H. Wolfson, L. Wong, D. Xu, S. Xu, Y. Xu, K. Zhang, M. Q. Zhang.

2002 • 540 pp. • 100 illus. • \$55.00/£37.95
0-262-10092-4

Computational Molecular Biology series

(Not for sale to China, including Hong Kong)

NEW

FOUNDATIONS OF SYSTEMS BIOLOGY

edited by Hiroaki Kitano, *Japan Science and Technology Corporation and Sony Computer Science Laboratories, Inc.*

The emerging field of systems biology involves the application of experimental, theoretical, and modeling techniques to the study of biological organisms at all levels, from the molecular, through the cellular, to the behavioral. Its aim is to understand biological processes as whole systems instead of as isolated parts. Developments in the field have been made possible by advances in molecular biology — in particular, new technologies for determining DNA sequence, gene expression profiles, protein-protein interactions, and so on. *Foundations of Systems Biology* provides an overview of the state of the art of the field. The book covers the central topics of systems biology: comprehensive and automated measurements, reverse engineering of genes and metabolic networks from experimental data, software issues, modeling and simulation, and system-level analysis.

2001 • 320 pp. • 100 illus. • \$45.00/£30.95
0-262-11266-3

NEW

GENE REGULATION AND METABOLISM

Post-Genomic Computational Approaches

edited by Julio Collado-Vides, *Universidad Nacional Autónoma de México, Cuernavaca* and Ralf Hofestädt, *University of Bielefeld*

The rapidly expanding role of computers in biology may usher in a profound conceptual change in how we study living systems in the laboratory. This book focuses on current computational approaches to understanding the complex networks of metabolic and gene regulatory capabilities of the cell. The contributors look well beyond the state of the art in computational biology to anticipate what biological research will be like in a post-genomic world.

CONTRIBUTORS: J. Ahouse, E. A. Ananko, R. Apweiler, M. Biswas, G. M. Church, J. Collado-Vides, T. Dandekar, W. Fleischmann, A. Freier, R. Hofestädt, S. Huang, E. V. Ignatieva, N. A. Kolchanov, E. V. Kriventseva, M. Lange, V. A. Likhoshvai, E. M. Marcotte, Yu. G. Matushkin, A. Manson McGuire, N. Mulder, O. A. Podkolodnaya, I. V. Ratushny, S. Schmidt, U. Scholz, G. Stormo, M. Tomita.

July 2002 • 295 pp. • 68 illus. • \$45.00/£30.95
0-262-03297-X

Computational Molecular Biology series

CONTRIBUTORS: M. Amano, K. Bettenbrock, H. Bolouri, D. Bray, J. Bruck, J. Doyle, A. Finney, E. D. Gilles, M. Ginkel, S. Hamahashi, M. Hucka, K. Kaibuchi, M. Kawato, M. A. Keane, H. Kitano, J. R. Koa, A. Kremling, S. Kuroda, K. M. Kyoda, G. Lanza, A. Levchenko, P. Mendes, S. Miyano, E. Mjolsness, M. Morohashi, W. Mydlowec, M. Nagasaki, Y. Nakayama, S. Onami, H. Sauro, N. Schweighofer, B. Shapiro, T. S. Shimizu, J. Stelling, P. W. Sternberg, Z. Szallasi, M. Tomita, M. Wahde, T.-M. Yi, J. Yu.

COMPUTATIONAL MOLECULAR BIOLOGY

BIOINFORMATICS

The Machine Learning Approach Second Edition

Pierre Baldi, *College of Medicine at the University of California, Irvine*, and Søren Brunak, *Technical University of Denmark*

An unprecedented wealth of data is being generated by genome sequencing projects and other experimental efforts to determine the structure and function of biological molecules. The demands and opportunities for interpreting these data

are expanding rapidly. Bioinformatics is the development and application of computer methods for management, analysis, interpretation, and prediction, as well as for the design of experiments. Machine learning approaches (e.g., neural networks, hidden Markov models, and belief networks) are ideally suited for areas where there is a lot of data but little theory, which is the situation in molecular biology. The goal in machine learning is to extract useful information from a body of data by building good probabilistic models — and to automate the process as much as possible.

In this book Pierre Baldi and Søren Brunak present the key machine learning approaches and apply them to the computational problems encountered in the analysis of biological data. The book is aimed both at biologists and biochemists who need to understand new data-driven algorithms and at those with a primary background in physics, mathematics, statistics, or computer science who need to know more about applications in molecular biology.

This edition contains expanded coverage of probabilistic graphical models and of the applications of neural networks, as well as a new chapter on microarrays and gene expression. The entire text has been extensively revised.

A Bradford Book
2001 • 400 pp. • 72 illus. • \$49.95/£34.50
0-262-02506-X

Adaptive Computation and Machine Learning series



COMPUTATIONAL MODELING OF GENETIC AND BIOCHEMICAL NETWORKS

edited by James M. Bower, *California Institute of Technology and Hebrew University, Jerusalem* and Hamid Bolouri, *University of Hertfordshire and California Institute of Technology*

Computational Modeling of Genetic and Biochemical Networks provides specific examples, across a wide range of molecular and cellular systems, of how modeling techniques can be used to explore functionally relevant molecular and cellular relationships. The modeling techniques covered are applicable to cell, developmental, structural, and mathematical biology; genetics; and computational neuroscience. The book, intended as a primer for both theoretical and experimental biologists, is organized in two parts: models of gene activity and models of interactions among gene products. Modeling examples are provided at several scales for each subject. Each chapter includes an overview of the biological system in question and extensive references to important work in the area.

A Bradford Book
2001 • 390 pp. • 126 illus. • \$59.95/£41.50
0-262-02481-0

Computational Molecular Biology series

COMPUTATIONAL MOLECULAR BIOLOGY

An Algorithmic Approach

Pavel A. Pevzner, *University of Southern California*

In one of the first major texts in the emerging field of computational molecular biology, Pavel Pevzner covers a broad range of algorithmic and combinatorial topics and shows how they are connected to molecular biology and to biotechnology. The book has a substantial “computational biology without formulas” component that presents the biological and computational ideas in a relatively simple manner. This makes the material accessible to computer scientists without biological training, as well as to biologists with limited background in computer science.

A Bradford Book
2000 • 333 pp. • 100 illus. • \$50.00/£34.50
0-262-16197-4

Computational Molecular Biology series

THE DESIGN OF ANIMAL COMMUNICATION

edited by Marc D. Hauser, *Harvard University*, and Mark Konishi, *California Institute of Technology*

When animals, including humans, communicate, they convey information and express their perceptions of the world. Because different organisms are able to produce and perceive different signals, the animal world contains a diversity of communication systems. Based on the approach laid out in the 1950s by Nobel laureate Nikolaas Tinbergen, this book looks at animal communication from the four perspectives of mechanisms, ontogeny, function, and phylogeny.

The book's great strength is its broad comparative perspective, which enables the reader to appreciate the diversity of solutions to particular problems of signal design and perception. Such comparative findings form the basis of a conceptual framework for understanding the mechanisms underlying communication systems and their evolution.

A Bradford Book
1999 • 663 pp. • 145 illus. • \$75.00/£51.50
0-262-08277-2

THE NATURAL SCIENCE OF THE HUMAN SPECIES

An Introduction to Comparative Behavioral Research
The "Russian Manuscript" (1944-1948)

Konrad Lorenz
edited from the author's posthumous works by Agnes von Cranach
translated by Robert D. Martin

Here Am I — Where Are You?: The Behavior of the Greylag Goose was thought to be Konrad Lorenz's last book. However, in 1991 the "Russian Manuscript" was discovered in an attic, and its subsequent publication in German has become a scientific sensation. Written under the most extreme conditions in Soviet prison camps, the "Russian Manuscript" was the first outline of a large-scale work on behavioral science. This translation contains a synopsis of all the ideas that made Lorenz famous as the founder of ethology, the study of comparative animal behavior.

1995 • 384 pp. • 10 illus. • paper • \$22.95/£15.95
0-262-62120-7

NEW

THE COGNITIVE ANIMAL

Empirical and Theoretical Perspectives on Animal Cognition

edited by Marc Bekoff, *University of Colorado, Boulder*, Colin Allen, *Texas A&M*, and Gordon M. Burghardt, *University of Tennessee, Knoxville*

The fifty-seven original essays in this book provide a comprehensive overview of the interdisciplinary field of animal cognition. The contributors include cognitive ethologists, behavioral ecologists, experimental and developmental psychologists, behaviorists, philosophers, neuroscientists, computer scientists and modelers, field biologists, and others. The diversity of approaches is both philosophical and methodological, with contributors demonstrating various degrees of acceptance or disdain for such terms as "consciousness" and varying degrees of concern for laboratory experimentation versus naturalistic research. In addition to primates, particularly the nonhuman great apes, the animals discussed include antelopes, bees, dogs, dolphins, earthworms, fish, hyenas, parrots, prairie dogs, rats, ravens, sea lions, snakes, spiders, and squirrels.

The topics include (but are not limited to) definitions of cognition, the role of anecdotes in the study of animal cognition, anthropomorphism, attention, perception, learning, memory, thinking, consciousness, intentionality, communication, planning, play, aggression, dominance, predation, recognition, assessment of self and others, social knowledge, empathy, conflict resolution, reproduction, parent-young interactions and caregiving, ecology, evolution, kin selection, and neuroethology.

A Bradford Book
June 2002 • 451 pp. • 55 illus.
Paper • \$45.00/£30.95
0-262-52322-1
Cloth • \$110.00/£75.95
0-262-02514-0

ETHOLOGY

THE EVOLUTION OF COGNITION

edited by Cecilia Heyes, *University College London*
and Ludwig Huber, *University of Vienna*

This book encompasses the behavior and mentality of nonhuman as well as human animals and a full range of evolutionary approaches. Rather than a collection by and for the like-minded, it is a debate about how evolutionary processes have shaped cognition.

The debate is divided into five sections: Orientations, on the phylogenetic, ecological, and psychological/comparative approaches to the evolution of cognition; Categorization, on how various animals parse their environments, how they represent objects and events and the relations among them; Causality, on whether and in what ways nonhuman animals represent cause and effect relationships; Consciousness, on whether it makes sense to talk about the evolution of consciousness and whether the phenomenon can be investigated empirically in nonhuman animals; and Culture, on the cognitive requirements for non-genetic transmission of information and the evolutionary consequences of such cultural exchange.

A Bradford Book
2000 • 384 pp. • 32 illus. • \$52.00/£35.95
0-262-08286-1
The Vienna Series in Theoretical Biology

AAP/PSP Award in the Biological Sciences, 1999

SENSORY EXOTICA

A World beyond Human Experience

Howard C. Hughes, *Dartmouth College*

Bees, birds, bats, fish, and dolphins possess senses that lie far beyond the realm of human experience. In this book Howard C. Hughes tells the story of these "exotic" senses. He tells not only what has been discovered but how it was discovered — including historical misinterpretations of animal perception that we now view with amusement.

The book is divided into four parts: biosonar, biological compasses, electroreception, and the scents of attraction. Although the book is filled with fascinating descriptions of animal sensitivities, the author's goal is to explain the anatomical and physiological principles that underlie them.

A Bradford Book
1999 • 359 pp. • 124 illus. • paper • \$17.95/£12.50
0-262-58204-X

THE ORIGINS OF MUSIC

edited by Nils L. Wallin, Björn Merker, and
Steven Brown, *all of Mid Sweden University,*
Östersund

What biological and cognitive forces have shaped humankind's musical behavior and the rich global repertoire of musical structures? What is music for, and why does every human culture have it? What are the universal features of music and musical behavior across cultures? In this groundbreaking book, musicologists, biologists, anthropologists, archaeologists, psychologists, neuroscientists, ethologists, and linguists come together for the first time to examine these and related issues. The book can be viewed as representing the birth of evolutionary biomusicology — the study of which will contribute greatly to our understanding of the evolutionary precursors of human music, the evolution of the hominid vocal tract, localization of brain function, the structure of acoustic-communication signals, symbolic gesture, emotional manipulation through sound, self-expression, creativity, the human affinity for the spiritual, and the human attachment to music itself.

A Bradford Book
1999 • 514 pp. • 79 illus. • \$65.00/£44.95
0-262-23206-5

THE HOT BRAIN

Survival, Temperature, and the Human Body

Carl V. Gisolfi and Francisco Mora, *Universidad Complutense, Madrid and University of Iowa*

The Hot Brain tells the evolutionary story of the brain and thermoregulation, with an emphasis on modern humans.

The book first traces the story of the brain throughout evolution and shows how the control of body temperature as a survival mechanism was achieved. It then goes on to discuss the mechanisms of our environmental independence, why a body temperature of 37° C (only five degrees from death) is essential for humans and how this narrow temperature range is defended. It describes how we cope with environmental extremes, the function of fevers, and why thermoregulation is best understood through a combination of physiological and cognitive approaches.

A Bradford Book
2000 • 288 pp. • 94 illus. • \$45.00/£30.95
0-262-07198-3

SEX AND COGNITIONDoreen Kimura, *Simon Fraser University*

In this fact-driven book, Doreen Kimura provides an intelligible overview of what is known about the neural and hormonal bases of sex differences in behavior, particularly differences in cognitive ability. Kimura argues that women and men differ not only in physical attributes and reproductive function, but also in how they solve common problems. She offers evidence that the effects of sex hormones on brain organization occur so early in life that, from the start, the environment is acting on differently wired brains in girls and boys. She presents various behavioral, neurological, and endocrinological studies that shed light on the processes giving rise to these sex differences in the brain.

"Kimura provides an authoritative overview of the field of sex differences in cognition, moving from hormones to cognition, genes to behavior, in a calm and clear way. This book will be a valuable resource for students and teachers of cognitive science."

— Simon Baron-Cohen, Departments of Experimental Psychology and Psychiatry, University of Cambridge, UK

A Bradford Book
1999 • 232 pp. • 62 illus. • paper • \$17.95/£12.50
0-262-61164-3 **T**

DRIVE**Neurobiological and Molecular Mechanisms of Sexual Motivation**Donald W. Pfaff, *Rockefeller University, New York*

In this book Donald W. Pfaff focuses on a reproductive behavior typical of many female animals. Sensory stimuli from the male trigger responses in a well-defined circuit of nerve cells. At the top of the circuit, certain nerve cells receive and retain sex hormones such as estrogens and progesterone. As a result, specific genes in these nerve cells are turned on at specific times, affecting in turn the rest of the neural circuit and causing a state of sexual responsiveness.

According to Pfaff, the biological bases for the most primitive human drives are largely explained by mechanisms uncovered in animal brains that have not changed in their fundamental properties over millions of years of evolution. Focusing on a single instinctive behavior, in this case the sex drive, is an important step toward understanding the biological reasons for the change from unmotivated to motivated animal behavior.

"The impact of the research described in this book has been felt throughout the neuroscience community and has advanced the field of neuroendocrinology considerably. . . . Pfaff's approach should become a standard."

— James G. Pfaus, *Cell*

A Bradford Book
1999 • 316 pp. • 116 illus., 8-page color insert • paper • \$45.00/£30.95
0-262-66147-0
Cellular and Molecular Neuroscience series

THE INTEGRATIVE NEUROBIOLOGY OF AFFILIATION

edited by C. Sue Carter, *University of Maryland, College Park*, I. Izja Lederhendler, *National Institute of Mental Health, Rockville, Maryland*, and Brian Kirkpatrick, *University of Maryland, Baltimore*

This book examines the biological, especially the neural, substrates of affiliation and related social behaviors. Affiliation refers to social behaviors that bring individuals closer together. They provide a social matrix within which other behaviors, including reproduction and aggression, may occur. While reproduction and aggression also reduce the distance between individuals, their expression is regulated in part by the positive social fabric of affiliative behavior.

The integrative approach in this book reflects the constructive interactions between those who study behavior in the context of natural history and evolution and those who study the nervous system.

A Bradford Book
1999 • 432 pp. • 80 illus. • paper • \$45.00/£30.95
0-262-53158-5

VISION

*Just Published!***PERCEPTUAL LEARNING**

edited by Manfred Fahle, *University of Bremen and City University, Department of Optometry and Visual Science, London*, and Tomaso Poggio, *Massachusetts Institute of Technology*

Perceptual learning is the specific and relatively permanent modification of perception and behavior following sensory experience. It encompasses parts of the learning process that are independent from conscious forms of learning and involve structural and/or functional changes in primary sensory cortices. A familiar example is the treatment for a "lazy" or crossed eye. Covering the good eye causes gradual improvement in the weaker eye's cortical representations. If the good eye is patched too long, however, it learns to see less acutely.

This book presents advances made in the last decade in this rapidly growing field. The first part examines neuronal changes caused by lesions or external influences. It discusses the effects of these changes on behavior and the extent to which plasticity in sensory systems is possible. Taking a broader view, the second part looks at how more conscious or systemic stimuli cause cortical changes. Clinical trials in which subjects are taught to recognize visual and auditory stimuli demonstrate the relationship between perceptual and cognitive learning. The final sections offer general models of perceptual learning and discuss the future of the field.

A Bradford Book
2002 • 644 pp.
204 illus.
\$65.00/£44.95
0-262-06221-6

CONTRIBUTORS: M. Ahissar, A. J. Bell, N. Beradi, V. Bruce, H. Bülthoff, A. M. Burton, G. M. Clark, M. Dill, H. Dinse, S. Edelman, T. Elbert, U. Eysel, M. Fahle, A. Fiorentini, M. Herzog, S. Hochstein, N. Intrator, N. Logothetis, S. Löwell, M. M. Merzenich, K. Nakayama, T. Poggio, B. Rockstroh, N. Rubin, D. Sagi, A. Schoups, T. J. Sejnowski, R. Shapley, D. Sheinberg, W. Singer, P. Sinha, A. Sterr, K. Tanaka, G. Wallis, B. Zenger.

VISUAL ATTENTION AND CORTICAL CIRCUITS

edited by Jochen Braun, *University of Plymouth*, Christof Koch, *California Institute of Technology*, and Joel L. Davis, *Office of Naval Research*

The neurobiology and psychology of attention have much to learn from each other. Neurobiologists recognize that responses in sensory cortex depend on the behavioral relevance of a stimulus, but have few ways to study how perception changes as a result. Psychologists have the conceptual and methodological tools to do just that, but are confounded by the multiple interpretations and theoretical ambiguities. This book attempts to bridge the two fields and to derive a comprehensive theory of attention from both neurobiological and psychological data. It highlights situations where attention can be seen to alter both neural activity and psychophysical performance/phenomenal experience. This "bicultural" approach contributes not only to attention research but to the larger goal of linking neural activity to conscious experience.

The book focuses mainly on the effects of visual attention on the ventral and dorsal streams of visual cortex in humans and monkeys and the associated changes in visual performance. Several larger findings emerge: attention may involve more than one neural system; attention modulates all stages of cortical visual processing; the effect of attention is constrained by the intrinsic connectivity of cortex and the resulting contextual interactions; and the notion of a "saliency map" remains central to thinking about visual attention. The book also considers several approaches to evaluating the same variable through different methods, such as behavioral measurements, functional imaging, and single-unit recording.

A Bradford Book
2001 • 344 pp. • 125 illus., 22 color
\$60.00/£41.50
0-262-02493-4

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COMPUTATIONAL VISION

Information Processing in Perception and Visual Behavior

Hanspeter A. Mallot, *Max Planck Institute for Biological Cybernetics at Tübingen University, Germany*
translated by John S. Allen

This text provides an introduction to computational aspects of early vision, in particular, color, stereo, and visual navigation. It integrates approaches from psychophysics and quantitative neurobiology, as well as theories and algorithms from machine vision and photogrammetry. When presenting mathematical material, it uses detailed verbal descriptions and illustrations to clarify complex points. The text is suitable for upper-level students in neuroscience, biology, and psychology who have basic mathematical skills and are interested in studying the mathematical modeling of perception.

A Bradford Book
2000 • 290 pp. • 120 illus. • \$50.00/£34.50
0-262-13381-4
Computational Neuroscience series

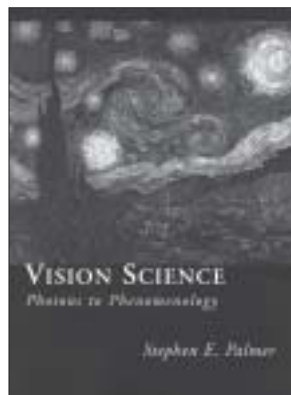
REPRESENTATION AND RECOGNITION IN VISION

Shimon Edelman, *Cornell University*

Recent neurobiological and computational advances in the study of vision have now brought us close to answering questions about representation. In *Representation and Recognition in Vision*, Shimon Edelman bases a comprehensive approach to visual representation on the notion of correspondence between proximal (internal) and distal similarities in objects. This leads to a computationally feasible and formally veridical representation of distal objects that addresses the needs of shape categorization and can be used to derive models of perceived similarity.

Edelman first discusses the representational needs of various visual recognition tasks, and surveys current theories of representation in this context. He then develops a theory of representation that is related to Shepard's notion of second-order isomorphism between representations and their targets. Edelman goes beyond Shepard by specifying the conditions under which the representations can be made formally veridical. Edelman assesses his theory's performance in identification and categorization of 3D shapes and examines it in light of psychological and neurobiological data concerning the object-processing stream in primate vision. He also discusses the connections between his theory and other efforts to understand representation in the brain.

A Bradford Book
1999 • 402 pp. • 80 illus. • \$55.00/£37.95
0-262-05057-9



VISION SCIENCE

Photons to Phenomenology

Stephen E. Palmer,
University of California, Berkeley

Vision Science is

the first comprehensive textbook on vision to reflect the integrated computational approach of modern research

scientists. This new interdisciplinary approach, called "vision science," integrates psychological, computational, and neuroscientific perspectives.

The book covers all major topics related to vision, from early neural processing of image structure in the retina to high-level visual attention, memory, imagery, and awareness. The presentation throughout is theoretically sophisticated yet requires minimal knowledge of mathematics. There is also an extensive glossary, as well as appendices on psychophysical methods, connectionist modeling, and color technology.

"This is an impressive, well-produced and easy-to-read textbook of visual science. . . . A student taking this book seriously will learn a great deal about perception of form, objects, colors and movement. One great merit is its clarity and conciseness of expression. . . . This book can be thoroughly recommended."

— Richard Gregory, *Nature*

A Bradford Book
1999 • 760 pp. • 667 illus., 20 color • \$75.00/£51.50
0-262-16183-4

NEUROPHILOSOPHY

NEUROPHILOSOPHY OF FREE WILL

From Libertarian Illusions to a Concept of Natural Autonomy

Henrik Walter, *University of Ulm*
translated by Cynthia Klohr

In this book Henrik Walter applies the methodology of neurophilosophy to one of philosophy's central challenges, the notion of free will. Walter's answer to whether there is free will is, It depends. The basic questions concerning free will are (1) whether we are able to choose other than we actually do, (2) whether our choices are made intelligibly, and (3) whether we are really the originators of our choices. According to Walter, freedom of will is an illusion if we mean by it that under identical conditions we would be able to do or decide otherwise, while simultaneously acting only for reasons and being the true originators of our actions. In place of this scientifically untenable strong version of free will, Walter offers what he calls natural autonomy — self-determination unaided by supernatural powers that could exist even in an entirely determined universe. Although natural autonomy can support neither our traditional concept of guilt nor certain cherished illusions about ourselves, it does not imply the abandonment of all concepts of responsibility. For we are not mere marionettes, with no influence over our thoughts or actions.

A Bradford Book
2001 • 420 pp. • 7 illus. • \$45.00/£30.95
0-262-23214-6

COHERENCE IN THOUGHT AND ACTION

Paul Thagard, *University of Waterloo*

This book is an essay on how people make sense of each other and the world they live in. Making sense is the activity of fitting something puzzling into a coherent pattern of mental representations that include concepts, beliefs, goals, and actions. Paul Thagard proposes a general theory of coherence as the satisfaction of multiple interacting constraints, and discusses the theory's numerous psychological and philosophical applications. Much of human cognition can be understood in terms of coherence as constraint satisfaction, and many of the central problems of philosophy can be given coherence-based solutions. Thagard shows how coherence can help to unify psychology and philosophy, particularly when addressing questions of epistemology, metaphysics, ethics, politics, and aesthetics. He also shows how coherence can integrate cognition and emotion.

A Bradford Book
2000 • 339 pp. • 32 illus. • \$35.00/£23.95
0-262-20131-3
Life and Mind: Philosophical Issues in Biology and Psychology

CYCLES OF CONTINGENCY

Developmental Systems and Evolution

edited by Susan Oyama, *John Jay College and CUNY Graduate Center, New York*, Paul E. Griffiths, *University of Pittsburgh*, and Russell D. Gray, *University of Auckland*

Developmental systems theory (DST) offers a new conceptual framework with which to resolve the "nature versus nurture" debates. DST views ontogeny as contingent cycles of interaction among a varied set of developmental resources, no one of which controls the process. These factors include DNA, cellular and organismic structure, and social and ecological interactions. DST has excited interest from a wide range of researchers, from molecular biologists to anthropologists, because of its ability to integrate evolutionary theory and other disciplines without falling into traditional oppositions.

The book provides historical background to DST, recent theoretical findings on the mechanisms of heredity, applications of the DST framework to behavioral development, implications of DST for the philosophy of biology, and critical reactions to DST.

A Bradford Book
2001 • 484 pp. • 26 illus. • \$50.00/£34.50
0-262-15053-0
Life and Mind: Philosophical Issues in Biology and Psychology



CONSCIOUSNESS AND COGNITION

RATIONALITY IN ACTION

John R. Searle, *University of California, Berkeley*

In this invigorating book, John Searle lays out six claims of what he calls the Classical Model of rationality and shows why they are false. He then presents an alternative theory of the role of rationality in thought and action.

A central point of Searle's theory is that only irrational actions are directly caused by beliefs and desires — for example, the actions of a person in the grip of an obsession or addiction. In most cases of rational action, there is a gap between the motivating desire and the actual decision making. The traditional name for this gap is “freedom of the will.” According to Searle, all rational activity presupposes free will. For rationality is possible only where one has a choice among various rational as well as irrational options.

Unlike many philosophical tracts, *Rationality in Action* invites the reader to apply the author's ideas to everyday life. Searle shows, for example, that contrary to the traditional philosophical view, weakness of will is very common. He also points out the absurdity of the claim that rational decision making always starts from a consistent set of desires. Rational decision making, he argues, is often about choosing between conflicting reasons for action. In fact, humans are distinguished by their ability to be rationally motivated by desire-independent reasons for action. Extending his theory of rationality to the self, Searle shows how rational deliberation presupposes an irreducible notion of the self. He also reveals the idea of free will to be essentially a thesis of how the brain works.

A Bradford Book
2001 • 342 pp. • 3 illus. • \$35.00/£23.95
0-262-19463-5
Jean Nicod series
(Not available in Belgium, France, or Switzerland)



Forthcoming!

ESSENTIAL SOURCES IN THE SCIENTIFIC STUDY OF CONSCIOUSNESS

edited by Bernard J. Baars, *Wright Institute, Berkeley, California* and James B. Newman

Consciousness is at the very core of the human condition. Yet only in recent decades has it become a major focus in the brain and behavioral sciences. Scientists now know that consciousness involves many levels of brain functioning, from brainstem to cortex. The almost seventy articles in this book reflect the breadth and depth of this burgeoning field. The many topics covered include consciousness in vision and inner speech, immediate memory and attention, waking, dreaming, coma, the effects of brain damage, fringe consciousness, hypnosis, and dissociation.

Underlying all the selections are the questions, What difference does consciousness make? What are its properties? What role does it play in the nervous system? How do conscious brain functions differ from unconscious ones? The focus of the book is on scientific evidence and theory.

A Bradford Book
August 2002 • 1037 pp. • 253 illus.
Paper • \$49.95/£34.50
0-262-52302-7
Cloth • \$125.00/£85.95
0-262-02496-9

THE NATURE OF CONSCIOUSNESS

Philosophical Debates

edited by Ned Block, *New York University*,
Owen Flanagan, *Duke University*, and
Güven Güzelere, *Stanford University*

This reader brings together most of the principal texts in philosophy (and a small set of related key works in neuropsychology) on consciousness, including the most current articles. Its extensive coverage strikes a balance between seminal works of the past few decades and the leading edge of philosophical research on consciousness.

A Bradford Book
1997 • 608 pp. • 44 illus. • paper • \$41.95/£28.95
0-262-52210-1 **T**

CONSCIOUSNESS AND COGNITION

Now Available in Paperback

CONSCIOUSNESS, COLOR, AND CONTENT

Michael Tye, *Temple University and King's College, London*

Experiences and feelings are inherently conscious states. There is something it is like to feel pain, to have an itch, to experience bright red. Philosophers call this sort of consciousness "phenomenal consciousness." Even though phenomenal consciousness seems to be a relatively primitive matter, something more widespread in nature than higher-order or reflective consciousness, it is deeply puzzling.

In 1995 Michael Tye proposed a theory of phenomenal consciousness now known as representationalism. This book is, in part, devoted to a further development of that theory along with replies to common objections. Tye's focus is broader than representationalism, however. Two prominent challenges for any reductive theory of consciousness are the explanatory gap and the knowledge argument. In part I of this book, Tye suggests that these challenges are intimately related. The best strategy for dealing with the explanatory gap, he claims, is to consider it a kind of cognitive illusion. Part II of the book is devoted to representationalism. Part III connects representationalism with two more general issues. The first is the nature of color. Tye defends a commonsense, objectivist view of color and argues that such a view is compatible with modern color science. In the final chapter, Tye addresses the question of where on the phylogenetic scale phenomenal consciousness ceases, arguing that consciousness extends beyond the realm of vertebrates to such relatively simple creatures as the honeybee.

A Bradford Book
2000 • 214 pp. • 8 illus. • paper • \$18.00/£12.50
0-262-70088-3

Representation and Mind series



NEURAL CORRELATES OF CONSCIOUSNESS

Empirical and Conceptual Questions

edited by Thomas Metzinger, *University of Osnabrück, Germany*

This book brings together an international group of neuroscientists and philosophers who are investigating how the content of subjective experience is correlated with events in the brain. The fundamental methodological problem in consciousness research is the subjectivity of the target phenomenon — the fact that conscious experience, under standard conditions, is always tied to an individual, first-person perspective. The core empirical question is whether and how physical states of the human nervous system can be mapped onto the content of conscious experience. The search for the neural correlates of consciousness (NCC) has become a highly active field of investigation in recent years. Methods such as single-cell recording in monkeys and brain imaging and electrophysiology in humans, applied to such phenomena as blindsight, implicit/explicit cognition, and binocular rivalry, have generated a wealth of data. The same period has seen the development of a number of theories about NCC location. This volume brings together the leading experimentalists and theoreticians in the field. Topics include foundational and evolutionary issues, global integration, vision, consciousness and the NMDA receptor complex, neuroimaging, implicit processes, intentionality and phenomenal volition, schizophrenia, social cognition, and the phenomenal self.

A Bradford Book
2000 • 367 pp. • 48 illus. • \$52.00/£35.95
0-262-13370-9

CONSCIOUSNESS AND COGNITION

THE PARADOX OF SLEEP

The Story of Dreaming

Michel Jouviet, *University of Lyon, France*
translated by Laurence Garey

Michel Jouviet is perhaps the world's leading sleep and dream researcher. In *The Paradox of Sleep*, Jouviet takes the reader on a scientific and sociological tour of the history of sleep and dream research.

Jouviet tells the story of a handful of neurobiologists, including himself, who pioneered sleep and dream research in the 1950s. He describes the technical and ideological obstacles they faced and opens his own laboratory to the reader. A key section of the book is Jouviet's discussion of why we dream. After summarizing Freud's theory of dreams, he contrasts it with current neurobiological data. Finally, he outlines his own controversial theory about why we dream: to preserve our individuality.

A Bradford Book
1999 • 227 pp. • 20 illus. • paper • \$15.95/£10.95
0-262-60040-4

DREAMING AS DELIRIUM

How the Brain Goes Out of Its Mind

J. Allan Hobson, *Harvard Medical School and Massachusetts Mental Health Center*
with a new foreword by the author

In this book J. Allan Hobson sets out a compelling — and controversial — theory of consciousness. Our brain-mind, as he calls it, is not a fixed identity but a dynamic balancing act between the chemical systems that regulate waking and dreaming. Drawing on his work both as a sleep researcher and as a psychiatrist, Hobson looks in particular at the strikingly similar chemical characteristics of the states of dreaming and psychosis. His underlying theme is that the form of our thoughts, emotions, dreams, and memories can be reduced to the nerve cells and electrochemical impulses described by neuroscientists.

A Bradford Book
1999 • 313 pp. • paper • \$19.95/£13.95
0-262-58179-5
originally published by Little, Brown under the title
The Chemistry of Conscious States

Winner of the Scientific and Medical Network Book Prize, 1998

ZEN AND THE BRAIN

James H. Austin, M.D., *University of Colorado Health Sciences Center*

Zen and the Brain uses Zen Buddhism as the opening wedge for an extraordinarily wide-ranging exploration of consciousness. In order to understand the brain mechanisms that produce Zen states, one needs some understanding of the anatomy, physiology, and chemistry of the brain. Austin, a neuroscientist and Zen practitioner, interweaves his teachings of the brain with his teachings/personal narrative of Zen. The science, which contains the latest relevant developments in brain research, is both inclusive and rigorous; the Zen sections are clear and evocative. Along the way, Austin covers such topics as similar states in other disciplines and religions, sleep and dreams, madness, consciousness-altering drugs, and the social consequences of advanced stages of enlightenment.

1998 • 872 pp. • 27 illus. • paper • \$32.95/£22.50
0-262-51109-6 **T**

THE RACE FOR CONSCIOUSNESS

John G. Taylor, *Kings College, University of London, and Guest Scientist, Institute of Medicine, Research Centre, Juelich, Germany*

There is a sense among scientists that the time is finally ripe for the problem of consciousness to be solved once and for all. The development of new experimental and theoretical tools for probing the brain has produced an atmosphere of unparalleled optimism that the job can now be done properly: the race for consciousness is on!

In this book John Taylor describes the complete scene of entries, riders, gamblers, and racecourses. He presents his own entry into the race, which he has been working on for the past twenty-five years — the relational theory of consciousness, according to which consciousness is created through the relations between brain states, especially those involving memories of personal experiences. Because it is an ongoing and adaptive process, consciousness emerges from past brain activity. It is this highly subtle and delicate process of emergence that leads to the complexity of consciousness.

A Bradford Book
1999 • 392 pp. • 20 illus.
Paper • \$24.95/£16.95
0-262-70086-7

CONSCIOUSNESS AND COGNITION

LINGUA EX MACHINA

Reconciling Darwin and Chomsky with the Human Brain

William H. Calvin, *University of Washington, Seattle*, and Derek Bickerton, *University of Hawaii, Honolulu*

A machine for language? Certainly, say the neurophysiologists, busy studying the language specializations of the human brain and trying to identify their evolutionary antecedents. Linguists such as Noam Chomsky talk about machinelike “modules” in the brain for syntax, arguing that language is more an instinct (a complex behavior triggered by simple environmental stimuli) than an acquired skill like riding a bicycle.

William Calvin and Derek Bickerton suggest that other evolutionary developments, not directly related to language, allowed language to evolve in a way that eventually promoted a Chomskian syntax. They compare these intermediate behaviors to the curb-cuts originally intended for wheelchair users. Their usefulness was soon discovered by users of strollers, shopping carts, rollerblades, and so on. The authors argue that reciprocal altruism and ballistic movement planning were “curb-cuts” that indirectly promoted the formation of structured language. *Lingua ex Machina* presents an engaging challenge to those who view the human capacity for language as a war between Chomsky and Darwin.

A Bradford Book

2000 • 312 pp. • 17 illus. • paper • \$16.95/£11.50
0-262-53198-4

THE MYTH OF PAIN

Valerie Gray Hardcastle, *Virginia Polytechnic Institute*

Pain, although very common, is little understood. Worse still, according to Valerie Gray Hardcastle, both professional and lay definitions of pain are wrongheaded — with consequences for how pain and pain patients are treated, how psychological disorders are understood, and how clinicians define the mind/body relationship.

Hardcastle offers a biologically based complex theory of pain processing, inhibition, and sensation and then uses this theory to make several arguments: (1) psychogenic pains do not exist; (2) a general lack of knowledge about fundamental brain function prevents us from distinguishing between mental and physical causes, although the distinction remains useful; (3) most pain talk should be eliminated from both the folk and academic communities; and (4) such a biological approach is useful generally for explaining disorders in pain processing. She shows how her analysis of pain can serve as a model for the analysis of other psychological disorders and suggests that her project be taken as a model for the philosophical analysis of disorders in psychology, psychiatry, and neuroscience.

A Bradford Book

1999 • 320 pp. • 16 illus. • paper • \$19.95/£13.95
0-262-58210-4

Philosophical Psychopathology series

WHERE BIOLOGY MEETS PSYCHOLOGY

Philosophical Essays

edited by Valerie Gray Hardcastle, *Virginia Polytechnic Institute*

A great deal of interest and excitement surround the interface between the philosophy of biology and the philosophy of psychology, yet the area is neither well defined nor well represented in mainstream philosophical publications. This book is perhaps the first to open a dialogue between the two disciplines. Its aim is to broaden the traditional subject matter of the philosophy of biology while informing the philosophy of psychology of relevant biological constraints and insights.

The book is organized around six themes: functions and teleology, evolutionary psychology, innateness, philosophy of mind, philosophy of science, and parallels between philosophy of biology and philosophy of mind. Throughout, one finds overlapping areas of study, larger philosophical implications, and even larger conceptual ties. Woven through these connections are shared concerns about the status of semantics, scientific law, evolution and adaptation, and cognition in general.

A Bradford Book

1999 • 384 pp. • 12 illus. • paper • \$30.00/£20.50
0-262-58174-4



HISTORY OF NEUROSCIENCE

A NATURAL HISTORY OF VISION

Nicholas J. Wade, *University of Dundee, Scotland*

This illustrated survey covers what Nicholas Wade calls the “observational era of vision,” beginning with the Greek philosophers and ending with Wheatstone’s description of the stereoscope in the late 1830s. This is the first history of vision to present extracts of the works of scholars, organized both topically and chronologically. In what has become the author’s signature style, the book juxtaposes verbal and visual descriptions. Many of the more than three hundred illustrations are derived from engravings — of portraits of the scholars cited, as well as of scientific diagrams.

Each portrait appears beside a significant quotation by the scholar and the source of the original illustration. The author’s commentary provides the context for the quotations and traces the scientific development within each topic. The book is organized around the principal topics within the investigation of visual phenomena: light, color, subjective visual phenomena (such as afterimages and pattern distortions), motion, binocularity, space, and visual illusions.

A Bradford Book
1998 • 486 pp. • 304 illus. • paper • \$32.95/£22.50
0-262-73129-0

BRAIN, VISION, MEMORY

Tales in the History of Neuroscience

Charles G. Gross, *Princeton University*

Charles G. Gross is an experimental neuroscientist who specializes in brain mechanisms in vision. He is also fascinated by the history of his field. In these engaging tales describing the growth of knowledge about the brain — from the early Egyptians and Greeks to the Dark Ages and the Renaissance to the present time — he attempts to answer the question of how the discipline of neuroscience evolved into its modern incarnation through the twists and turns of history.

“Informative and amusing in equal part, Gross is as fair to those who were wildly wrong as to those who were (relatively) right. . . . Never less than fascinating.”

—John C. Marshall, *Nature*

A Bradford Book
1998 • 280 pp. • 50 illus. • paper • \$20.00/£13.95
0-262-57135-8

AAP/PSP Award in History of Science and Technology, 2000

AN ODD KIND OF FAME

Stories of Phineas Gage

Malcolm Macmillan, *Deakin University, Australia*

In 1848 a railway construction worker named Phineas Gage suffered an accident that made him a major curiosity of medicine and a significant figure

in psychology and neuroscience: an explosion caused a tamping iron to be blown completely through his head, destroying the left frontal lobe of his brain. Gage survived the accident and remained in reasonable physical health for another eleven years.

But his behavior changed markedly

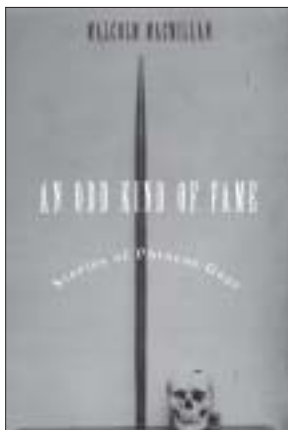
after the injury, and his case is considered to be the first to reveal the relation between the brain and complex personality characteristics. Yet almost nothing is known about him, and most of what is written is seriously in error.

In this book Malcolm Macmillan, a leading authority on Gage, covers all aspects of this fascinating story. One of his primary aims is to rescue the case from the predominantly fantastic accounts so that its real contribution to modern neuroscience can be understood.

“Malcolm Macmillan’s enthusiasm is as infectious as his knowledge of detail is prodigious. . . . What we are told is often fascinating and answers questions that — a century and a half after the event — we would not expect to be answerable.”

— Ian Glynn, *Nature*

A Bradford Book
2000 • 552 pp. • 71 illus. • \$42.95/£29.50
0-262-13363-6



HISTORY OF NEUROSCIENCE

ADVICE FOR A YOUNG INVESTIGATOR

Santiago Ramón y Cajal

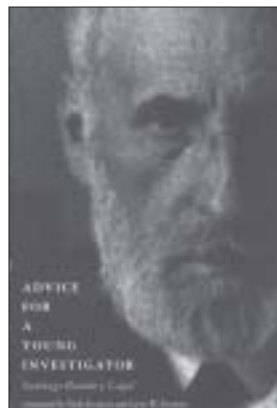
translated by Neely Swanson and Larry W. Swanson

Santiago Ramón y Cajal was a mythic figure in science. Hailed as the father of modern anatomy and neurobiology, he was largely responsible for the modern conception of the brain. His groundbreaking works were *New Ideas on the Structure of the Nervous System* and *Histology of the Nervous System in Man and Vertebrates*. In addition to leaving a legacy of unparalleled scientific research, Cajal sought to educate the novice scientist about how science was done and how he thought it should be done. This recently rediscovered classic, first published in 1897, is an anecdotal guide for the perplexed new investigator as well as a refreshing resource for the old pro.

Cajal was a pragmatist, aware of the pitfalls of being too idealistic — and he had a sense of humor, particularly evident in his diagnoses of various stereotypes of eccentric scientists. The book covers everything from valuable personality traits for an investigator to social factors conducive to scientific work.

"Bearing in mind the distance in time and culture, you are left with the feeling that a high proportion of [Cajal's] advice is valid. It is written in the candid style of a person devoted to science and willing to help young people on the verge of making a decision that was as difficult a century ago as it is today."

— Pere Puigdomènech, *Nature*



A Bradford Book

1998 • 176 pp. • \$27.95/£19.50

0-262-18191-6

NEW IDEAS ON THE STRUCTURE OF THE NERVOUS SYSTEM IN MAN AND VERTEBRATES

Santiago Ramón y Cajal

translated by Neely Swanson and Larry W. Swanson

Foreword by Larry W. Swanson

"This excellent translation of Cajal's brilliant work could not have been published at a better time. One hundred years ago Cajal led a revolution in the study of the nervous system . . . The text is complemented by beautiful sketches from the original edition, their wonderful clarity and accuracy still make them perfect accompaniments to a neuroanatomy course. . . I recommend this book to those who consider themselves students of the nervous system, whether they are surgeons, psychiatrists, or scientists."

— Henry J. Kaminski, M.D., *The New England Journal of Medicine*

1990 • 216 pp. • 49 illus. • \$37.95/£25.95

0-262-18141-X

Selected as a Great Brain Book, Cerebrum

RECOLLECTIONS OF MY LIFE

Santiago Ramón y Cajal

translated by E. Horne Craigie with J. Cano

Foreword by W. Maxwell Cowan

Recollections of My Life unfolds the significant scientific events in Cajal's life and reveals the character and personality of this pioneer histologist.

1989 • 664 pp. • 168 illus. • paper • \$29.95/£17.95

0-262-68060-2

GENERAL INTEREST

THE DREAM DRUGSTORE**Chemically Altered States of Consciousness**

J. Allan Hobson, *Harvard Medical School and the Massachusetts Mental Health Center*

In this book J. Allan Hobson offers a new understanding of altered states of consciousness based on knowledge of how our brain chemistry is balanced when we are awake and how that balance shifts when we fall asleep and dream. He draws on recent research that enables us to explain how psychedelic drugs work to disturb that balance and how similar imbalances may cause depression and schizophrenia. He also draws on work that expands our understanding of how certain drugs can correct imbalances and restore the brain's natural equilibrium.

Hobson explains the chemical balance concept in terms of what we know about the regulation of normal states of consciousness over the course of the day by brain chemicals called neuromodulators. He presents striking confirmation of the principle that every drug that has transformative effects on consciousness interacts with the brain's own consciousness-altering chemicals.

A Bradford Book
2001 • 360 pp. • 40 illus. • \$27.95/£19.50
0-262-08293-4

THE PSYCHOPHARMACOLOGY OF HERBAL MEDICINE**Plant Drugs That Alter Mind, Brain, and Behavior**

Marcello Spinella, *Richard Stockton College of New Jersey*

The Psychopharmacology of Herbal Medicine compiles and integrates the most up-to-date information on the major psychoactive herbal medicines — that is, herbal medicines that alter mind, brain, and behavior. It focuses particularly on the effects on various areas of cognition, including attention, learning, and memory. The book covers all major classes of psychoactive drugs, including stimulants, cognitive enhancers, sedatives and anxiolytics, psychotherapeutic herbs, analgesics and anesthetic plants, hallucinogens, and cannabis.

2001 • 500 pp. • 91 illus. • paper • \$24.95/£16.95
0-262-69265-1

THE SHATTERED SELF**The End of Natural Evolution**

Pierre Baldi, *Institute for Genomics and Bioinformatics at the University of California, Irvine*

Throughout history, we have selected and manipulated the genomes of plants, animals, and even ourselves. Until now, however, such control could be exerted only at the level of the entire organism. Scientific and technological advances now allow us to manipulate genomes directly at the level of single genes and their constituents, with a speed and precision that far exceed what natural evolution has been able to achieve over the past 3.5 billion years. These advances open new possibilities for medicine, biotechnology, and society as a whole. We already have in vitro fertilization and animal cloning; in the future human cloning and the exploitation of embryonic stem cells, among other capabilities, may be routine. At the same time, we are developing machines that will surpass the human brain in raw computing power and building an interconnected world of information-processing devices that makes science fiction pale in comparison. In this book Baldi explores what it is about these phenomena that makes us so uneasy — the shattering of the human self as we know it.

Through evolution our brains have been wired to provide us with an inner sense of self, a feeling that each of us is a unique individual delimited by precise boundaries. We have also been wired to reproduce ourselves in a certain way. Baldi argues that this self-centered view of the world is scientifically wrong. Its past success lies in its being an adequate model during our evolutionary bootstrapping: a world without molecular biotechnology, human cloning, and the Internet. Eventually we must come to terms with the fact that genomes, computations, and mind are fluid, continuous entities, in both space and time. The boundary between the self and the world has begun to blur and ultimately may evaporate entirely. Baldi offers not predictions but an open-eyed exploration of our current state of knowledge and the possibilities that lie ahead.

A Bradford Book
2001 • 245 pp. • 13 illus. • \$24.95/£16.95
0-262-02502-7



"With a host of well-conceived resources, MIT's CogNet is poised to become the digital watering hole of the Cognitive and Brain Science community. It has a diversity of useful tools tucked into a clean, fast, and intuitive interface, and will facilitate dialogue between scientists interested in brain and mind."

— brainconnection.com

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Major reference works

- *The MIT Encyclopedia of the Cognitive Sciences*, Robert A. Wilson and Frank C. Keil, editors
- *The New Cognitive Neurosciences*, Michael S. Gazzaniga, editor-in-chief
- *Handbook of Developmental Cognitive Neuroscience*, Charles A. Nelson and Monica Luciana, editors

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— Terrence J. Sejnowski, Professor, Salk Institute; Professor of Biology, University of California, San Diego; and Investigator, Howard Hughes Medical Institute

NEW

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