



Topics in Integrative Neuroscience

From Cells to Cognition

CAMBRIDGE

Edited by
James R. Pomerantz

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Rice University



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Topics in Integrative Neuroscience

Neuroscience is progressing so rapidly that even expressions such as “by leaps and bounds” fail to capture the pace of its growth. Questions that once were thought to be unanswerable – perhaps even unaskable – have now been both asked and answered, and new questions, once unthinkable, are routine. *Topics in Integrative Neuroscience* has singled out four of the most important problems in neuroscience: higher order perception; language; memory systems; and sensory processes. The volume presents original contributions by many of the leading researchers in those fields, and with an initial chapter covering neuroethics. It is impossible to capture fully the sweep of discoveries that emerged from the “Decade of the Brain” within the covers of a single volume. It is possible, however, to provide a sample, both in recognition of what has been accomplished and as a harbinger of what is surely to come.

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Preface

The field of neuroscience is progressing so rapidly that even expressions such as “by leaps and bounds” fail to capture the pace of its growth. Questions that at one time were thought to be unanswerable – perhaps even unaskable – have now been asked and in some cases answered, and new questions once unthinkable are now asked matter-of-factly. Much of this acceleration is due to the maturing of the field – advances in techniques as well as in theory – fueled by an infusion of research support during the 1990s “Decade of the Brain” effort.

It is impossible to capture fully the sweep of discoveries and advances that emerged from that decade within the covers of a single volume. It is possible, however, to provide a sample of the best of that work, both as recognition of what has been accomplished during that period of time and since, and as a harbinger of what is surely to come as the pace of neuroscience shows no hint of slowing down.

Our goal in the present volume is to provide that sample through carefully chosen topics and even more carefully chosen researchers in those fields. Singling out the four most important problems in neuroscience is probably an unwise goal and is a surefire way to start an argument. That said, however, few would argue that the four featured here are anything less than powerful candidates for that inner circle: higher order perception; language; memory systems; and sensory processes.

Within these four categories, even fewer would contest the preeminence of the research programs carried out by the authors of this volume’s chapters. In Higher Order Perception, we have Michael Posner leading a group including both Charles Gilbert and Leslie Ungerleider and her colleagues. In Language we see Helen Neville leading a distinguished international team of scholars including David Poeppel, Karalyn Patterson, Jacques Mehler, and their co-workers.

Our part on Memory Systems is led by Larry Squire and includes Howard Eichenbaum, Joseph E. LeDoux, Susumu Tonegawa, and their co-authors. Finally, a part on Sensory Processes includes chapters by Allison J. Doupe, Ruth Anne Eatock, and their colleagues.

As a special treat, we have an additional chapter, not part of these four parts, dealing with the intersection of neuroscience and philosophy. This chapter is written by Patricia Churchland and deals with changing conceptions of choice and responsibility as we better understand the neural processes underlying human behavior.

No effort of this magnitude takes place without a great deal of effort, stemming first and most importantly from those neuroscientists and other scholars who have conducted the work described here and who have written about it for this volume. We are grateful to them, their co-authors, and for the many students and other collaborators who helped them along the way.

Our second round of thanks goes out to C.M. and Demaris Hudspeth of Houston Texas, whose generosity and support made this volume possible. The inspiration and impetus for this book lies with a De Lange Conference held in March 2001 on the campus of Rice University, entitled "The Neurobiology of Perception and Communication: From Synapse to Society." This book is based to a considerable extent on updated, written versions of presentations first given on that occasion. The De Lange Conference series is made possible by an endowment established at Rice University by the Hudspeths in memory of the parents of Demaris, Albert, and Demaris De Lange. These conferences are held every few years and have the flexibility to range broadly in subject matter and discipline. All are intended to bring to the Rice University campus top experts and major figures to focus on a topic of great concern to society. Rice University owes a great debt to Hank and Demaris Hudspeth, two alumni whose contributions to this institution have been so great and who are a source of both pride and admiration for all who are fortunate enough to know them and work with them.

Our third round of thanks goes to the two institutions that provided additional support, both financial and human, that this effort possible: Rice University and its neighbor across Main St., Baylor College of Medicine. Our partnership in this and other ventures is a source of great satisfaction to both institutions and multiplies the contributions we can make both locally and globally. The steering committee behind this effort included, on the Baylor side, Michael C. Crair, Kathryn J. Kotrla, James W. Patrick, and J. David Sweatt. The Rice side included Don Johnson, Randi Martin, and James Pomerantz. Additional valuable support was provided by Rice University's outstanding Glasscock School of Continuing Studies and their fine group of staff.

On the Rice side in particular, our largest rounds of applause are reserved first for Kathleen Minadeo Johnson, who served as the De Lange Conference Coordinator, handling the myriad duties that go along with a major, multi-institutional event. Kathleen handled all her assignments with a combination of efficiency, grace, and good cheer and kept the morale high even during times when by all rights it should have been low. Great thanks and gratitude go as well to Ellen Butler, who since has taken over as the permanent Executive Assistant for the De Lange Conferences and who has done much of the organizational work needed to convert the set of manuscripts from which we began into a complete draft volume to present to the Cambridge University Press. Picking up on a complex task that another person has begun is rarely easy, and it is a testament to the skill and patience of both of these individuals that the final result is as good as it is. I give my great personal thanks to both, not only for their hard work but also for their friendship.

Finally, we thank the editors and staff at Cambridge University Press for their efforts in publishing this volume and their patience in dealing with setbacks experienced along the way. We especially thank Martin Griffiths (Commissioning Editor) and Jeanette Alfoldi (Production Editor), at Cambridge for their careful work and attention.

As progress in neuroscience continues at its blistering pace, it will not be long before another decade of the brain is in order. Perhaps when that time arises, we will produce another De Lange Conference and published volume summarizing where we have come. In the meantime, please read and enjoy the chapters that follow and appreciate the advances that these pioneers in the field have worked so hard to achieve.

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