

PREFACE

As a work that combines philosophy and (what was then) current science, I have always admired David Hull's (1974) *Philosophy of Biological Sciences* in the Prentice Hall "Foundations of Philosophy Series." Hull's writing is crisp, his presentation is focused, and—most importantly—the scientific details, clearly described, drive the philosophy. I kept these features of Hull's book constantly before me as I wrote this manuscript. I hope others see in this work those same features, along with the addition of more science from the primary literature, as befitting a book that seeks to do more than introduce students to a philosophical area.

Neuroscience and its implications have not gone unnoticed by either professional philosophers or the educated general public. How could they have? We move closer every day to actually having something that human beings have speculated about for centuries, a purely physical account of behavioral causes. Yet it has struck me for close to a decade that most self-described "philosophers of neuroscience" and "neurophilosophers"—people with a professional stake in keeping up with the actual science—focus on the wrong levels of research, theory, and experiment. Furthermore, this mistaken emphasis by specialists produces negative repercussions in the larger philosophy of mind/cognitive science community. Without question, neural network modeling and computer simulation, functional neuroimaging, and neuropsychological and neurological assessments are central neuroscientific pursuits. But one glance at an influential neuroscience textbook, or a short perusal through recent titles of colloquia talks delivered at a Ph.D.-granting Neuroscience department, or—even more dramatically—one visit to the week-long Society for Neuroscience annual meeting, should convince anyone that the amount of research being done in "cognitive neuroscience" and the amount we can safely be said to "know" at that level pales in comparison to the amount going on and already discovered in the discipline's cellular and molecular core. I'll begin developing this theme right off the bat in Chapter One, but this entire book is at bottom an extended argument that higher-level theorists of mind, especially philosophers, should reorient their interests "down levels" in the neurosciences. Or, short of that, they should realize that the mainstream core of the current science, the part on which *all* the higher level cognitive neuroscientific investigations ultimately depend, has a "ruthless" reductionism built directly into its practice. Furthermore, at this cellular/molecular level, we "know a lot about how the brain works" and we are increasingly able to manipulate specific behaviors by intervening directly with these cellular processes and intracellular pathways. This is no longer just the

fare of science fiction, but of *Cell*, *Journal of Neurophysiology*, *Science*, *Nature*, and *Proceedings of the National Academy of Sciences*.

The status of “ruthless reductionism” in current mainstream neuroscience contrasts sharply with its status in philosophy, even in the tip of the “analytic” branch that over the last century embraced scientific philosophy. In his Presidential Address to the American Philosophical Association (delivered orally in 1989), noted reductionist philosopher Jaegwon Kim remarked:

Perhaps as a result of the singular lack of success with which our earlier reductionist efforts have been rewarded, a negative image seems to have emerged for reductionisms in general. Many of us have the feeling that there is something rigid and narrow-minded about reductionist strategies. Reductionisms, we tend to feel, attempt to impose on us a monolithic, strait-jacketed view of the subject matter, the kind of cleansed and tidy picture that appeals to those obsessed with orderliness and discipline. ... Perhaps, too, reductionists are out of step with the intellectual style of our times: we strive for patterns of life and thought that are rich in diversity and complexity and tolerant of disagreement and multiplicity. We are apt to think that the real world is a messy place and resists any simplistic drive, especially one carried on from the armchair, toward simplification and unification. In fact, the word “reductionism” seems by now to have acquired a negative, faintly disreputable flavor—at least in philosophy of mind. Being a reductionist is a bit like being a logical positivist or a member of the Old Left—an aura of doctrinaire naiveté hangs over him. (1993, 265-266)

Kim’s assessment of philosophical orthodoxy remains correct to this day.

The motivation guiding this book is that this orthodoxy remains because (scientific) reduction is misunderstood. That diagnosis is, of course, not original with me. But my new prescription for the malady is. I now contend that the only way to overcome this misunderstanding is to show *what scientific reductionism is in practice*—the experiments it motivates, the results these experiments have yielded, and the way they are interpreted—in the mainstream branch of a “hot” reductionist discipline. I leave it to readers, both philosophers and scientists, to decide if this prescription works.

Realistically, however, can I expect philosophers and cognitive scientists to wade through as much cellular and molecular detail as I have included in this book? I hope so. There is a growing schism in both philosophy of mind and philosophy of science, between metaphysically minded and normatively prescriptive philosophers versus philosophers willing to countenance scientific practice and results as scientists present them. I’m

trying to push the agenda of the second camp one step beyond where it has been pushed so far by philosophers interested in neuroscience. I seek to push it into *core* neuroscience circa 2002. If successful, this will widen philosophy's schism. But that might not be such a bad thing. Perhaps it is time to cleave philosophy of mind, philosophy of science, and philosophy of particular sciences (like psychology, cognitive science, neuroscience, and biology) into separate disciplines: one that, although mindful of scientific practices and results, remains tied to perennial metaphysics and epistemology; the other a part of science itself. This attitude reflects the rationale behind the Reichenbach quote that serves as this book's epigram, as well as the first part of my title. This is a book on philosophy *and* neuroscience, not philosophy *of* neuroscience. Does the neuroscience overshadow the philosophy? As readers will see throughout this book, I take on questions and arguments that have been put forward by philosophers; only I do so while limiting myself to the resources of recent cellular and molecular neuroscience. I also strive for the "synoptic vision" of all of neuroscience that lies implicit in its mainstream cellular and molecular core. In one sense I do leave things "entirely up to science," but in another I am putting together the individual pieces that science provides to make explicit the "bigger picture" that most scientists leave implicit. That's "philosophy" enough for me.

My subtitle comes from my colleague, Robert Richardson. Those who know Bob know of his ruthless wit. Appropriately, he heard my original, boring subtitle, *A Thoroughly Reductive Account*, and immediately suggested the much punchier form. Continuing discussions with a number of my colleagues in Philosophy at the University of Cincinnati—in particular, Richardson, Don Gustafson, Christopher Gauker, and Tom Polger—helped me clarify arguments (and strengthened my conviction that I was on the right track!). The Neuroscience Graduate Program at the University of Cincinnati College of Medicine, of which I am very proud to be a part, keeps me up on the latest scientific developments and trends through its weekly visiting speaker's seminar. My scientific collaborators on a recent functional neuroimaging project—Scott Holland at the University of Cincinnati and Childrens Hospital, Cincinnati, Malcolm Avison at the University of Kentucky Medical Center, and Vince Schmithorst at Childrens Hospital, Cincinnati—have all commented helpfully on these themes over many discussions. My current Ph.D. student, Anthony Landreth, assisted with this manuscript in numerous ways. I tried out earlier versions of this material in a Fall 2000 seminar at the University of Cincinnati, and thank Ph.D. students from Philosophy, Biology, and Neuroscience for helpful questions and comments.

I've presented talks that became pieces of this book at many conferences and colloquia over the past few years, so thanks to all who've made me think things through again with their questions and comments. This group includes especially Ken Aizawa (Centenary College), Louise Antony (Ohio State University), Ansgar Beckerman (University of Bielefeld), Luc

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