

Cognitive Science: An Introduction to the Science of the Mind

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Introductory textbooks for a relatively new discipline, such as cognitive science, generally enter the marketplace in a precarious position. To start, such disciplines have yet to settle on precisely what an introductory course should do. Should it provide the historical and/or theoretical foundations of the discipline, introduce key concepts, explain what professionals who work in the area do, develop a preliminary skill set, all of these, etc.? Over time, however, consensus starts to emerge concerning a standard agenda, and the textbook market responds. For evidence of this claim, one need only consider how much introductory psychology, calculus and chemistry texts look alike. Though there are certainly small variations from book to book, a common (usually short) history of the discipline, basic concepts, and in the instance of psychology, even common case studies, appear in almost all of the available textbooks.

As a discipline, cognitive science has been without consensus about its introductory course for forty years. Only part of this situation can be explained by the fact that the discipline is somewhat new. A more efficacious reason is due perhaps to the interdisciplinary nature of the field and the disciplinary commitments of professors. A computer science professor might take one approach to an introductory course, a psychologist another and a philosopher a third. Consequently, cognitive science can often look to undergraduates like either a sub-branch of one of the disciplines that makes it up or, worse yet, a miscellaneous hodgepodge of concepts drawn from several fields with no real integration. This hodgepodge approach to interdisciplinarity is apparent in several texts on the market. (See, for instance, Friedenber & Silverman, 2006, and Kolak et. al., 2006, in spite of the fact that both books would like to be otherwise.) This situation is not present in Bermúdez's new book, however, which is the first textbook that is pitched to first and second year undergraduates and that tackles the "integration challenge" head on, while introducing students to core concepts and the history of the discipline. Consequently, this book stands a chance where others have failed to set the precedent for what an undergraduate cognitive science textbook should be.

The book consists of fourteen chapters divided into five sections: (i) Historical landmarks; (ii) The integration challenge (i.e., how to fit the various disciplines that make up cognitive science together); (iii) Information-processing models of the mind; (iv) The organization of the mind; and (v) New horizons. Each section is further divided into several chapters. Without offering a full table of contents here, the book moves from the cognitive turn in reaction to behaviorism, the development of computational technologies with Turing and the formal analysis of language to define cognitive science as the science of information processing by the mind. As this initial enumeration of topics suggests, the book excels at a seamless integration of cognitive psychology, computer science, neuroscience and philosophy throughout, along with input from other disciplines as needed.

The most difficult part of the book is perhaps section iii, where models of cognition are presented. This section addresses the strong AI hypothesis in the context of distributed systems and artificial neural networks; indeed, it serves as an excellent example of how it is possible to weave

foundational (i.e. philosophical) questions with applied science and computer modeling. The modularity hypothesis is a central theme of section iv, where agent and hybrid architectures are discussed along with various techniques for brain mapping. The section ends with an extended “case study” on mindreading, including material on the theory/simulation debate, the false believe task and the cognitive neuroscience behind this phenomenon.

Each chapter in the book is built around three or four seminal articles (summarized, not included) with references for those who wish to supplement the text with additional reading or use foundational articles as the basis for student papers. Each chapter also includes questions to help guide the reader's attention and ends with a summary and a checklist of key points. The book also contains several captivating diagrams. Together, these supplements work well to invite the student not just to read the book, but to interact with it. Slide presentations for teachers, electronic versions of the images in the text for projection in the classroom and a variety of other supplements are available on a companion website.

I have taught Introduction to Cognitive Science at my university fifteen times, never having used the same set of books twice until now, and I have discussed the question of how best to teach the course with others who do so at a range of institutions across the country. The stories are often similar. Several of the books are too difficult. A favorite, Andy Clark's *Mindware* (2000), is way beyond the ability of freshmen and sophomores, but it is often used anyway because it sets such a nice trajectory for an introductory course. Some regularly used are not as difficult, but somewhat limited in scope, requiring a teacher to use several texts to try to piece together a coherent vision of the field. Favorites include Churchland's *Matter and Consciousness* (1988), his *The Engine of Reason, The Seat of the Soul* (1996), Haugeland's *Artificial Intelligence: The Very Idea* (1985), and *Mind Design II* (1997), though the readings in this last text are, like *Mindware*, too difficult. Another favorite is Thagard's *Mind* (1996) and its accompanying reader. However, the former is too dedicated to a single theme, what a mental representation might be like, and the supplemental reader is again too difficult. Several professors have also tried to piece together their own readers made up of professional articles. (I've tried all of these approaches.)

The principal difficulty to date has been that selecting texts like those above reinforces the illusion that cognitive science is a hodgepodge of inconsistent theories from whomever might mention "cognition" or "mind." They are also intimidating to the student and often difficult to the point of being uninformative. This situation makes Bermúdez's book a welcome relief. There is one criticism, however, on a matter that will be immediately apparent to anyone who examines the book and who works in more recent developments in the field. The book falls on the conservative/traditional side, not because of what it advocates—its intellectual commitments are minimal—but because of what it covers. Dynamic systems, embodied and situated cognition, biorobotics and behavior-based robotics, etc., are all topics pushed into one chapter at the end of the book. My experience has been that these are the issues that tend to capture the imagination of students and inspire the best class discussion, so much so that one might be tempted to supplement this text with another on new frontiers in cognitive science. Doing so is unnecessary, however, since this textbook is easy enough for students to read on their own. Thus, in the classroom, I assign it for reading, but I lecture from Clark (2000) and some of the other texts previously mentioned. I then test students on both the textbook and class lectures. There is plenty of room for this approach to work. Bermúdez lays down a firm foundation for students coming into the class, and my lectures pick an idea or two from the reading that I then bring up to date and that I use, in turn, to inspire class discussion. The results have been quite positive; at least the com-

plaints about the course being too difficult have been minimized and student response to the text (and cognitive science in general) enthusiastic.

In this last regard, one could wonder what the best approach to an introductory text should be. Should it be conservative or on the cutting edge? After teaching the class many times, my vote is for the conservative approach in the text and a more exciting update during lecture. This dynamic interplay between text and lecture has several pedagogical advantages in that it lays down a firm foundation in cognitive science while inciting the imagination of young scholars-to-be, since students walk away from the course with a grounded understanding of the history of cognitive science, while simultaneously understanding how much work is left to be done. Used this way, Bermúdez's text is an ideal text for introducing cognitive science.

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