



The Algebraic Mind: Integrating Connectionism and Cognitive Science (Learning, Development, and Conceptual Change)

By Gary F. Marcus

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In *The Algebraic Mind*, Gary Marcus attempts to integrate two theories about how the mind works, one that says that the mind is a computer-like manipulator of symbols, and another that says that the mind is a large network of neurons working together in parallel. Resisting the conventional wisdom that says that if the mind is a large neural network it cannot simultaneously be a manipulator of symbols, Marcus outlines a variety of ways in which neural systems could be organized so as to manipulate symbols, and he shows why such systems are more likely to provide an adequate substrate for language and cognition than neural systems that are inconsistent with the manipulation of symbols. Concluding with a discussion of how a neurally realized system of symbol-manipulation could have evolved and how such a system could unfold developmentally within the womb, Marcus helps to set the future agenda of cognitive neuroscience.

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Editorial Review

Review

In *The Algebraic Mind*, Marcus dives into the difficult waters of the connectionist-symbolic debate.

(Kenneth J. Kurtz *Cognitive Sciences Society Newsletter*)

In this strikingly original and penetrating book, Gary Marcus examines the core of our understanding of mind and brain: the nature of cognitive architecture. In constructive and incisive analyses, he pinpoints the computational strengths and weaknesses of connectionist and symbol-processing models of the mind, combining attention to minute particulars with an eye to what it all means. *The Algebraic Mind* is a rare and invaluable achievement, which should be required reading for cognitive scientists, cognitive neuroscientists, and researchers in artificial intelligence.

(Steven Pinker, Peter de Florez Professor, MIT, and author of *How the Mind Works* and *Words and Rules*)

Anyone who wants to understand the nature of thought has to come to grips with the controversy between symbolic and connectionist architectures. Marcus's book gives the most sophisticated treatment of this debate to date, showing clearly what is at stake and making a compelling case for an at least partly symbolic architecture.

(Ned Block, Professor of Philosophy and Psychology, New York University)

Marcus provides an insightful analysis of the underlying representations and processes in connectionist models along with a vigorous defense of the role of variables and binding in cognitive processing. This thought-provoking work is certain to inspire debate over the proper way to model the cognitive architecture.

(Arthur B. Markman, Department of Psychology, University of Texas, and author of *Knowledge Representation*)

This book will surprise you. Instead of attacking connectionism, Gary Marcus defends a detailed theory of the proper role of connectionist theory within the cognitive sciences. This is a beautifully clear, fiercely argued book, and it will have a huge influence on how researchers from a range of different perspectives think about the nature of cognition and development.

(Paul Bloom, Professor, Department of Psychology, Yale University)

In this book, Gary Marcus moves the twenty-year-old discussion of connectionism versus symbol manipulation to a higher plane. He carefully delineates three essential features of all symbolic systems, including the grammars of human languages. He then gives principled reasons why the most popular breed of connectionist architectures cannot implement these features, demonstrating that such models cannot be

scaled up from their current modest successes to a full-blown account of language learning. I hope this book encourages a search for new connectionist architectures that can stimulate more fruitful dialogue between linguists and network modelers.

(Ray Jackendoff, Professor of Linguistics, Brandeis University)

Anyone interested in the computational theory of mind and in how the machinery required for the requisite neural structures develops should read this book. It is a masterpiece of clear exposition from someone who has thought long and deeply about these questions.

(C. R. Gallistel, Professor, Rutgers Center for Cognitive Science, Rutgers University)

From the Back Cover

"The Algebraic Mind is a rare and invaluable achievement, which should be required reading for cognitive scientists, cognitive neuroscientists, and researchers in artificial intelligence."

--Steven Pinker, *Peter de Florez Professor at MIT, and author of How the Mind Works and Words and Rules.*

"This is a beautifully clear, fiercely argued book, and it will have a huge influence on how researchers from a range of different perspectives think about the nature of cognition and development."

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-- C. R. Gallistel, *Professor of Psychology, Rutgers University*

About the Author

Gary F. Marcus is Associate Professor of Psychology at New York University.

Users Review

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