

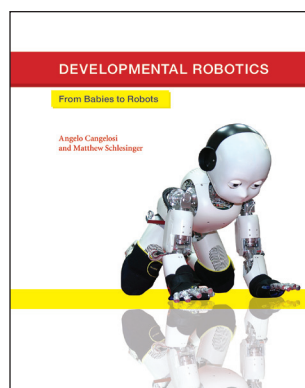
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Developmental Robotics

From Babies to Robots

by **Angelo Cangelosi and
Matthew Schlesinger**

Foreword by Linda B. Smith



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Developmental robotics is a collaborative and interdisciplinary approach to robotics that is directly inspired by the developmental principles and mechanisms observed in children's cognitive development. It builds on the idea that the robot, using a set of intrinsic developmental principles regulating the real-time interaction of its body, brain, and environment, can autonomously acquire an increasingly complex set of sensorimotor and mental capabilities. This volume, drawing on insights from psychology, computer science, linguistics, neuroscience, and robotics, offers the first comprehensive overview of a rapidly growing field.

After providing some essential background information on robotics and developmental psychology, the book looks in detail at how developmental robotics models and experiments have attempted to realize a range of behavioral and cognitive capabilities. The examples in these chapters were chosen because of their direct correspondence with specific issues in child psychology research; each chapter begins with a concise and accessible overview of relevant empirical and theoretical findings in developmental psychology. The chapters cover intrinsic motivation and curiosity; motor development, examining both manipulation and locomotion; perceptual development, including face recognition and perception of space; social learning, emphasizing such phenomena as joint attention and cooperation; language, from phonetic babbling to syntactic processing; and abstract knowledge, including models of number learning and reasoning strategies. Boxed text offers technical and methodological details for both psychology and robotics experiments.

Angelo Cangelosi is Professor of Artificial Intelligence and Cognition at the Centre for Robotics and Neural Systems at the University of Plymouth, U.K.

Matthew Schlesinger is Associate Professor of Psychology and Adjunct Professor of Electrical and Computer Engineering at Southern Illinois University.

“Cangelosi and Schlesinger provide a thorough and thoughtful overview of the emerging field of developmental robotics. Integrating insights from the full range of historical traditions on development, and bringing them together with the power of modern computational methods, they show us how the effort to understand development will depend both on classical analytic approaches and on synthetic experiments with robots that develop their mental abilities through experience. Anyone wishing to know where we are and where we are going in the effort to understand how mind and purposive behavior arise from biology and experience will want to own a copy of this book.”

— **Jay McClelland**, Director, Center for Mind, Brain, and Computation, Stanford University

“Angelo Cangelosi and Matthew Schlesinger present a fascinating review of ongoing scientific and technological research on human intelligence by exploring the parallel between robotics research and the study of child development. By highlighting the role of robotic engineering as a tool to investigate the principles giving rise to human intelligence, the book presents a very timely and convincing message in support of interdisciplinary research.”

— **Giulio Sandini**, Director, Robotics, Brain and Cognitive Sciences Department, Istituto Italiano di Tecnologia; Professor of Bioengineering, University of Genova

“If you build it, they will come...and we have! This volume distills the principles of the exciting new field of developmental robotics. Although researchers will undoubtedly find places to argue with the authors, that's really the point—the volume states these principles in an accessible way that will promote progress.

Developmental robotics has finally stood up and taken a big step forward.”

— **John P. Spencer**, Professor of Psychological and Brain Sciences, University of Iowa; coeditor of *Toward a Unified Theory of Development: Connectionism and Dynamic Systems Theory Re-Considered*

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