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VOLUME 164

FROM ACTION TO COGNITION

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Preface

This volume is based on topics discussed during an ESF conference in the series on “Brain Development and Cognition Human Infants” held during the first week of October 2005 at Maratea di Aquafredda in Southern Italy. The idea behind this series of conferences is to explore the phylogenetic and ontogenetic roots of development from a unified perspective, showing how perception, cognition, and action are interrelated in the early development of the child. This problem is examined in both non-human primates and different populations of human children. Development in atypical circumstances can shed new light on typical development, and on the evolutionary process that lead to such advanced functioning as language and culture in humans. Within this theoretical framework, the present conference brought together research on the maturation of cortical processes, mirror neurons, the development of tracking, reaching and locomotion, core knowledge, face perception, social understanding. A special part of the conference examined the work done on developmental robotics. This part was sponsored by EU-project “Robotcub”.

Activity is at the very core of development, from the principles that underlie the early structuring of the brain to the processes that enable us to represent and reflect on the world and plan our actions on it. In development, actions bring about change to the neural system and the neural system brings about change to action. Perception, cognition, and motivation develop at the interface between neural processes and action and are crucially dependent on having a body with the experiences that such a body affords. In other words, cognition is a product of the ways in which the child moves through the world and interacts with it.

Thus, perception, cognition, and social functioning are all anchored in the actions of the child. Actions reflect the motives, the problems to be solved, and the constraints and possibilities of the child’s body and sensory-motor system. The planning of actions also requires knowledge of the affordances of objects and events that are discovered through the explorative actions of the child. Furthermore, actions are directed into the future and their control is based on knowledge of what is going to happen next. Such knowledge is available because events are governed by rules and regularities. The most basic rules are laws of nature, like gravity and inertia. Others are task specific, like those making it possible to drive a car or ride a bike. Finally, some rules are a function of our innate dispositions and social conventions. They are necessary for the understanding of our own actions and for facilitating social interaction. Children’s understanding of other people’s actions and intentions emerges from the understanding of their own.

Motor actions are present before birth and, in normally developing children; they evolve in interaction with the evolving perceptual and cognitive systems during the early years of life. In other words, cognition is a product of the ways in which the child moves through the world and interacts with it. Extensive neurophysiological and neuropsychological evidence show that, perception, action, and cognition are closely related in the brain and develop in parallel. We have divided up the sections in the book in terms of how the brain gets structured in development, how perception and cognition evolves in the context of action, how social competence gets structured by these basic abilities and how the principles of embodied cognition can be applied to the structuring of artificial systems. The book discusses both the normal structuring of action, perception, and cognition and how it is expressed in deviant action control, prematurely born children and children with autism.

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