

Preface

This volume “The Hand. Perception, Cognition, Action” results from the convergence between research programs developed at the University Campus Bio-Medico (Rome, Italy) and international scholars in order to provide a solid interdisciplinary network of knowledge and research questions.

Recent progresses in the field of artificial hand design and surgery have played a crucial role in the path that eventually led to the present volume. The field of study connected to upper limb prosthetic, in fact, is challenging a wide range of disciplines and providing significant insights on hands’ biomechanical functions. Developing competitive projects on biorobotics and prosthetics requires unprecedented interdisciplinary efforts and sensitivity that sometimes call into question the conceptual foundations of disciplines. For example, the possibility to restore tactile perception in amputees through neural interfaces stimulates reflections in neuroscience, philosophy of perception, and psychology. Accordingly, the volume offers an overview of the extraordinary role of the hand in human life by taking into consideration different perspectives, from neuroscience and bioengineering to psychology, from anthropology to philosophy and aesthetics.

In the first part—From Action to Cognition, from Cognition to Action—the authors focus on the impact of the use of hand in human neurobiological and psychological development, highlighting the mutual influence of motor and cognitive domains on human development. By introducing the cognitive properties of the mirror neuron system, L. Fogassi (Chapter “[The Cognitive Properties of the Motor System and Mirror Neurons](#)”) considers the importance of actions performed by non-human primates’ upper limb to understand the goal of actions. The same system in humans is mediated by hand and is responsible for higher cognitive functions, such as social communication, imitation, and action understanding. In Chapter “[Children’s Object Manipulation: A Tool for Knowing the External World and for Communicative Development](#),” V. Focaroli and J. Iverson consider the use of hand in the first stages of child development. Through an accurate review on the acquisition of manipulative skills in infants, they show that this progressive acquisition is an important developmental milestone, thus highlighting the interdependency between object exploration and language development. The relationship between

hand and language is addressed by L. Sparaci and V. Volterra (Chapter “[Hands Shaping Communication: From Gestures to Signs](#)”), who provide a complete analysis of the role of handshape from a multimodal and embodied perspective, which results in an integrative review of the several perspectives on the communicative function of the hand. F. Taffoni et al. (Chapter “[Primates’ Propensity to Explore Objects: How Manual Actions Affect Learning in Children and Capuchin Monkeys](#)”) compare the impact of objects exploration in children and in non-human primates, showing that spontaneous exploration mediated by the hand has a great biological significance because it allows to discover and learn the relationship between action and effect and to plan goal-directed tasks. Results from an experiment with non-human primates and children are also discussed there. A.L. Ciancio et al. (Chapter “[Current Achievements and Future Directions of Hand Prostheses Controlled via Peripheral Nervous System](#)”) conclude the first part of the volume, facing the issue of the hand from one of the most advanced fields of research in bioengineering, i.e. neuroprosthetics. They present the state of the art of technological advancements in the use of neural interfaces in order to restore tactile perception in amputees, showing the complexity of the “hand system” and evidencing the strong linkage between perception, cognition, and action.

The second part of the volume considers the role of the hand in human identity and creativity, highlighting the importance of hand use in those activities that profoundly characterize human rationality and identity, such as playing and listening to music, cooking, or caring. M.T. Russo (Chapter “[The Human Hand as a Microcosm. A Philosophical Overview on the Hand and Its Role in the Processes of Perception, Action and Cognition](#)”) opens the part with a theoretical overview on the various philosophical discussions on the hand. Starting from the Greek debate between Aristotle and Anaxagoras, The author focuses on the controversy between the primacy of touch (i.e., hand) or that of sight (eye) in the characterization of human intelligence and on the consequences that this early debate has in the modern conception of the mind. J.M. Chillon (Chapter “[Ready-to-Hand in Heidegger. Philosophy as an Everyday Understanding of the World and the Question Concerning Technology](#)”) tackles a traditional question for Heideggerian scholars, i.e., the question of technology, which is properly centered in the notion of *Zuhandenheit* (readiness-to-hand). The relationship between man and the handiness world is thus presented in connection with the notion of technique and modern technology. Chapters “[The Therapeutic Hand](#)” and “[Cooking and Human Evolution](#)” face two fundamental dimensions of human life essentially mediated by the hand—i.e., caring and cooking. In the world of health care, the hand represents a medium for building an affective (and effective) relationship between caregivers and patients. The chapter by X. Escribano and A. Pérez-Bellmunt (Chapter “[The Therapeutic Hand](#)”) thus leads to the anthropology of caring as an essential part of the art of healing and caring. Instrumental, cognitive, and pathic at the same time, the therapeutic hand is here presented through its multidimensional features that cooperate for the care and healing of the human person. In Chapter “[Cooking and Human Evolution](#),” grounding on the works by Richard Wrangham, M.P. Chirinos stresses the role of cooking in the transition from hominization to humanization. The role of hand specialization in this biocultural practice made our digestive

system so different from other primates, thus impacting also on social behavior and habits. The volume ends considering the aesthetic dimension of humans. In Chapter “[Essential to Art](#),” S. Castro faces the relationship between aesthetic experience and touch, framing it within the traditional primacy of “intellectual” senses (i.e., sight and hearing) with respect to lower ones (i.e., smell, taste, and touch). Finally, in Chapter “[On the Role of the Hand in the Expression of Music](#),” M. Leman et al. provide a review of the role of the hand in the expression of music, focusing on different dimensions of music experience, i.e., music playing, listening, conducting, and learning.

Integrating biological, technological, and philosophical contributions, the volume aims at providing an innovative perspective on the issues related to hand. Though technological development has always offered new opportunities for scientific and social advancements, nowadays technology and biomedicine are co-evolving in extraordinary ways, asking philosophy and epistemology to understand the implications of these movements, e.g. the reshape of traditional philosophical concepts such as the opposition between natural and artificial, or basilar notions such as body, hand, or perception. More academic effort is expected in this direction, i.e. the identification of philosophical issues that are emerging within science and that inextricably connect life, technology, and cultural practices, thus emphasizing their mutual interdependencies.

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Perception, Cognition, Action

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2017, X, 192 p. 18 illus., 17 illus. in color., Hardcover

ISBN: 978-3-319-66880-2