

Preface

It has become widely acknowledged, and almost trivial to state, that the study of the control and coordination of biological movement – motor control – is inherently multidisciplinary. From the investigation of overt functional behavior to the intricacies of neuronal activations, the issues are numerous and invite many different levels of analysis, methods, and perspectives. Clearly, the biological movement system is simultaneously a dynamical, neurophysiological, electrophysiological, and intentional system, in short, a complex system in the technical sense of the word.

While multidisciplinary in motor control research is a necessity, it also presents a stumbling block to developing a coherent body of knowledge that represents the science of the control and coordination of movement. Research thrusts are developing from different academic backgrounds that are not easily understood by peers with entirely different disciplinary training. Not only for the student of motor control, but also for the advanced researcher, it can be daunting to make connections, for example, between cognitive issues like planning or attention and functional properties of the peripheral nervous system, between motor cortical activation and the biomechanics of the multi-joint limb system. Yet, all of these approaches aim to shed light on the same phenomenon – the astonishing ability of biological systems to move, perceive, grow, adapt, use tools, and do infinitely more things. For the science of motor control to progress more integration of disciplines is therefore necessary.

The present book is an attempt to facilitate connections across different strands of research and thereby contribute towards developing a more coherent body of knowledge. Organized into seven core topics, 38 contributions were selected from leading researchers to represent the study of movement in all its breadth and facets. In each of these topic sections four to six different approaches are juxtaposed to entice readers to go beyond their immediate focus and become acquainted with different lines of thought. An introduction at the beginning of each section provides a commentary and guideline by drawing connections between the individual contributions. The chapters are explicitly written in accessible form and provide some review followed by a more focused treatment of the authors' own research. The diversity aims to give the student of motor control not only understanding of the extent of the field but also, hopefully, some orientation for their own research.

This book is aimed at graduate students to provide both an introduction to and an overview of motor control. To date, there is no textbook that presents a systematic progression through motor control in all its breadth. On the one hand, this is a sign of a growing but not yet mature research; on the other hand, the sheer expanse of our area of research would make writing such a text a daunting undertaking for any single person. Evidently, there are a number of excellent single-authored textbooks that focus on, for example, the neurophysiology of movements, or on computational approaches, or on more clinically applied questions. While such books are eminently valuable, they necessarily present a selected subsection of the area, simply because they are written by a single author. A book that provides an informed and unbiased overview over the entire field would require a psychologist/physiologist/nonlinear dynamicist/kinesiologist/engineer to faithfully represent the advances made in all these domains. For this reason, the present volume invited a number of leading researchers to present their perspectives on seven selected core topics.

This book originally developed from the conference “Progress in Motor Control V – A Multidisciplinary Perspective” which took place at the Pennsylvania State University on August 19–22, 2005. The conference featured an impressive array of speakers and the oral and poster presentations spanned an unprecedented range of disciplinary approaches to motor control. The 350 attendees came from 23 countries to State College, PA to make this an exciting and special event. An amazing realization was that while all researchers were focused on motor control, due to their disciplinary affiliation, many typically attended different conferences, published in different journals and were part of different research communities. After the four conference days, such boundaries were overcome and discussions were spontaneous and mutually informative.

This book first began as a conference volume collecting this state-of-the-art research in its breadth and depth. Very soon, I realized that it would be beneficial to make this collection of papers less of a conference volume, but rather more of a textbook with an introductory flavor for both students and researchers. With this goal in mind, I subsequently also invited other contributors to complement the original conference presentations. The last section on the equilibrium-point hypothesis has a somewhat special status: the papers were presented as part of a symposium dedicated to the “40-year-anniversary” of the equilibrium-point hypothesis and simultaneously honored Anatol Feldman who spearheaded this research. The contributions presented an excellent discussion of this particular line of theorizing and are therefore included in this book.

One clear message from the conference was that the study of the control and coordination of biological behavior, in short *motor control*, is a thriving field of research with a fast growing body of knowledge. At the present stage of development the field of research may gain from more integration and a textbook covering and connecting the many strands of this research. This volume is one attempt in this direction.

Progress in Motor Control

A Multidisciplinary Perspective

Sternad, D. (Ed.)

2009, XVIII, 734 p., Hardcover

ISBN: 978-0-387-77063-5