Contents

Part I  The Nature of Motor Control

Nature of Motor Control: Not Strictly “Motor”, Not Quite “Control” . . . 3
Michael T. Turvey

Beyond Control: The Dynamics of Brain-Body-Environment Interaction in Motor Systems. ........................................... 7
Randall D. Beer

Towards Testable Neuromechanical Control Architectures for Running . . 25
Shai Revzen, Daniel E. Koditschek, and Robert J. Full

Control from an Allometric Perspective ............................................ 57
Bruce J. West

Synergies: Atoms of Brain and Behavior ................................. 83
J.A. Scott Kelso

Nature of Motor Control: Perspectives and Issues ............................ 93
Michael T. Turvey and Sergio Fonseca

Part II What is Encoded in the Brain?

Past, Present, and Emerging Principles in the Neural Encoding of Movement ................................................................. 127
Timothy J. Ebner, Claudia M. Hendrix, and Siavash Pasalar

From Intention to Action: Motor Cortex and the Control of Reaching Movements ........................................................... 139
John F. Kalaska
Contents

Control of Muscle Synergies by Cortical Ensembles ......................... 179
Michelle M. Morrow, Eric A. Pohlmeyer, and Lee E. Miller

Behavioral and Neurophysiological Aspects of Target Interception ....... 201
Hugo Merchant, Wilbert Zarco, Luis Prado, and Oswaldo Pérez

Learning from Learning: What Can Visuomotor Adaptations Tell us About the Neuronal Representation of Movement? .................... 221
Rony Paz and Eilon Vaadia

The Problem of Parametric Neural Coding in the Motor System .......... 243
Jacob Reimer and Nicholas G. Hatsopoulos

Part III Perception and Action

Introduction to Section on Perception and Action ......................... 263
Brett R. Fajen

Mutuality in the Perception of Affordances and the Control of Movement 273
Claudia Carello and Jeffrey B. Wagman

Object Avoidance During Locomotion .................................... 293
David A. McVea and Keir G. Pearson

The Roles of Vision and Proprioception in the Planning of Reaching Movements ......................................................... 317
Fabrice R. Sarlegna and Robert L. Sainburg

James Stanley and R. Christopher Miall

The Human Mirror Neuron System and Embodied Representations ....... 355
Lisa Aziz-Zadeh and Richard B. Ivry

Disorders of the Perceptual-Motor System ................................ 377
Steven A. Jax and H. Branch Coslett

Part IV Motor Learning

Some Contemporary Issues in Motor Learning ............................. 395
Karl M. Newell and Rajiv Ranganathan

Motor Learning and Consolidation: The Case of Visuomotor Rotation . 405
John W. Krakauer
Cortical Processing during Dynamic Motor Adaptation 423
Simon A. Overduin, Andrew G. Richardson, and Emilio Bizzi

Motor Learning: Changes in the Structure of Variability in a Redundant Task 439
Hermann Müller and Dagmar Sternad

Time Scales, Difficulty/Skill Duality, and the Dynamics of Motor Learning 457
Karl M. Newell, Yeou-Teh Liu, and Gottfried Mayer-Kress

Part V Bridging of Models for Complex Movements in 3D

Bridging of Models for Complex Movements in 3D 479
Stan Gielen

The Posture-Based Motion Planning Framework: New Findings Related to Object Manipulation, Moving Around Obstacles, Moving in Three Spatial Dimensions, and Haptic Tracking 485
David A. Rosenbaum, Rajal G. Cohen, Amanda M. Dawson, Steven A. Jax, Ruud G. Meulenbroek, Robrecht van der Wel, and Jonathan Vaughan

Grasping Occam’s Razor 499
Jeroen B.J. Smeets, Eli Brenner, and Juul Martin

Review of Models for the Generation of Multi-Joint Movements in 3-D 523
Stan Gielen

Part VI The Hand as a Complex System

Why the Hand? 553
Francisco J. Valero-Cuevas

Selective Activation of Human Finger Muscles after Stroke or Amputation 559
Marc H. Schieber, C.E. Lang, K.T. Reilly, P. McNulty, and A. Sirigu

Neural Control of Hand Muscles During Prehension 577
Jamie A. Johnston, Sara A. Winges, and Marco Santello

Multi-Finger Prehension: Control of a Redundant Mechanical System 597
Mark L. Latash and Vladimir M. Zatsiorsky
A Mathematical Approach to the Mechanical Capabilities of Limbs and Fingers .................................................. 619
Francisco J. Valero-Cuevas

Part VII   Forty Years of Equilibrium-Point Hypothesis

Origin and Advances of the Equilibrium-Point Hypothesis .............. 637
Anatol G. Feldman

The Biomechanics of Force Production .................................. 645
Denis Rancourt and Neville Hogan

The Implications of Force Feedback for the λ Model ................. 663
Richard Nichols and Kyla T. Ross

Control and Calibration of Multi-Segment Reaching Movements ...... 681
James R. Lackner and Paul DiZio

The Equilibrium-Point Hypothesis – Past, Present and Future ...... 699
Anatol G. Feldman and Mindy F. Levin

Subject Index ........................................................................ 727
Progress in Motor Control
A Multidisciplinary Perspective
Sternad, D. (Ed.)
2009, XVIII, 734 p., Hardcover