

Preface

The brain is an extremely complex system. Disabilities caused by impaired brain function have been tackled mainly from the perspective of rehabilitation, which involves assisting persons with disabilities to recover from or improve dysfunctions, and ultimately aims to improve their well-being. Although much effort has been made to this end, the impaired brain is often difficult to rehabilitate, and part of this difficulty may be caused by our limited knowledge of the mechanisms of the brain system.

Systems neuroscience is a subdiscipline of neuroscience that studies brain functions at the systems level. Recently, advanced techniques have provided new methods for conducting research in this field. For example, imaging techniques such as functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) have allowed researchers to investigate spatiotemporal dynamics in the living human brain. Consequently, knowledge in the field is now rapidly growing. In addition, these advanced imaging techniques have started to contribute to the support of impaired brain functions by providing new prosthetics, such as brain-machine and brain-computer interfaces.

The accumulating knowledge in systems neuroscience and related fields might be used for more practical applications in rehabilitation. To discuss this possibility, we launched the Conference on Systems Neuroscience and Rehabilitation in March 2010. The first conference, SNR2010, was held at the National Rehabilitation Center for Persons with Disabilities (NRCD) in Tokorozawa, Japan, and a wide range of researchers from systems neuroscience, neurology, psychology, engineering, and other disciplines exchanged ideas at this forum.

At the conference, keynote and special lectures were given by Dr. Leonardo Cohen of the National Institute of Neurological Disorders and Stroke, Dr. Yves Rossetti of the Université Claude Bernard, and Dr. Shigeru Kitazawa of Juntendo University. After the keynote lecture about brain-computer interfaces and neurorehabilitation by Dr. Cohen, the special lecturers and speakers gave presentations in three sessions: brain-machine or brain-computer interfaces (Dr. Yasuharu Koike of Tokyo Institute of Technology and I), neurorehabilitation (Dr. Toru Ogata of NRCD and Dr. Tatsuya Mima of Kyoto University), and augmenting cognition

(Dr. Yves Rossetti, Dr. Shigeru Kitazawa, and Dr. Katsumi Watanabe of The University of Tokyo). Each lecturer and speaker contributed a chapter to this book. Eight young investigators also gave 7-min presentations, and Dr. Akitoshi Ogawa of RIKEN Brain Science Institute and Dr. Satoko Koganemaru of Kyoto University included these contributions in their chapters. This book is the outcome of the conference. Consequently, it does not cover all of the research topics in the field of systems neuroscience; that said, however, we are confident that this book constitutes a solid foundation for researchers who aim to contribute scientifically to the project of helping persons with disabilities expand their range of activities.

In closing, we would like to express our profound gratitude to the NRCD executives – Dr. Tsutomu Iwaya, Dr. Fumio Eto, Dr. Masami Akai, Dr. Motoi Suwa, and Dr. Yasoichi Nakajima – and for a Grant-in-Aid from the Ministry of Health, Labour, and Welfare (Japan) for supporting both the conference and the publication of this book.

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