Preface

Five decades of brain research have led to the emergence of a new field, spanning the entire spectrum of cognition from synaptic dynamics to social interactions, and which integrates nonlinear neurodynamics operating simultaneously at and across various scales. A new kind of scientist is emerging, schooled in multiple academic disciplines, comfortable in working with data from different levels, and conversant with the mathematical and computational tools that are essential to cross the boundaries of these disciplines.

Cognition, in its essence, is dynamic and multilayered, and the pursuit of new clues inevitably leads us from one layer to the next, both reductionist and holistic. A new trend in the study of cognition from the point of view of neurodynamics has emerged as a result of the rapidly evolving developments of the activity within the field of Nonlinear Dynamics and Cognitive Science.

In order to promote the integration of Cognitive Science and Neurodynamics as a whole, the International Conference on Cognitive Neurodynamics has been held biannually since 2007 under the support of the editorial board meeting of Cognitive Neurodynamics (Springer). The first conference, ICCN2007, was held in Shanghai, and the second, ICCN2009, in Hangzhou, also in China.

And this was the third ICCN, at The Hilton Niseko Village, Hokkaido, Japan, from June 9–13, 2011. Due to the tragedies of the Great East Earthquake and ensuing tsunami in Japan, many people had difficulty in attending, so we are very grateful for the efforts of those who nonetheless helped to make ICCN2011 a success. There were 161 participants from 17 countries, 6 plenary talks by Prof. Leslie Kay, Prof. Robert Kozma, Prof. Soo-Young Lee, Prof. Hajime Mushiake, Prof. Noriko Osumi, and Prof. Peter Robinson, 130 papers, and invited lectures by 3 renowned researchers, Prof. Shun-ichi Amari, Prof. Minoru Tsukada, and Prof. Walter Freeman.

The conference ranged from a microscopic model of the neural impulse to a macroscopic model of the sleeping rhythm. Key sessions were: Neuronal Impulse, Patterns and Bifurcation, Integrative and Multi-level Approaches for Cognitive Neurodynamics, Model Complexity in Neural Network Phenomena, Toward Understanding of Intelligence: Collaboration between Neuroscience and Robotics, Spatiotemporal Network Dynamics, Shaping Embodied Neurodynamics through

Interaction, Mathematical and Statistical Aspects of Neurodynamics, Dynamic Patterns of Neural Activity in Human Information Processing, and Neural Basis of Biological Timing. We express our sincere appreciation to all the session organizers. We also appreciate the session presenters who maintained discussions throughout the sessions and at the poster presentations.

Another highlight was the young researcher session in which we asked young researchers to discuss and create a tentative collaboration plan which was then evaluated by the senior researchers. The young researchers learned much from the suggestions of the senior people. We also wish to acknowledge the Dynamic Brain Forum (DBF), co-organized with ICCN2011, and in particular, Prof. Jan Lauwerence for his organization of DBF sessions.

Historically, DBF was the "Origin of Brain Dynamics Study", the core research field of ICCN. DBF was initiated by the Japanese "Gang of Five" who were focused on nonlinear dynamics and their activity led to related work in Cognitive Neurodynamics in China which finally resulted in ICCN2007. So, ICCN owes much to DBF for their research field concept establishment, and ICCN2011 was happy to have coordinated with DBF2011. The next ICCN2013 will be held in Sigtuna, Sweden, by Prof. Hans Lijenstrom (Swedish Univ. of Agricultural Science). We look forward to sharing fresh topics and ideas both among the people who originally gathered at Niseko and with all other attendees.

We would also like to express our gratitude to the supporting organizations, Grant-in-Aid for Scientific Research on Innovative Areas "The study on the neural dynamics for understanding communication in terms of complex hetero systems (No.4103)" of MEXT Japan, RIKEN BSI, and Tamagawa University Global COE Program "Origins of the Mind"; for financial support from SCAT, sponsorship by Springer, FIRST project and Budapest Seminar, and co-sponsorship by JNNS, INNS and CNS. We hope all the supporting activity will continue to foment the development of this fast-moving and exciting scientific field.

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