Advances in Cognitive Neurodynamics (IV)

More information about this series at <http://www.springer.com/series/11163>

Hans Liljenström

Editor

Advances in Cognitive Neurodynamics (IV)

Proceedings of the Fourth International
Conference on Cognitive
Neurodynamics – 2013

Springer

Editor

Hans Liljenström

Department of Energy and Analysis, SLU

Biometry and Systems Analysis

Uppsala, Sweden

Agora for Biosystems

Sigtuna, Sweden

ISSN 2213-3569

ISSN 2213-3577 (electronic)

Advances in Cognitive Neurodynamics (IV)

ISBN 978-94-017-9547-0

ISBN 978-94-017-9548-7 (eBook)

DOI 10.1007/978-94-017-9548-7

Library of Congress Control Number: 2014958900

Springer Dordrecht Heidelberg New York London

© Springer Science+Business Media Dordrecht 2015

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer Science+Business Media B.V. Dordrecht is part of Springer Science+Business Media (www.springer.com)

Preface

Cognition in its essence is dynamic and multilayered, and the pursuit of new clues inevitably leads from one layer to the next, both bottom-up and top-down. Similarly, the nervous system can be described at different organizational levels, e.g. sub-cellular, cellular, network and the level of the entire brain, and each level is characterized by its dynamical states and processes. Knowledge and understanding of the great complexity of neural systems has increased tremendously in the last few decades. Experimental methods, such as patch clamp technique, EEG, MEG, PET, fMRI etc., have provided a huge amount of data. At the same time, statistical, mathematical, and computational analysis and modeling have contributed to an understanding of the intricate relations between structure, dynamics, and function of neural systems at different scales. Both holistic and reductionist approaches have proven essential for a more comprehensive description.

The young and rapidly growing research field of cognitive neurodynamics has evolved from the inter-play between experimental and theoretical/computational neuroscience and cognitive science. Inevitably, this field is highly interdisciplinary, where scientists from many different fields, such as neuroscience, cognitive science, psychology, psychiatry, medicine, mathematics, physics, and computer science contribute to the advancement of the field. In particular, methods to describe, analyze, and model nonlinear dynamics, including spiking, bursting, oscillating, and chaotic behavior, often in combination with stochastic processes, need to be further developed and applied. Also, advanced techniques to implement the models in artificial systems, computers, and robots are called for.

In order to promote the integration of cognitive science and neurodynamics as a whole, the International Conference on Cognitive Neurodynamics (ICCN) is held biennially since 2007 with support from the international journal *Cognitive Neurodynamics* (Springer). The first two conferences in the series were held in China (Shanghai and Hangzhou, respectively) and the third conference was held in Japan (Hokkaido).

The 4th conference, ICCN2013, on which these proceedings are based, was for the first time organized outside Asia, in Sigtuna, Sweden, on 23–27 June 2013,

right after the Swedish Midsummer. The conference was held in the inspiring and creative atmosphere of the Sigtuna Foundation, offering a stimulating forum for scientists, scholars, and engineers to review the latest progress in the field of cognitive neurodynamics, and to exchange experiences and ideas. The Sigtuna Foundation, with its unique architecture on a hill near the shore of lake Mälaren, provided an excellent setting for the talks and intense discussions, often extending late into the bright midsummer nights.

ICCN2013 attracted 153 participants from 20 different countries, who made this conference a successful and memorable event. There were four keynote talks by leading scientists in the field of cognitive neurodynamics: Prof. Walter Freeman, Prof. Riitta Hari, Prof. Fabio Babiloni, and Prof. Yoko Yamaguchi. In addition, eight plenary talks were given by Prof. Steven Bressler, Prof. Barry Richmond, Prof. Yanchao Bi, Prof. Scott Kelso, Prof. John Hertz, Prof. James Wright, Prof. Paul Rapp, and Prof. Aike Guo. In total 120 papers were presented in oral or poster sessions. The topics ranged from macro- and meso- to microscopic levels, from social and interactive neurodynamics, all the way down to neuronal processes at quantum levels.

This volume fairly well reflects the large span of research presented at ICCN2013. The papers of this volume are grouped in ten parts that are organized essentially in a top-down structure. The first parts deal with social/interactive (I) and mental (II) aspects of brain functions and their relation to perception and cognition (III). Next, more specific aspects of sensory systems (IV) and neural network dynamics of brain functions (V), including the effects of oscillations, synchronization, and synaptic plasticity (VI), are addressed, followed by papers particularly emphasizing the use of neural computation and information processing (VII). With the next two parts, the levels of cellular and intracellular processes (VIII) and finally quantum effects (IX) are reached. The last part (X), with the largest number of papers of mixed topics, is devoted to the contributions invited by the Dynamic Brain Forum (DBF), which was co-organized with ICCN2013.

We wish to express our gratitude to all those who made ICCN2013 and this Proceedings possible. In addition to all the contributing authors, we owe thanks to the special session organizers, Drs. Katarzyna Blinowska, Erik Fransén, Walter Freeman, Pavel Herman, Włodzimierz Klonowski, Jan Lauwereyns, Sisir Roy, Emmanuelle Tognoli, Felix Tretter, Hong-bo Yu, and Tao Zhang. We gratefully acknowledge support from The Swedish Research Council, the Grant-In-Aid G4103 MEXT Japan, the Sigtuna Foundation, Agora for Biosystems, Uppsala University, the Swedish University of Agricultural Sciences, as well as from Springer. We are also grateful to all the helpful students who assisted during the conference, and to the friendly staff at the Sigtuna Foundation, including those in the kitchen, who provided us with excellent food throughout the conference.

The 5th conference in the series, ICCN2015, will be held in Sanya on the Chinese island of Hainan, 3–7 June 2015, organized by Prof. Rubin Wang and colleagues at the East China University of Science and Technology. We have no doubt that ICCN2015 will be as successful as the previous ones, bringing together

an interdisciplinary group of scientists in an inspiring atmosphere for the discussion of new exciting knowledge and surprises in the exploration of the human brain and mind. This is the guiding idea that will make each ICCN meeting a most adventurous event for many years to come.

Hans Liljenström
Hans A. Braun

Organizers

Honorary Chairs

Shun-ichi Amari, RIKEN Brain Science Institute, Japan

Jean-Pierre Changeux, Institut Pasteur, France

Walter J. Freeman, University of California, Berkeley, USA

Fanji Gu, Shanghai Society for Biophysics/Fudan University, P.R. China

Hermann Haken, University of Stuttgart, Germany

John J. Hopfield, Princeton University, USA

Barry J. Richmond, NIMH/NIH/DHHS, USA

Minoru Tsukada, Tamagawa University, Japan

General Chair

Hans Liljenström, SLU and Agora for Biosystems, Sweden

Co-Chairs

Hans A. Braun, Philipps University of Marburg, Germany

Rubin Wang, East China University of Science and Technology, P.R. China

Yoko Yamaguchi, RIKEN Brain Science Institute (BSI), Japan

Local Organizing Committee

Hans Liljenström, SLU/Agora, Uppsala/Sigtuna

Christian Finke, Carl von Ossietzky University, Germany

Alf Linderman, Sigtuna Foundation, Sigtuna

Dietrich von Rosen, SLU, Uppsala

Björn Wahlund, Karolinska Institutet, Stockholm

Peter Århem, Karolinska Institutet, Stockholm

Program Committee

Gaute Einevoll, UMB, Norway
Jeanette Hellgren, Royal Institute of Technology, Sweden
John Hertz, Nordita, Sweden
Guang Li, Zhejiang University, P.R. China
Svetlana Postnova, University of Sydney, Australia
Paul Rapp, Drexel University, College of Medicine, USA
Ichiro Tsuda, Hokkaido University, Japan
Björn Wahlund, Karolinska Institute, Sweden
Alessandro Villa, Université de Lausanne, Switzerland
Peter Århem, Karolinska Institute, Sweden

Advisory Committee

Kazuyuki Aihara (The University of Tokyo, Japan)
Fabio Babilloni (University of Rome, Italy)
Erol Basar (Istanbul Kultur University, Turkey)
Roman Borysyuk, (Russian Academy of Science/University of Plymouth, UK)
Włodzisław Duch (Nicolaus Copernicus University, Poland)
Peter Erdi (Kalamazoo College, USA)
Erik Fransen (Royal Institute of Technology, Sweden)
Riitta Hari (Aalto University, Finland)
Leslie Kay (University of Chicago, USA)
Scott Kelso (Florida Atlantic University, USA)
Peter Koenig (University of Osnabrück, Germany)
Robert Kozma (University of Memphis, USA)
Anders Lansner (Royal Institute of Technology, Sweden)
Jan Lauwereyns (University of Wellington, New Zealand)
Soo-Young Lee (Korea Advanced Institute of Science and Technology, Republic of Korea)
Cees van Leuven (RIKEN Brain Science Institute, Japan)
Pei-ji Liang (Shanghai Jiao Tong University, P.R. China)
Shigetoshi Nara (Okayama University, Japan)
Alessandro Treves (International School for Advanced Studies (SISSA), Italy)
Joanna Tyrcha (Stockholm University, Sweden)
Francesco Ventriglia (Institute of Cybernetics of CNR, Italy)
Deliang Wang (Ohio State University, USA)
James Wright (Auckland University, New Zealand)

Secretariat

Maria-Pia Anderloni, Sigtunastiftelsen, Sigtuna, Sweden
Sofia af Geijerstam, Sigtunastiftelsen, Sigtuna, Sweden
Malin Lindqvist, Sigtunastiftelsen, Sigtuna, Sweden
Birgitta Lagerholm, Sigtunastiftelsen, Sigtuna, Sweden

Cover Design

Regina Clevehorn, Sigtunastiftelsen, Sigtuna, Sweden

Home Pages

Sigtunastiftelsen, Sigtuna, Sweden, www.sigtunastiftelsen.se/ICCN2013

Agora for Biosystems, www.agoraforbiosystems.se

Sponsors

Agora for Biosystems

Sigtunastiftelsen, the Sigtuna Foundation

Vetenskapsrådet Vetenskapsrådet, the Swedish Research Council

Grant-in-Aid G4103 MEXT Japan

Springer

Cognitive Neurodynamics, Springer

Contents

Part I Interactive and Social Neurodynamics

Brain Network Efficiency and Intelligent Scores of Children	3
Fang Duan, Hiroyuki Tsubomi, Yuko Yoshimura, Mitsuru Kikuchi, Yoshio Minabe, Kastumi Watanabe, and Kazuyuki Aihara	
Computational Emotions	9
Mauricio Iza Miqueleiz and Jesús Ezquerro Martínez	
Group Neurodynamics: Conceptual and Experimental Framework.....	15
Darius Plikynas, Saulius Masteika, Gytis Basinskas, Darius Kezys, and Pravin Kumar	
The Activity Modalities: A Priori Categories of Coordination	21
Lars Taxén	
On the Use of Cognitive Neuroscience in Industrial Applications by Using Neuroelectromagnetic Recordings.....	31
Giovanni Vecchiato, Anton Giulio Maglione, and Fabio Babiloni	
A Study of c-VEP/SSVEP BCI Hybrid System	39
Gang Zhang, Guangyu Bin, and Xiaorong Gao	

Part II Higher Mental Functions and Dysfunctions

Memory Consolidation from Seconds to Weeks Through Autonomous Reinstatement Dynamics in a Three-Stage Neural Network Model	47
Florian Fiebig and Anders Lansner	
Biologically Inspired Models of Decision Making	55
Włodzimierz Klonowski, Michał Pierzchalski, Paweł Stepień, and Robert A. Stepień	

Decision Making Mechanisms Based on Fundamental Principles of Thermodynamics	67
Anton P. Pakhomov	
Reward Prediction in Prefrontal Cortex and Striatum	77
Xiaochuan Pan, Rubin Wang, and Masamichi Sakagami	
The Integrated Neuropsychiatric Assessment System: A Generic Platform for Cognitive Neurodynamics Research	83
Paul Rapp, David O. Keyser, Dominic Nathan, and Christopher J. Cellucci	
An Interaction Between Orbitofrontal and Rhinal Cortices Contributing to Reward Seeking Behavior	89
Barry J. Richmond	
Exploring Dynamic Temporal-Topological Structure of Brain Network Within ADHD	93
Rong Wang, Pan Lin, and Ying Wu	
Study on the EEG Rhythm in Meditation	99
Tinglin Zhang, Ruxiu Liu, Chungang Shang, Ruifen Hu, Hans Liljenström, and Guang Li	
Part III Cortical Dynamics in Perception and Cognition	
Set-Related Neurocognitive Networks	111
Steven L. Bressler	
The Dissipative Many-Body Model and Phase Transitions in Brain Nonlinear Dynamics	117
Antonio Capolupo, Walter J. Freeman, and Giuseppe Vitiello	
Advanced Models of Cortical Dynamics in Perception	127
Walter J. Freeman, Robert Kozma, Guang Li, Rodrigo Quian Quiroga, Giuseppe Vitiello, and Tinglin Zhang	
Modeling Cortical Singularities During the Cognitive Cycle Using Random Graph Theory	137
Robert Kozma and Walter J. Freeman	
Concept Cells in the Human Brain	143
Rodrigo Quian Quiroga	
EEG Spatiotemporal Pattern Classification of the Stimuli on Different Fingers	147
Tinglin Zhang, Lengshi Dai, You Wang, Walter J. Freeman, and Guang Li	

Part IV Neurodynamics of Sensory Systems

Time Varying VEP Evaluation as a Prediction of Vision Fatigue Using Stimulated Brain-Computer Interface.....	157
Teng Cao, Chi Man Wong, Feng Wan, and Yong Hu	
Spike Synchronization Analysis in a Network Model of the Olfactory Bulb	161
Ying Du and Rubin Wang	
Laterality of Gamma-Oscillations in Primate Supplementary Motor Area During Performance of Visually-Guided Movements	165
Ryosuke Hosaka, Toshi Nakajima, Kazuyuki Aihara, Yoko Yamaguchi, and Hajime Mushiake	
Thalamocortical and Intracortical Contributions to Task-Related Cross-Frequency Coupling in Auditory Cortex	171
Marcus Jeschke and Frank W. Ohl	
Temporal Characteristics of the Steady State Visual Evoked Potentials...	177
Maciej Labecki, Magdalena Zieleniewska, Karol Augustin, Jaroslaw Zygierecz, and Piotr Suffczynski	
A Novel Neural Coding Mechanism Study of Interaural Time Difference Detection	181
Hong Zhang, Jiong Ding, and Qinye Tong	

Part V Multi-scale Neural Network Dynamics

Representation-Implementation Trade-Off in Cortico-Limbic Ganglio-Basal Loops	189
Jean-Paul Banquet, Philippe Gaussier, Mathias Quoy, E. Save, F. Sargolini, and B. Poucet	
Source Differences in ERP Components Between Pain and Tactile Processing	199
Yong Hu, Wutao Lou, Weiwei Peng, Li Hu, Zhiguo Zhang, and Jane Z. Wang	
The Time-Varying Causal Coupling in Brain and Organization of Its Networks	203
Maciej Kaminski, Katarzyna J. Blinowska, Aneta Brzezicka, Jan Kaminski, and Rafal Kus	
Enhancement of Weak Signal Detection in Parallel Arrays of Integrate-and-Fire Neurons by Negative Spatial Correlation	209
Yan-Mei Kang and Yong Xie	

A Computational Model of Hippocampal-VTA Microcircuit: Why Expectation of Reward in Rat Striatum at Choice Point Is Covert?	215
Yongtao Li and Ichiro Tsuda	
A Computational Model of Cortical Pathways Formed with Electroencephalogram Synchronization	221
Naoyuki Sato	
Neurodynamics of Up and Down Transitions in a Network Model	231
Xuying Xu and Rubin Wang	
 Part VI Oscillations, Synchronization and Synaptic Plasticity	
STDP Produces Well Behaved Oscillations and Synchrony	241
David Bhowmik and Murray Shanahan	
Robust Synchronization in Excitatory Networks with Medium Synaptic Delay	253
Hong Fan, Zhijie Wang, and Fang Han	
Synchronization in Neuronal Population with Phase Response	259
Xianfa Jiao, Danfeng Zhu, and Rubin Wang	
Geometry of Dynamic Movement Primitives in Neural Space: A FORCE-Learning Approach	265
Hiromichi Suetani	
Contribution of Endogenous Acetylcholine to STDP Induction	271
Eriko Sugisaki, Yasuhiro Fukushima, Minoru Tsukada, and Takeshi Aihara	
Bidirectional Wave Propagations Can Improve Loop Finding Time	277
Kei-Ichi Ueda, Yasumasa Nishiura, Yoko Yamaguchi, and Keiichi Kitajo	
Phase Coupling Between Hippocampal CA1 and Prefrontal Cortex in a Depression-Model Rats Indicating Impaired Synaptic Plasticity	283
Chenguang Zheng, Zhuo Yang, and Tao Zhang	
 Part VII Neural Computation and Information Processing	
Mapping of Cortical Avalanches to the Striatum	291
Jovana J. Belić, Andreas Klaus, Dietmar Plenz, and Jeanette Hellgren Kotaleski	

Gauss-Markov Processes for Neuronal Models Including Reversal Potentials	299
Aniello Buonocore, Luigia Caputo, Amelia G. Nobile, and Enrica Pirozzi	
On Super-Turing Neural Computation	307
J����� Cabessa and Alessandro E.P. Villa	
Chasing Cognitive Neurodynamics by Single-Trial Analysis of Electroencephalogram (EEG)	313
Yong Hu, Li Hu, Hongtao Liu, Zhiguo Zhang, Guangju Zhang, and Hongyan Cui	
Brain: Biological Noise-Based Logic	319
Laszlo B. Kish, Claes G. Granqvist, Sergey M. Bezrukov, and Tamas Horvath	
Time-Dependent Approximate and Sample Entropy Measures for Brain Death Diagnosis	323
Li Ni, Jianting Cao, and Rubin Wang	
Preliminary Study on EEG-Based Analysis of Discomfort Caused by Watching 3D Images	329
Jie Yin, Jingna Jin, Zhipeng Liu, and Tao Yin	
EEG-EMG Analysis on Corticomuscular Coherence of Middle Finger Flexion Tasks	337
Tianchen Zhai, Cheng Qi, Rui Xu, Anshuang Fu, Lixin Zhang, Xin Zhao, Peng Zhou, Hongzhi Qi, Baikun Wan, Xiaoman Cheng, Weijie Wang, and Dong Ming	
Part VIII Signal Transmission at Cellular and Network Levels	
Bursting in Two-Coupled Cells Network in the Pre-B��������������� ..	347
Lixia Duan, Dandan Yuan, and Xi Chen	
An Electrodiffusive Formalism for Ion Concentration Dynamics in Excitable Cells and the Extracellular Space Surrounding Them	353
Geir Halnes, Ivar �����, Klas H. Pettersen, Stig W. Omholt, and Gaute T. Einevoll	
Dispersion in Excitatory Synaptic Response	361
Francesco Ventriglia	
Research on the Neural Energy Coding	367
Rubin Wang and Ziyin Wang	

Neural Field Dynamics and the Development of the Cerebral Cortex	373
J.J. Wright and P.D. Bourke	

Signal Processing by Ephaptic Coupling of Hodgkin-Huxley Axons	385
Masashi Yamada, Hideaki Konno, and Nobuyuki Takahashi	

Part IX Quantum Cognition

Modeling Concept Combinations in a Quantum-Theoretic Framework ..	393
Diederik Aerts and Sandro Sozzo	

Beyond the Quantum Formalism: Consequences of a Neural-Oscillator Model to Quantum Cognition	401
J. Acacio de Barros	

Random Variables Recorded Under Mutually Exclusive Conditions: Contextuality-by-Default	405
Ehtibar N. Dzhafarov and Janne V. Kujala	

Weak vs. Strong Quantum Cognition	411
Paavo Pyllkkänen	

Quantum Ontology: A New Direction for Cognitive Modeling	419
Sisir Roy	

Part X Dynamic Brain Forum

Cue-Dependent Modulation of Synchrony in Primates' Medial Motor Areas	427
Haruka Arisawa, Ryosuke Hosaka, Keisetsu Shima, Hajime Mushiake, and Toshi Nakajima	

Multisynaptic State Functions Characterizing the Acquisition of New Motor and Cognitive Skills	435
José M. Delgado-García, Raudel Sánchez-Campusano, Alejandro Carretero-Guillén, Iván Fernández-Lamo, and Agnès Gruart	

Visual Hallucinations in Dementia with Lewy Bodies (I): A Hodological View	441
Hiroshi Fujii, Hiromichi Tsukada, Ichiro Tsuda, and Kazuyuki Aihara	

Dividing Roles and Ordering Information Flow in the Formation of Communication Systems: The Influence of Role Reversal Imitation	447
Takashi Hashimoto, Takeshi Konno, and Junya Morita	

Optical Imaging of Plastic Changes Induced by Fear Conditioning in Auditory, Visual, and Somatosensory Cortices	453
Yoshinori Ide, Muneyoshi Takahashi, Johan Lauwereyns, Minoru Tsukada, and Takeshi Aihara	
Reward-Modulated Motor Information in Dorsolateral Striatum Neurons	459
Yoshikazu Isomura	
Anxiolytic Drugs and Altered Hippocampal Theta Rhythms: The Quantitative Systems Pharmacological Approach	465
Tibin John, Tamás Kiss, Colin Lever, and Péter Érdi	
Carbachol-Induced Neuronal Oscillation in Rat Hippocampal Slices and Temperature	473
Itsuki Kageyama and Kiyohisa Natsume	
Associative Memory Network with Dynamic Synapses	479
Yuichi Katori, Yosuke Otsubo, Masato Okada, and Kazuyuki Aihara	
Neural Dynamics for a Sudden Change in Other's Behavioral Rhythm ...	485
Masahiro Kawasaki, Keiichi Kitajo, Kenjiro Fukao, Toshiya Murai, Yoko Yamaguchi, and Yasuko Funabiki	
Active Behaviors in Odor Sampling Constrain the Task for Cortical Processing	491
Leslie M. Kay, Daniel Rojas-Líbano, and Donald Frederick	
Autonomous Situation Understanding and Self-Referential Learning of Situation Representations in a Brain-Inspired Architecture .	497
Edgar Koerner, Andreas Knoblauch, and Ursula Koerner	
Metastable Activity Patterns in Cortical Dynamics and the Illusion of Localized Representations	503
Robert Kozma	
Memories as Bifurcations Shaped Through Sequential Learning	509
Tomoki Kurikawa and Kunihiro Kaneko	
Behavioral Interactions of Two Individual Arm Robots Using Independent Chaos in Recurrent Neural Networks	515
S. Kuwada, T. Aota, K. Uehara, S. Hiraga, Y. Takamura, and Shigetoshi Nara	
Free Will and Spatiotemporal Neurodynamics	523
Hans Liljenström	

High Frequency Oscillations for Behavioral Stabilization During Spatial Alternation	531
Hiroshi Nishida, Muneyoshi Takahashi, A. David Redish, and Johan Lauwereyns	
Planning Based on One's Own Past and Other's Past During a Communication Task	537
Jiro Okuda, Maki Suzuki, Takeshi Konno, Junya Morita, and Takashi Hashimoto	
Development of the Multimodal Integration in the Superior Colliculus and Its Link to Neonates Facial Preference	543
Alexandre Pitti, Yasuo Kuniyoshi, Mathias Quoy, and Philippe Gaussier	
Excitation-Inhibition Balance of Prefrontal Neurons During the Execution of a Path-Planning Task	547
Kazuhiro Sakamoto, Naohiro Saito, Shun Yoshida, and Hajime Mushiake	
Simultaneous Multichannel Communication Using Chaos in a Recurrent Neural Network	553
Ken-ichiro Soma, Ryota Mori, and Shigetoshi Nara	
Self-Reflective Mind in a Machine: Neural Correlates for Multidimensional Mind Perception	561
Hideyuki Takahashi and Takashi Omori	
Formation of Pyramidal Cell Clusters Under Neocortical Balanced Competitive Learning	567
Amir Tal and Hava Siegelmann	
Systems Biopsychiatry: The Cognitive Neurodynamics of Schizophrenia in an Integrated Systemic View	575
Felix Tretter	
Modeling the Genesis of Components in the Networks of Interacting Units	583
Ichiro Tsuda, Yutaka Yamaguti, and Hiroshi Watanabe	
Visual Hallucinations in Dementia with Lewy Bodies (II): Computational Aspects	589
Hiromichi Tsukada, Hiroshi Fujii, Ichiro Tsuda, and Kazuyuki Aihara	
Neural Dynamics Associated to Preferred Firing Sequences	597
Alessandro E.P. Villa, Alessandra Lintas, and Jérémie Cabessa	

**Evolution of Heterogeneous Network Modules via
Maximization of Bidirectional Information Transmission 605**
Yutaka Yamaguti

**Gamma-Band Shift in the Activity of Rat Hippocampal CA1:
A Comparison of Memory-Guided and Visually-Cued Spatial Choice 609**
Noha Mohsen Zommara, Hiroshi Nishida, Muneyoshi Takahashi,
and Johan Lauwereyns

Index 615