

Preface

A symposium on nonlinear statistical mechanics and nonlinear physics and general topics on form was held in Kyoto from 31 October to 3 November, 2008 under the auspices of the Society for Science on Form, Japan, partially supported by a Grant-in-Aid for Scientific Research (c) (No. 20540376) from the Japan Society for the Promotion of Science, and funded by an educational grant of the Institute of Electronics, Information and Communication Engineers, Kansai. This symposium was attended by 143 participants. There were 69 talks and 7 posters presented.

It should also be noted that just thirty years have passed since the international symposium on nonlinear nonequilibrium statistical mechanics was held in the same city, Kyoto, as an Oji seminar, which is a monumental conference in this research area, and that some of the current symposium participants also took part in the Oji seminar thirty years ago. (See the Proceedings of the 1978 Oji Seminar at Kyoto, July 10–14, 1978, <http://ptp.ipap.jp/journal/PTPS-64.html>)

This special issue contains peer-reviewed post-conference papers, which consist of one review and five original papers contributed from the participants of the symposium on nonlinear statistical mechanics and nonlinear physics and general topics on form in 2008. The themes range widely over various research fields: structural glasses, brain science, neuroscience, pattern dynamics, cooperative phenomena of coupled oscillators, and complex network.

The first paper is a brief and free-spirited review of structural glasses written from the personal perspective of the founder of the mode coupling theory. The next two papers focus on problems stemming from brain science and neuroscience. One of these papers estimated the functional connectivity between electrodes based on the observation of spontaneous bursting activities of a cultured neural network with the help of Bayes' prediction, and reproduced the spontaneous activity using a network model constructed from the obtained connectivity. The other paper considered the situation in which a neural network evolves and its structure varies and examined network dynamics combined with learning theory. The next two papers investigated large degrees of freedom such as pattern formation, pattern dynamics, coupled oscillators and so on. In the fourth paper, entrainments of the Turing-unstable FitzHugh-Nagumo equation with an applied spatio-temporal external field were analytically and numerically studied, and a completely entrained, a periodically unentrained and a completely unentrained state were observed. A novel method of constructing feedback coupling is proposed to control dynamical states of coupled oscillators in the fifth paper. The last paper related the small-world property of a Watts-Strogatz network to the correlation decay of a random walk on the network, in which the spectral statistics of the transition matrix were intensively studied.

Finally, we are very grateful to the editors of *FORMA* for their generous consideration in the publication of these conference papers as a special issue.

This issue is dedicated to Dr. Hirokazu Fujisaka who passed away suddenly on August 21, 2007 and would have been a contributor, if he had lived.

December 1, 2009

Syuji MIYAZAKI
Kyoto University, Japan