Berlin Center for Studies of Complex Chemical Systems

Fritz-Haber-Institut der Max-Planck-Gesellschaft, Humboldt-Universität, Max-Delbrück-Centrum für Molekulare Medizin, Otto-von-Guericke-Universität Magdeburg, Physikalisch-Technische Bundesanstalt, Technische Universität Berlin, Universität Potsdam.

Seminar

Complex Nonlinear Processes in Chemistry and Biology

Honorary Chairman: G. Ertl.
Organizers: M. Bär, C. Beta, H. Engel, M. Falcke, M. J. B. Hauser, J. Kurths, A. S. Mikhailov, P. Plath, L. Schimansky-Geier, and H. Stark.

Friday, 25th May, 2012, 16:00 s.t.
Address: Richard-Willstätter-Haus, Faradayweg 10,14195 Berlin, U-Bahnhof Thielplatz (U3).

Dr. Shigefumi Hata

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Global feedback control of Turing patterns in network-organized activator-inhibitor systems

Control of self-organization processes is an important problem encountered in various applications. Turing patterns provide classical examples of self-organized structures far from thermal equilibrium. They have been experimentally and theoretically investigated for chemical and biological reaction-diffusion media. Turing patterns have also been considered for network-organized activator-inhibitor systems and their properties for different kinds of random networks have been discussed [1]. The question addressed in this talk is whether the network Turing patterns can be controlled. Recently, we have proposed and studied the control scheme for network Turing patterns which is based on the introduction of global feedback [2]. It has been shown that, by using this method, the Turing instability and the properties of the emerging patterns can be efficiently steered. The hysteresis typical for the network Turing patterns can thus be prevented and patterns with the desired properties can be obtained. In my talk, I will also report preliminary results of our current investigations of non-equilibrium pattern formation near the Hopf-Turing bifurcation in the network Brusselator model.

[1] H. Nakao and A. S. Mikhailov, Nature Physics 6, 544 (2010).
[2] S. Hata, H. Nakao, and A. S. Mikhailov, Europhys. Lett., submitted (2012)

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