Berlin Center for Studies of Complex Chemical Systems

**Fritz Haber Institute of the Max Planck Society, Technical University of Berlin,
Max Delbrueck Centre for Molecular Medicine, Otto von Guericke University of Magdeburg,
Physikalisch-Technische Bundesanstalt**

Seminar "Complex Nonlinear Processes in Chemistry and Biology"

Honorary Chairman: Gerhard Ertl
Organizers: M. Bär, H. Engel, M. Falcke, M. Hauser, A. S. Mikhailov, P. Plath, H. Stark

Friday 23 April 2010, 16:00 *s.t.*

Marcus J.B. Hauser (Institut für Experimentelle Physik, Otto-von-Guericke-Universität Magdeburg)

"Regular graph properties of the plasmodial vein network of the slime mould Physarum polycephalum"

Abstract:

The plasmodium of the slime mould Physarum polycephalum is a single multi-nucleate giant amoeboid cell. It forms a characteristic two-dimensional vein network, where the apical end of the plasmodium extends to search for new food sources, while the dense network of tubular veins is in charge of transport of protoplasm throughout the giant cell. A graph theoretical analysis of the vein network of the Physarum polycephalum strain HU195×HU200 reveals that the nodes have exclusively the degree 3, i.e., each node connects to exactly three veins. This means that the vein network of this slime mould forms a regular cubic graph, and hence does not show small-world properties. The intensities of the edges (the vein segments) connecting a pair of nodes differs, thus forming a weighted graph. The distributions of the lengths and areas of the veins (as defined as segments between two adjacent nodes) follow exponential distributions, while the widths of the veins are distributed either log-normally or normally. Interestingly, these functional dependencies are robust during the entire evolution of the growing plasmodial vein network of Physarum polycephalum.

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