Isar Amper Clinics  
Clinic Munich East (FRG)

Department of Psychiatry  
University of Munich (FRG)

Department of Pharmacology  
University of Mannheim (FRG)

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University of Frankfurt (FRG)

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**Prolog**

Psychiatric disorders are based on a dysfunction of synapses in neural networks. For schizophrenia and addiction among others the dopamine and glutamatergic synapses are of relevance, for depression the norepinephrine and the serotonin synapse are more important. In dementia e.g. the deficiency of the cholinergic system is treated by anticholinergic substances. All diseases can be treated by changing the synaptic transmission by molecular switches such as receptor blockade or reuptake blockers by blockade of enzymatic degradation of transmitter etc. indicating that not only the synaptic molecular mechanisms but also the electrophysiological properties might be modulated. In many cases the significant treatment effects have a latency of about 10 days. Although important progress is made in treatment of mental disorders, still the psychopharmacological treatment is not satisfying especially regarding side effects.

This is showing that we do not understand the dynamics of pathology and reorganization of synapses. For this reason the dynamics of various components of synaptic transmission should be studied: The kinetics of control of synthesis, storage, release, reuptake, degradation, receptor occupation, up-regulation, and down-regulation.

Additionally, the synapses have to be related to the neuron as the basic functional unit of the brain. This perspective corresponds to the molecular biological research approach that now is integrating more and more the view of systems biology. Systems biology aims to reconstruct the cell on the basis of molecular biological data. This “bottom-up” reconstruction is based on quantitative kinetic data that are integrated in mathematical models that are transformed into computerized models. By these models “in-silico”-experiments can be performed that help to understand complex networks of chemical pathways. It seems to be helpful for understanding the dynamics and the pathology of synapses by computational models.

With this aim we started a series of workshops on “Computational Neuropsychiatry” in order to relate psychiatry to computational modeling in theoretical neuroscience in 2005. These workshops are designed as communicational meetings between theoreticians such as systems scientists, computational scientists and empirical researchers such as neuropsychiatrists and neurobiologists. We started with a workshop with Arvid Carlsson and discussed his models of networks of schizophrenia. In 2006 we organized a second workshop in order to discuss clinical and experimental data and theoretical concepts of disturbances of the working memory as they are observed in patients with schizophrenia. In 2007 we discussed the perspective of Molecular Systems Biology on schizophrenia. In 2008, we applied these experiences on addiction. We want to discuss if theoretical neuropsychiatry has essential benefits by using the tools of systems science like systemic modeling and computer simulations.
13:30 Opening
Margot ALBUS, Felix TRETTER, Dan RUJESCU, Peter GEBICKE-HAERTER, Hans BRAUN, Walter MÜLLER

13:45 Introduction - Psychiatry, the Synapse and Systems Biology
Felix TRETTER, Eduardo MENDOZA
(Psychology, Physics, Univ. of Munich)

Moderation: Hans BRAUN (Univ. of Marburg)

14:15 Ingo VERNALEKEN (Psychiatry, Univ. of Aachen, FRG)
The synaptic action of antipsychotic drugs – up-regulation after receptor blockade by antipsychotics?

14:45 Discussion

15:00 Coffee Break
Moderation: Dan RUJESCU (Univ. of Munich)

15:20 Anthony GRACE (Psychiatry, Univ. of Pittsburgh, USA)
The signalling properties of dopamine networks and schizophrenia

16:05 Discussion

17:05 Coffee Break
Moderation: Michael KOCH (Univ. of Bremen, FRG)

17:20 Peter ERDI (Complex Systems, Kalamzoo College, USA)
Multi-scale modelling approach to schizophrenia as a disconnection syndrome

18:05 Discussion

18:55 Coffee Break
Moderation: n.n.

19:15 Henry MARKRAM (Brain-Mind Institute Lausanne, CH)
The Blue Brain Project: Modelling synapses in a cortical column

20:00 Discussion
20:15 End of the Session