

## CNS-Workshop **Modern Mathematical Neurodynamics: Bridging Single Cells to Networks**

### **Organizer:**

Marc Timme, Network Dynamics Group, Max Planck Inst. f. Dynamics & Self-Organization (MPIDS) and Bernstein Center for Computational Neuroscience (BCCN) Göttingen

### **Wednesday, July 22nd 2009, Berlin**

taking place at **two different places (!)**:

- part I : Berlin Brandenburg Acad. of Science (BBAS)	<b>room 4,</b>	<b>09:00-12:00</b>
- part II:	<b>Hilton Hotel,</b>	<b>18:00-21:00</b>

Coordinating neural dynamics across complex interaction networks is crucial for computation and information processing in neural systems and thus provides the key bottleneck linking sensory stimulation, internal memory and actual behavior of humans and higher animals. Currently, experimental resolution for the study of neural circuits progresses at an unprecedented pace, with respect to both anatomical connectivity and dynamical activity of increasingly fine spatial and temporal resolutions. Mathematics provides the unifying language to conceptually understand the vast amount of data available and to make sensible predictions through general models.

This workshop aims to provide a computational neuroscience forum from the state-of-the-art mathematical neurodynamics perspective that strives to bridge single cell dynamics and network level description. The broad focus should be on neural modeling, conceptual ideas, and modern techniques to make sense of neural data. We aim at bringing together and stimulating exchange between key contributors from the corners of mathematical and computational neuroscience with topics ranging from synaptic dynamics and learning, via neural correlations and complex network activities to coding and computing strategies.

Schedule of speakers and topics.

#### part I (BBAS, room 4)

**9:00-9:05 Introduction:** (Marc Timme, Göttingen)

**9:05-9:50 Andreas Herz (Opening Speaker of morning Session), Munich:**  
Iso-Response Theory

**9:50-10:25 Raoul-Martin Memmesheimer, Harvard University, Cambridge, MA, USA:**  
Precise Timing and Synchronization due to Nonlinear Dendritic Interactions\*

10:25-10:40 break

**10:40-11:15 David Hansel, CNRS, Paris:**  
Non-linearities in synaptic interactions sustain delay activity in working memory

**11:15-11:50 Benjamin Lindner (replacing Andre Longtin), MPI Physics of Complex Syst., Dresden**  
The effect of short-term plasticity on the spectral coherence

**11:50 - 12:00 - Discussion -**

part II (Hilton, Salon Corinth)

**18:00-18:45 Sara Solla (Opening Speaker of evening session)**, Northwestern U, Evanston, USA:  
Patterns of Neural Activity in Networks with Complex Connectivity

**18:45-19:20 Peter Ashwin**, Engineering, Computer Sci. & Mathematics, **University** of Exeter, UK:  
Clustering and switching in networks of coupled oscillators

19:20-19:35 break

**19:35-20:10 Henry Tuckwell**, Max Planck Institute for Mathematics in the Sciences, Leipzig:  
Noise effects in spatially extended nonlinear neurobiological systems

**20:10-20:45 Stefan Rotter**, Bernstein Center f. Computational Neuroscience, Freiburg:  
Variability and co-variability of spiking activity in cortical networks

**20:45- 21:00** – Discussion -