Modeling Migraine: From Nonlinear Dynamics to Clinical Neurology

Coordinators: Markus A. Dahlem (TU Berlin) and Sebastiano Stramaglia (University of Bari & INFN)

Wednesday July 22nd

8:30 - 9:15 Registration

9:15 - 9:20 Markus Dahlem
Opening remarks

Morning session I
Ion dynamics during migraine
Chair: Hugh R. Wilson

9:20 - 10:00 George Somjen
Why simulate SD? Empirical data and the search for their explanation

10:05 - 10:20 Wytse Wadman
Modeling Ionic Mechanisms in Spreading Depression

10:25 - 11:00 Coffee break

Morning session II
Potassium dynamics & excitability
Chair: Uwe Heineman

11:00 - 11:15 Ernest Barreto
Ion concentration dynamics and neuronal excitability

11:20 - 11:35 Gerson Florence
Effects of depressed K$^+$ currents caused by high [K$^+$]o on the different stages of spreading depression

11:40 - 11:55 Flavio Fröhlich
Potassium dynamics: new insights on an old topic

12:00 - 12:15 Tony Gardner-Medwin
Spatial buffering of K$^+$ in relation to SD models

12:20 - 13:45 Lunch break

13:45 - 14:45 Moderated discussions
Topic: Spreading depression, hypoxic depolarization, peri-infarct depolarization etc.: Processes of the same nature, need for a generic term?

Afternoon session I
Cellular and membrane dynamics
Chair: Sebastiano Stramaglia

14:45 - 15:00 Oscar Herreras
Polarization gradients and current loops within single cells raise the DC potential in spreading depression: from single channels to macroscopic fields

15:05 - 15:20 Thomas Heimburg
Action potentials as electromechanical pulses

15:25 - 15:40 Rubem C.A. Guedes
Effects of AC- and DC-electrical brain stimulation on CSD

15:45 - 16:45 Coffee break

Afternoon session II
Functional abnormalities in channel mutations
Chair: Frank Richter

16:45 - 17:00 Daniela Pietrobon
Enhanced excitatory transmission at cortical synapses as the basis for facilitated spreading depression in CaV2.1 knockin migraine mouse models.

17:05 - 17:20 Thomas Friedrich
Functional abnormalities due to Na,K-ATPase $\alpha_2$-subunit mutations identified in familial hemiplegic migraine type 2.

17:25 - 17:40 Gianluca Coppola
New approaches to analysis of high frequency somatosensory oscillations in healthy subjects and migraine patients.
Thursday July 23rd

Morning session I
Migraine Aura: window to brain hyperexcitability
Chair: Markus Dahlem
09:00 - 09:35 Frances Wilkinson
Hypersensitivity in migraine: Does this imply cortical hyperexcitability?
09:40 - 09:55 Alex Shepherd
Pattern sensitivity in migraine
10:00 - 10:15 Hugh R. Wilson
Neural Network Simulations of Aura Characteristics
10:05 - 10:40 Coffee break

Morning session II
EEG and Hyper-synchronization
Chair: Frank Starmer
10:40 - 10:55 Marina de Tommaso
News inside hyper-synchronization pattern in migraine. (1) Clinical
11:00 - 11:15 Sebino Stramaglia
News inside hyper-synchronization pattern in migraine. (2) Techniques aspects
11:20 - 12:20 Moderated discussions
Markus Dahlem, Eckehard Schöll & Heinz G. Schuster
Topic: Chaos Control of hyper-synchronization/excitability – new therapeutic approaches?
12:20 - 14:00 Lunch break

Afternoon session I
Spatial aspects I: Imaging spreading depression
Chair: Eckehard Schöll
14:00 - 14:15 Michael Müller
Intrinsic optical signals: light scattering changes creating the optical signature of spreading depression
14:20 - 14:35 Vera de Lima
The synergetic modulation of the excitability of central gray matter by a neuro-peptide
14:40 - 14:55 Rudolf Graf
Imaging cortical spreading depression in experimental ischemia
15:00 - 15:15 Frank Richter
Spreading depression and anoxic depolarization in adult rat brainstem - electrophysiology and their influences on heart rate, blood pressure and local blood flow
15:20 - 16:00 Coffee break

Afternoon session II
Spatial aspects II: SD propagation pattern
Chair: Rudolf Graf
16:00 - 16:15 Markus Dahlem
Spreading depression wave patterns in two spatial dimensions: A new paradigm
16:20 - 16:35 Frank Starmer
Initiating a propagating wave in an excitable media
16:40 - 16:55 Harald Engel
Shape and velocity of stabilized wave segments in excitable media
17:00 - 17:15 Lutz Schimansky-Geier
Waves in heterogeneous neural tissues
17:20 - 17:25 Sebino Stramaglia
Announcement Migraine Symposium in Bari 2010
Markus Dahlem
Farewell