

MPIPKS, Dresden, Germany

IFISC, Palma de Mallorca, Spain

**Trends in Complex Systems
Systems**

Timing and Dynamics in Biological

Dresden, September 27 - October 01, 2010

Scientific coordination:

Felix Naef, School of Life Sciences, EPFL, Lausanne, Switzerland

Andrew Oates, MPI of Molecular Cell Biology and Genetics, Dresden, Germany

Meeting report

Biological rhythms attracted theorists long before the molecular era of modern biology, and important contributions came from theoretical or geometrical reasoning. However, how complex and stochastic dynamics of underlying molecular and cellular processes translates into temporally ordered macroscopic behavior is still poorly understood. The coupling of biological oscillators provides an additional layer of rich phenomenology. This workshop aimed to bring theorists and experimentalists together to learn about new conceptual and technical developments, to foster a common language, and to build bridges between experimental data on timing and theoretical explanations and methods. The workshop tried to identify principles of timing that are general biological strategies, regardless of the model system or the absolute timescale.

Plenary lectures were given by three important participants spanning the experimental – theoretical spectrum. Michael Hastings is an experimental biologist working on the circadian clock and presented the outstanding technical advances he and his colleagues have made in recording the dynamics of the system and probing the underlying genetics. Jean-Pierre Eckmann is a leading theorist in networks, presented his work on information flow in biological networks including for models of self-organizing neurons in culture. Joe Howard is a biophysicist whose lab uses theory and experiment to understand coupled mechanical oscillators such as molecular motors in cell behaviors such as flagellar beating. Other prominent participants included John Tyson, whose work on the dynamical analysis of the cell cycle is pioneering; this time he present an insightful analysis of the stochastic molecular events during the yeast cell-cycle.

There were a number of younger researchers whose presentations were stimulating and sparked discussions, notably the presentations of Ronny Straube, Luis Morelli, Ernesto Nicola, Achim Kramer. The poster sessions were particularly well attended by all of the participants, and this gave the younger researchers an extended time for discussion with the more experienced. We asked those participants who presented a short talk selected from the abstracts to also present a poster, and this contributed to the critical mass for discussion at the sessions.

The general scientific outcome is perhaps best estimated by the exchange of information between experimentalists and theorists. Experimentalists were introduced to theoretical concepts and practicalities of modeling. Several reported that they intended to seriously engage in modeling their systems. Theorists were exposed to new biological systems and phenomena. One example of this was the presentation of newly discovered short period embryonic oscillators in neural and somitic tissue. It was felt that timing was an unusual topic for a conference, but one that merited serious further consideration in its own right.