BIOENGINEERING SEMINAR

“Mechanisms and Dynamics of the Coupling Between the Circadian Clock and the Cell Cycle Oscillators”

Monday – December 14, 2015 – 11:15 a.m.
EPFL – room AI 1 153

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host: Prof. Félix Naef

Abstract

Daily synchronous rhythms of cell division at the tissue or organism level are observed in many species and suggest that the circadian clock and cell cycle oscillators are coupled. Despite known molecular links, little is known regarding the dynamics of this coupling and how the temporal organisation of cell division at the single cell level produces the daily rhythm at the tissue level. Using multispectral imaging of single live cells, computational methods and mathematical modelling we have addressed this question in proliferating mouse fibroblasts. This approach revealed that in unsynchronized cells, the cell cycle and circadian clock robustly phase-lock each other in a 1:1 fashion so that in an expanding cell population the two oscillators oscillate in a synchronized way with a common frequency. Pharmacological synchronization of cellular clocks reveals additional phase-locked clock states. The temporal coordination of cell division by phase-locking to the clock at a single cell level has significant implications because disordered circadian function is increasingly being linked to the pathogenesis of many diseases including cancer.

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