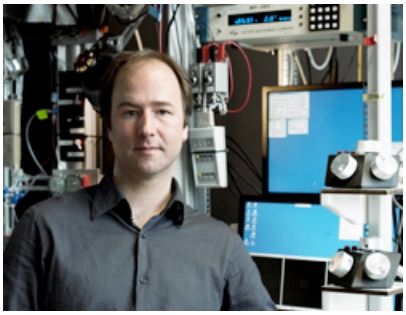
LES CONFÉRENCES DE L'ICM



Rainer W. FRIEDRICH
Friedrich Miescher Institute for Biomedical Research
Basel - Switzerland
rainer.friedrich@fmi.ch

Hosted by Claire WYART
If you would like to meet the speaker, please use the following contact: *claire.wyart@icm-institute.org*

Rainer W. FRIEDRICH - October 17, 2011 at 11:00

Neuronal circuits and computations in the olfactory system

Rigorous quantitative insights into the structure and function of neuronal cirucits are key to understand how higher brain functions arise from interactions between large numbers of neurons. We use a small animal model, the zebrafish, to analyze neuronal computations in the olfactory bulb and cortex by a combination of optical, physiological, molecular and theoretical approaches. I will focus on three or four recent findings. First, computational modelling and mathematical analyses revealed that pattern decorrelation emerges naturally from generic properties of recurrent neuronal circuits. The underlying mechanisms do not require adaptation to statistical properties of inputs and are enhanced by olfactory bulb-like network architecture. Second, we found that odor representations across olfactory bulb output neurons are largely invariant to changes in odor concentration but switch abruptly when one odor is morphed into another. The olfactory bulb therefore classifies sensory inputs into a large number of discrete outputs. This computation creates defined, noise-limited stimulus representations and acts as a sensory filter. Third, we found that telencephalic area Dp, the main target of the olfactory bulb in zebrafish and the homolog of olfactory cortex, uses multiple synaptic pathways to integrate sensory information across processing channels in the olfactory bulb. This integration is thought to establish synthetic representations of olfactory objects. Fourth, we recently found that neuronal circuits in area Dp perform at least two temporal filtering operations that tune Dp neurons to those features of input activity patterns that are particulary informative about precise odor identity. These results provide insights into olfactory computations and illustrate general computational principles by which neuronal circuits represent and process information.

Lundi 17 octobre 2011 à 11H00 / Auditorium de l'ICM
Hôpital Pitié-Salpêtrière, 47 boulevard de l'hôpital - 75013 Paris