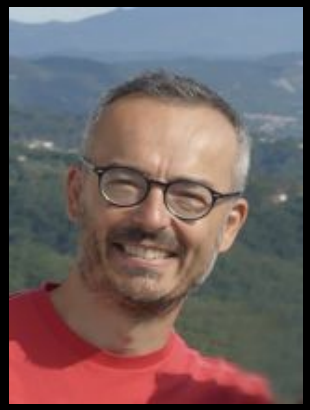
17 Maggio 2019 **ORE 14.30** BUILDING PIECES OF HUMAN BRAIN IN THE DISH: HOW FAR ARE WE FROM THERE?

Ospedale S Raffaele, Milano
**Divisione di Neuroscienze, Cellule Staminali e Neurogenesi**



## DR. VANIA BROCCOLI

Dr Broccoli is a neuroscientist of the CNR Institute of Neuroscience and is leading the Research Unit of "Stem Cells and Neurogenesis" at the San Raffaele Scientific Institute in Milan (Italy). He has unraveled some of the molecular mechanisms that control key processes of brain development including neural stem cell identity, neural commitment and migration, neural network establishment and function. Lately, his group has developed new technologies of direct cell reprogramming and generated human neurons suitable for convenient in vitro model of Parkinson's disease and other neurological disorders. His lab is also actively working on novel gene therapy strategies for brain diseases by using novel engineered synthetic AAVs and CRISPR/Cas9 gene modification approaches.

The human brain shows a breathtaking structural complexity and outstanding functional integration to elaborate external sensory stimuli and encode memory and cognitive skills. Brain circuitries are the basic modules which compute specific neuronal activities. Neuronal cultures obtained by in vitro differentiation of stem cells are an ideal model to assess physiological and disease-relevant processes occurring in human brain biology. However, stem cell-derived neurons are obtained in mass cultures that lack spatial organization and without any meaningful connectivity. We implemented a novel microfluidic system for long-term culture of human neurons with patterned organization of projections and synaptic terminals. Co-culture of human midbrain dopaminergic and striatal medium spiny neurons on the microchip established an orchestrated nigro-striatal circuitry with functional dopaminergic synapses. Moreover, assembling of human DRG sensory neurons with peripheral tissues enable the reconstitution of proprioceptive sensory organs. We demonstrated that reconstituted neuronal circuitries with stem cells generated from patients with Parkinson's disease or ataxia offer a neat system to assess pathophisiogical mechanisms. In vitro reconstitution of human circuitries by microfluidic technology offers a powerful system to study brain networks by establishing ordered neuronal compartments and correct synaptic identity.

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KNOWLEDGE IS SPEAKING, WISDOM IS LISTENING
*Jimi Hendrix*