B·DEBATE International Center for Scientific Debate BARCELONA

IDIBAPS Institut D'Investigacions Biomèdiques August Pi i Sunyer

MAURIZIO MATTIA

CV

PARTICIPANT AT:

A DIALOGUE WITH THE CEREBRAL CORTEX: CORTICAL FUNCTION AND INTERFACING

April, 29th-30th, 2015, Barcelona

Maurizio Mattia, Researcher at the **Istituto Superiore di Sanità**, Rome, Italy

Researcher at the Istituto Superiore di Sanità (ISS, Italian Institute of Health) in Rome, Italy. Theoretical physicist (MSc) with a research doctorate in neurophysiology (PhD). Author of more than 30 articles in ISI-indexed journals. Partner in several EU-funded projects, including the ongoing CORTICONIC and CORONET FET projects. Past fellowships with the Istituto Nazionale di Fisica Nucleare (INFN, Italian Institute of Nuclear Physics) from 1997 to 2009. Research collaborator at the Institute for Neuroinformatics (ETH University of Zurich, Switzerland) during 2006. Research interests and activity in computational and systems neuroscience focused on the collective nonlinear dynamics of cortical networks underlying high cognitive functions and slow oscillations during sleep and anesthesia.

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ABSTRACT

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Computational Insights from the Multiscale Organization of Spontaneous Cortical Activity

Slow oscillations (SO) are a stereotyped activity pattern pervasively expressed during slow-wave sleep and deep anaesthesia by the cerebral cortex of many species. SO in sensorial cortices are known to mirror early neuronal processing of environmental stimuli, and occur simultaneously in cell assemblies at different cortical depths and positions as a concerted multiscale activity. Here, I will present some recent advances in the understanding of the mechanistic organization of such multiscale phenomenon, by following the chain of activations and inactivations of the different layers of the rat visual cortex under deep anaesthesia. I will show that Up states initiate in layer 6 spreading upward towards the cortical surface, and that layer 5 assemblies give rise to hysteresis loops like in flip-flop computational units. I will provide evidence that layer 6 activation originates from cortical input likely due to travelling up wavefronts, unravelling a hierarchy of cortical loops.

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