B·DEBATE International Center for Scientific Debate BARCELONA

IDIBAPS Institut D'Investigacions Biomèdiques August Pi i Sunyer

MARCELLO MASSIMINI

CV

PARTICIPANT AT:

A DIALOGUE WITH THE CEREBRAL CORTEX:
CORTICAL FUNCTION AND INTERFACING

April, 29th-30th, 2015, Barcelona

Marcello Massimini, Associate professor of Human Physiology at the Department of Biomedical and Clinical Sciences, **University of Milan**, Milan, Italy

Physician and neurophysiologist is associate professor of Human Physiology at the University of Milan and Invited Professor at the Coma Science Group of Liege University (Belgium). He worked at Laval University (Quebec, Canada) in the laboratory of Mircea Steriade and subsequently moved to the Department of Psychiatry of the University of Wisconsin (USA) with Giulio Tononi. Dr. Massimini has been a partner in different EU grants and has received national and international prizes for his research and is recipient of the James S. McDonnel Scholar Award 2013. He is currently developing new tools to study non-invasively how human cortical excitability and connectivity change in physiological and pathological conditions. On these subjects he has published in high-ranking international scientific journals such as Science, Nature, Nature Neuroscience, PNAS, and Brain.

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ABSTRACT

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Brain Stimulation and the Estimation of Consciousness

Theoretical considerations suggest that consciousness depends on the ability of neural elements to engage in complex activity patterns that are, at once, distributed within a system of interacting cortical areas (integrated) and differentiated in space and time (information-rich). We thus hypothesized that the level of consciousness could be estimated empirically by perturbing the cortex to engage distributed interactions and by measuring the information content (algorithmic complexity) of the resulting responses. We found that the algorithmic complexity of cortical responses to transcranial magnetic stimulation reliably discriminated the level of consciousness in single individuals across different conditions in which consciousness was altered physiologically, pharmacologically and pathologically. This theoretically motivated quantification of brain complexity allows establishing a reliable, graded measurement scale along the consciousness/unconsciousness spectrum and provides novel mechanistic insight on the neurophysiological mechanisms of loss and recovery of consciousness.

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