B·DEBATE International Center for Scientific Debate BARCELONA

IDIBAPS Institut D'Investigacions Biomèdiques August Pi i Sunyer

ALAIN DESTEXHE

CV

PARTICIPANT AT:

A DIALOGUE WITH THE CEREBRAL CORTEX: CORTICAL FUNCTION AND INTERFACING

April, 29th-30th, 2015, Barcelona

Alain Destexhe, **CNRS** Research Director (UNIC, Gif sur Yvette), and Director of the **European Institute for Theoretical Neuroscience**, Paris, France

Alain Destexhe leads a research team in theoretical neuroscience at the interface with experimental neuroscience, at the "Neurosciences, Information and Complexity" research unit (UNIC) of Gif sur Yvette. He obtained a PhD (University of Brussels, 1992) in the field of nonlinear dynamics and complex systems, followed by a postdoc with Terry Sejnowski at the Salk Institute (La Jolla, USA), and was Assistant Professor at the Laval University in Canada (1995-2000), where he founded a theoretical laboratory in a purely experimental environment. He was awarded a tenured position of Research Director at CNRS in 2000 and participated to the creation of the UNIC, which mixes theory and experimental research teams. Since 2014, he is also Director and scientific animator of the European Institute for Theoretical Neuroscience (www.eitn.org) in Paris. He is author of 120 publications in peer-reviewed journals, 2 monographs, 7 books as co- Editor, and 42 book chapters. He is also co-Editor in Chief of the Journal of Computational Neuroscience since 2005, and is in the editorial board of 5 other journals including The Journal of Neuroscience. He is also invited speaker in numerous international conferences and summer schools, and coordinates the theoretical neuroscience activities in the EU-funded Human Brain Project. He was awarded several prizes, including the 2008 CNRS Medal for interdisciplinary work.

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ABSTRACT

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Linking Scales of Brain Activity from Single Neurons to Field Potentials and Voltage-Sensitive Dye Imaging

Linking scales of investigation of brain activity is a very difficult problem because it typically involves very different expertises and fields who tend to be rather separated. In this talk, we overview a project that attempts to combine different scales, from cellular to large-scale systems. We focus on the voltage-sensitive dye (VSD) imaging technique, which reveals brain activity at fine temporal scales and over large spatial scales, typically one or several brain areas. To understand the VSD signals, one uses population models of activity, but such models are presently not hardly constrained by cellular and biophysical properties of neurons. We show that using single-cell dynamic-clamp experiments, one can extract the transfer function of cortical neurons, and formulate population models which are biophyically more realistic. Such models account for large-scale features of VSD imaging, such as the suppressive effect of propagating waves. We suggest that this approach of linking scales could be very powerful to understand macroscopic properties of brain activity.

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