B·DEBATE International Center for Scientific Debate BARCELONA

Sant Joan de Déu HOSPITAL MATERNOINFANTIL - UNIVERSITAT DE BARCELONA

Sant Joan de Déu Research Foundation

PAU GOROSTIZA

CV

PARTICIPANT AT:

CONNECTING THE GROWING BRAIN

UNDERSTANDING NEUROPAEDIATRIC DISEASES THROUGH SYNAPTIC COMMUNICATION

November, 26th-27th, 2015, Barcelona

Pau Gorostiza, ICREA Research Professor at the Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain

Pau Gorostiza graduated in physics at the Universitat de Barcelona (UB), where he also obtained his Ph.D. (European Doctorate) in the field of semiconductor electrochemistry. He also worked at the microscopy facility of the UB, where he gained experience in AFM and STM of biological samples, as well as in nanotechnology applied to materials science. He has visited the CNRS and the Université Pierre et Marie Curie in Paris (France), and the University of California at Berkeley (USA). His recent works include the development of optical switches for remotely controlling neuronal activity. He obtained a Young Biomedical Investigator Award of the Francisco Cobos Foundation, a Career Development Award of the Human Frontier Science Program (HFSP) and Starting and Proof-of-Concept grants of the European Research Council (ERC). He is currently ICREA Research Professor at the Institute for Bioengineering of Catalonia (IBEC).

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ABSTRACT

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Manipulation of Biological Activity with Light

The manipulation of biological processes with light using optogenetics has revolutionized experimental neurobiology. Optogenetic manipulation of neuronal activity is based on the expression of light-sensitive proteins, which often alters cellular physiology and also limits its therapeutic applications due to the need of gene therapy in the case of human subjects. A powerful complement and alternative to optogenetics is offered by optopharmacology (the development of light-regulated drugs like receptor agonists, antagonists and modulators), which has the advantage that it can operate on endogenous receptors without genetic manipulation. Unlike optogenetics, optopharmacology involves small molecules that (1) can be validated and approved using standard “drug development” procedures, and (2) constitute a single component that can be applied directly to wildtype organisms, including humans. Despite the advances in the development of pharmacologically specific drugs for a large fraction of therapeutic target proteins in humans, important challenges remain unsolved, including the control of the drug action site, the time course of drug effect, and the fine-tuning of drug effects on target tissue. In this proposal, we aim to address these issues by using drugs with light-dependent properties (i.e. affinity and/or efficacy) in order to regulate the activity of endogenous proteins. The administration of a photocontrolled drug in combination with illumination that is patterned in space and time would provide a novel degree of control and regulation of drug action. This method would allow precisely focusing on a target tissue and controlling drug doses with time, thus reducing side effects due to target receptors located in non-targeted tissues. We have recently developed several novel optopharmacological tools, including light-regulated peptide inhibitors of protein-protein interactions and light-regulated orthosteric and allosteric modulators of glutamate receptors. Their design, characterization and possible applications will be discussed.

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