B·DEBATE International Center for Scientific Debate BARCELONA

upf. Universitat Pompeu Fabra Barcelona

MUSTAFA KHAMMASH CV

PARTICIPANT AT:

SYNTHETIC BIOLOGY.
FROM STANDARD BIOLOGICAL PARTS TO ARTIFICIAL LIFE

September, 17th-18th, 2015, Barcelona

Mustafa Khammash, Professor of Control Theory and Systems Biology at ETH-Zurich, Department Head, Department of Biosysteme Science and Engineering (D-BSSE), ETH-Zurich, Switzerland

Mustafa Khammash is the Professor of Control Theory and Systems Biology at the Department of Biosystems Science and Engineering (D-BSSE) at ETH Zurich, and is currently serving as the head of the department. He received his PhD in control theory at Rice University, Houston in 1990. From 1990 till 2001, he was on the Engineering faculty of Iowa State University. In 2001 he joined the University of California at Santa Barbara (UCSB) where he served as the Director of the Center for Control, Dynamical systems, and Computations (CCDC) from 2006 till he joined ETH in 2011. Working at the interface of systems biology, synthetic biology, and control theory, Khammash develops novel computational methods for the modeling, simulation, analysis, and control of biological networks. In the area of systems biology, he utilizes these methods for reverse engineering biological complexity, with particular interest in understanding the role of dynamics, feedback, and randomness in endogenous biological circuits. In the area of synthetic biology, his research focuses on creating the mathematical foundation and necessary tools for the robust and precise control of living cells. Khammash is a Fellow of the IEEE, IFAC, and the Japan Society for the Promotion of Science (JSPS).

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ABSTRACT

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Cybergenetics: Synthetic Circuits and Systems for the Precise Control of Living Cells

Norbert Wiener's 1948 Cybernetics presented a vision unifying the study of control and communication in the animal and the machine. Predating the discovery of the structure of DNA and the ensuing molecular biology revolution, applications in the life sciences at the time were limited. More than 60 years later, the confluence of modern genetic manipulation techniques, powerful measurement technologies, and advanced analysis methods is enabling a new area of research in which systems and control notions are used for regulating cellular processes at the gene level. This presentation describes novel analytical and experimental work that demonstrates how de novo control systems implemented with stochastic components can be interfaced with living cells and used to precisely control their dynamic behavior.

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