B·DEBATE International Center for Scientific Debate BARCELONA

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MARK ISALAN

CV

PARTICIPANT AT:

SYNTHETIC BIOLOGY.
FROM STANDARD BIOLOGICAL PARTS TO ARTIFICIAL LIFE

September, 17th-18th, 2015, Barcelona

Mark Isalan, Reader in Gene Network Engineering, Imperial College London, London, UK

Mark Isalan heads the Gene Network Engineering group in the Dept. of Life Sciences at Imperial College London. He carried out a Ph.D. in engineering zinc fingers to bind new DNA sequences at the MRC LMB, in the University of Cambridge UK,1996-2000. This work was supervised by Prof. Sir Aaron Klug, OM, FRS, and continued postdoctorally from 2000-2002 at Gendaq Ltd, UK (now owned by Sangamo Biosciences, Richmond CA). The work ultimately contributed to the CompoZr zinc finger nucleases now available commercially from Sigma Aldrich. From 2002-2006 Dr. Isalan was awarded a Wellcome Trust International Research Fellowship to carry out research on engineering artificial gene networks in Prof. Luis Serrano's group at the EMBL Heidelberg, Germany. From 2006-2013 he was a group leader at the EMBL-CRG Systems Biology Unit in Barcelona, specialising in synthetic gene network engineering. He moved to Imperial College London in 2013 and continues to work in protein and gene network engineering, aiming to design biological systems that behave predictably and robustly

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ABSTRACT

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Engineering Synthetic Development: How many Ways can you Make a Stripe?

Synthetic biology is a promising tool to study the function and properties of gene regulatory networks. Gene circuits with predefined behaviors have been successfully built and modeled, but largely on a case-by-case basis. In this talk, I will present work where we go beyond individual networks and explore both computationally and synthetically the design space of possible dynamical mechanisms for 3-node stripe-forming networks. First, we computationally test every possible 3-node network for stripe formation in a morphogen gradient. We discover four different dynamical mechanisms to form a stripe and identify the minimal network of each group. Next, with the help of newly established engineering criteria we build these four networks synthetically and show that they indeed operate with four fundamental distinct mechanisms. Finally, this close match between theory and experiments allows us to infer and subsequently build a 2-node network that represents the archetype of the explored design space.

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