Imperial College London

Centre for Process Systems Engineering

UCL

2018 Seminar Series: New Frontiers in Systems Engineering

Prof. Uwe Sauer (Institute of Molecular Systems Biology, ETH Zurich)

Coordination of Microbial Metabolism

Abstract: The omics revolution has vastly expanded our ability to monitor molecular events, but we struggle to interpret and understand such data or to systematically generate hypotheses from them. Particularly problematic are the multiple, overlapping regulatory mechanisms that coordinate cellular adaptation (1). Here I will focus on two conceptual problems: i) discovery of functionally important regulation mechanisms and ii) understanding which of the many known mechanisms actually matter for a given adaptation. On the discovery side I will illustrate the use of coarse-grained kinetic models to extract mechanistic hypotheses from dynamic metabolomics data. For learning the coordination mechanisms, I will present an approach that hypothesizes the dynamically important mechanism from the much fewer steady state measurement in the bacterium *E. coli* (2). The surprising result is that only very few regulation events appear to be required for a given transition, typically involving less than a handful of active regulators.

Bio: Uwe Sauer earned his MS and PhD in microbiology from the University of Göttingen in 1992. During his postdoc work on metabolic engineering in the chemical engineering lab of Jay Bailey in Zurich, he became interested in computational modelling of cellular behaviour and quantitative analysis of metabolic fluxes. He is currently Professor of Systems Biology at the Institute of Molecular Systems Biology of the ETH Zurich with a research focus on the coordination of metabolism in bacteria and yeast and metabolic feedback into the regulation systems. The Sauer lab pioneered development of quantitative mass spectrometry-based methods for metabolomics and flux analysis. Computational methods are used to generate testable hypotheses on biochemical mechanisms of metabolic coordination.

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