

# BIENGINEERING SEMINAR

at 4:30 PM on September 20<sup>th</sup>, 2013 (Friday)

MRDG Seminar Hall, 1<sup>st</sup> floor, Biological Sciences Building

## Modelling and systems approaches for investigating cellular processes at different levels: gene regulation, protein networks and cellular responses in tissues

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Cellular processes are controlled by complex genetic and signal transduction networks. The complexity arises for multiple reasons, and temporal, stochastic and spatial factors can all play important roles. In the first example, I will discuss an investigation of the ubiquitous genetic process of translation. We present results, combining modelling and experiments, to investigate the functioning of an in built feedback control mechanism working at the translation termination level in yeast, with analogues in bacteria. In the second example we investigate the organization and functioning of protein networks which are responsible for directed cell migration (chemotaxis). In this study, we develop an in silico synthetic approach to understand design principles and features underlying networks which give rise to both attractive and repulsive gradient sensing. In the third example we present a modelling platform integrating chemotherapeutic drug delivery, transport and uptake by cells in a solid tumour, as well as cellular response. Working within this framework we show how different drug resistance mechanisms which have similar behaviour at the single cell level, may have very different tissue level behaviour. We conclude with a synthesis from all these investigations

### About the speaker:

Dr Krishnan did his undergraduate studies at IIT Madras, and PhD in Princeton University, both in Chemical Engineering. Following that he was an Associate Research Scientist in the department of Electrical Engineering at Johns Hopkins University. He is currently a lecturer in Chemical Engineering and Process Systems Engineering at Imperial College London, with affiliations in the Institute of Systems and Synthetic Biology and the Centre for Bioinformatics. His work focuses on different aspects of the elucidation of cellular processes, and signal transduction in particular, combining mathematical modelling, theoretical work, systems approaches and collaboration with experimental groups.