

The Role of Process Systems Engineering in physiology and clinical medicine



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Abstract

The potential role of Process Systems Engineers in physiology and medicine is in developing engineering design and analysis approaches to modelling biological systems across multiple levels – cell signalling networks, gene, protein and metabolic networks, movement of molecules and fluids, through to whole physiological systems. The 21st Century challenge in the Life Sciences is to bring together widely dispersed models and understanding in order to enable system-wide understanding of these complex systems. Chemical Engineers tackle multiple scale problems in manufacturing processes – from molecular scale through unit operations scale to plant-wide and enterprise wide systems – so we have an appropriate skill set.

The talk will discuss these issues and the role that Process Systems Engineers can play, in collaboration with life and clinical scientists. The talk will draw on three projects at University College London. The first is a project which is building an in-silico model of the human liver, scaling up models from the molecular level to the liver, an epithelial organ. The composite model so far models glucose regulation in the liver and associated organs. The second project has modelled the effects of blood flow on endothelial cells lining arteries, taking into account cell shape change resulting in changes in the cell skeleton which cause consequent chemical changes. The third is looking at complex networks which control cancer. The projects involve molecular transport, chemical reactions, and complex multiscale systems, all attributes of systems with which Process Systems Engineers have experience.

Biography

Prof David Bogle is Professor of Chemical Engineering and has been Pro-Vice-Provost of the Doctoral School at University College London since 2005. He undertakes research and teaching in process design and process control and in Systems Biology, working with a number of Medical Science Departments at UCL including the UCL Institute for Liver and Digestive Health and the UCL Cancer Institute. Prof David Bogle studied Chemical Engineering at Imperial College at both undergraduate and graduate levels, receiving his PhD in 1983. Following this, he worked on modelling and control projects for British Gas before taking a position as lecturer at the University of Adelaide, a position he held from 1986 until 1990. Prof Bogle joined UCL as a lecturer in 1990 and became full professor in 2000. He is Deputy Director of the Centre for Process Systems Engineering, a joint Centre between Imperial College and UCL. He is a Chartered Engineer and Fellow of the Institution of Chemical Engineers and was made a Fellow the Royal Academy of Engineering in 2005.