Joint CBME and School of EEE Seminar

THE UNIVERSITY of ADELAIDE

Seminar Title: **Modelling Multi-scale Physiology**

Presenter: **Prof Tim David**
University of Canterbury
Director BlueFern HPC Unit,
and Director of the Centre for Bioengineering
Christchurch , New Zealand

Date and Time: 12th of July 2012 (Thursday) at 3.10 PM

Venue: **Ingkarni Wardli (formerly Innova21):** Building, Level 5, Room 5.57

Site Map: http://www.adelaide.edu.au/campuses/mapscurrent/north_terrace.pdf

Abstract

There are a significant number of problems that exhibit a large range of physical scales, for example small vortex generators positioned on large scale aerofoils; but none so prominent in the 21st Century as that exemplified within the biological sciences and engineering. Biological Engineering problems have a multitude of physical scales. In the major arterial networks the blood flow dynamic scales are of the order of 1mm (cerebral vessels) up to 25mm (ascending aorta). Downstream of any major vessel exists a substantial network of arteries, arterioles and capillaries whose characteristic length scales reach the order of 10-20 microns. Within the walls of these cylindrical vessels lie ion channels consisting of proteins (100 nanometers and smaller) folded in such a way as to allow only certain molecules through the membrane. Taking examples from cerebral perfusion and arterial coupled cell function this talk will look at a range of ways in which multi-scale problems can be investigated. Our big question that has yet to be answered is in different models that highlight different scales do all the models provide essentially the same answer?

Biography

Professor Tim David gained a degree in Mathematics from Leeds University (UK) in 1983 and subsequently was awarded a PhD in Applied Mathematical Studies from Leeds in 1987. He was awarded the Foxwell Award from the Department of Energy in 1986. Initially his studies continued to look at combustion theory in the area of laminar flamelets however after moving to an office next to a bioengineer began investigating the dynamics of heart valves. He continued this theme and widened the scope to include numerical and analytical models of flowing particles in the blood stream and solutions of conservation equations for antagonists such as Adenosine Tri-phosphate. In 2002 he and his family moved to New Zealand to take up the Chair in Bioengineering at the University of Canterbury. His work in numerical analysis helped the University to form a relationship with IBM and the arrival of an IBM power series supercomputer in 2006. An IBM Blue Gene arrived soon after in 2007. He was the lead in negotiating with the New Zealand government a $27 million upgrade and infrastructure for HPC in New Zealand. He is currently the Director of BlueFern Supercomputing Unit at Canterbury which supports both Blue Gene /L and Blue Gene /P machines along with a power 7 series SMP machine. His "Brains Trust" Research group is one of the leading teams in the world for numerical simulations of cerebral perfusion.

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