PhD studentship in
Mathematics/ Applied Mathematics/
Mathematical Biology

A PhD studentship (3.5 years) is available at the Division of Mathematics at University of Dundee

Apply before 31st of March 2015

Stochastic multiscale modelling and analysis of cell signalling processes

The multiscale nature of biological and physical systems is fascinating and challenging. Both mammalian cells and plant cells have highly developed regulatory signalling mechanisms.

Gene regulatory networks, i.e. DNA segments in a cell which interact with each other indirectly through their RNA and protein products, lie at the heart of many important intracellular signal transduction processes. Such intracellular negative feedback systems are known to exhibit oscillatory behaviour and are involved in regulating important cellular processes such as inflammation, meiosis, apoptosis and the heat shock response, and are linked to diseases such as arthritis and cancer. Such intra-cellular processes are known to affect higher-level properties at the tissue scale. Plant cells and tissues also have a very interesting and complex microstructure that facilitates control of their biomechanical properties and anisotropic growth. Additionally, highly developed regulatory signalling mechanisms allow immobile plants to adapt to changing environmental conditions.

The main focus of the research project will be on the development and mathematical analysis of novel deterministic and stochastic multiscale models of the interactions between intra-cellular signalling processes and the biomechanical properties of tissues. The multiscale analysis of the models will enable us to identify the influence of microscopic molecular interactions on the macroscopic behaviour of tissues.

A better understanding of the influence of microstructure and intra-cellular biochemical processes on the mechanical properties of biomaterials is not only a theoretical challenge in itself but may also lead to better treatments for diseases such as cancer and arthritis, and helps to improve plant response to environmental changes.

Training opportunities:
The successful applicant will receive a broad training in several modern aspects of mathematics. In relation to the project, he/she will be trained in mathematical modelling and analysis (PDEs and stochastic processes). Additionally, he/she will have the opportunity to attend courses on Pure and Applied Mathematics provided by the Scottish Mathematical Sciences Training Centre (http://www.smstc.ac.uk) and receive specialised Postgraduate Skills Training via the University's Organisational & Professional Development unit (http://www.dundee.ac.uk/opd/). He/she will be part of an active research group, and will be offered a range of regular seminars in Mathematical and Numerical Analysis and Modelling. Attention will be paid to make sure that he/she will be integrated in an international research network and grow as an independent researcher. There are active collaborations with the Universities of Heidelberg and Muenster (Germany), Autonomous University of Madrid (Spain), Narvik University College (Norway), Uppsala University (Sweden).

Because of EPSRC restrictions, the full studentships will be available only to UK residents.
(For complete information on students eligibility, please consult the EPSRC website http://www.epsrc.ac.uk/skills/students/help/Pages/eligibility.aspx).

If you are interested in this PhD position please contact

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Please include a cover letter, a full CV and contact information of two referees.