PhD Studentship 1: Life Time Models (Mathematical Modeller and Computational Biologist)

The position is part of the EU-funded Marie Skłodowska-Curie Innovative Training Network InCeM (Integrated Component Cycling in Epithelial Cell Motility). InCeM focuses on cell migration, which is essential for vital processes such as tissue formation, wound healing and tissue invasion during carcinogenesis. It aims to visualise morphological, biochemical and physical processes of cell motility to integrate these data into multi-scale models with the goal to deliberately tune motile behaviour in relation to disease. InCeM provides an international and highly interdisciplinary framework of collaborators from academia and industry with core expertise in medicine, biology, biochemistry, image analysis, modelling and engineering.Within this framework, we seek a highly talented and motivated PhD student to join a thriving international research group in mathematical and computational biology at the University of Sussex under the supervision of Dr Anotida Madzvamuse. The prospective student will seek to develop new mathematical and computational life-time models associated with the spatio-temporal life cycles of actin and keratin filaments, their binding proteins, focal adhesions, hemidesmosomes and various regulatory molecules. The candidate will adapt reaction models for actin and keratin filaments to describe biochemical processes such as nucleation, polymerisation and solubilisation, depolymerisation, annealing, disassembly and fragmentation and extend the models to take into account diffusion processes. To further understand migrating single cells, we will mathematically characterise the morphology and dynamics of FAs by modelling their size, number, localisation, velocity profiles and turnover. We will develop new mathematical models to describe hemidesmosome protein dynamics. Experimentally driven geometric partial differential equations for the cell motion will be subsequently derived. The models derived will be solved efficiently, accurately and robustly by the use of moving and surface finite element methods in 2-D and 3-D and on complex evolving topological surfaces. Ultimately, the student will develop integrated computational models that link the dependencies between the individual components of the life cycle.

The student will be exposed to both industrial as well as academic cutting-edge knowledge transfer in the general area of cell motility and this will be achieved through substantial attachments to partner laboratories of InCeM and/or Industrial Partners across Europe. The ultimate goal is to train a new generation of scientists with unique expertise at the interface between fundamental disciplines and experimental sciences as well as in-depth industrial knowledge transfer.

We are therefore looking for an outstanding candidate from outside the UK who holds a first class or distinction at Masters level in mathematics, numerical analysis and/or physics. We will recruit a motivated individual who will pursue a highly interactive multi-disciplinary project towards a PhD degree.

PhD Studentship 2: Integration of forces and life times (Mathematical Modeller and Computational Biologist)

The position is part of the EU-funded Marie Skłodowska-Curie Innovative Training Network InCeM (Integrated Component Cycling in Epithelial Cell Motility). InCeM is focused on cell migration, which is essential for vital processes such as tissue formation, wound healing and tissue invasion during carcinogenesis. It aims to visualise morphological, biochemical and physical processes of cell motility to integrate these data into multi-scale models with the goal to deliberately tune motile behaviour in relation to disease. InCeM provides an international and highly interdisciplinary framework of collaborators from academia and industry with core expertise in medicine, biology, biochemistry, image analysis, modelling and engineering.

Within this framework, we seek a highly talented and motivated PhD student to join a thriving international research group in mathematical and computational biology at the University of Sussex under the supervision of Dr Anotida Madzvamuse. The prospective student will seek to develop new integrative mathematical and computational models describing biochemical processes and biomechanical properties of single-cell migration at different scales and locations. The candidate will develop systems of coupled bulk-surface models to couple life-time models, membrane shape forces, protein-driven cell motion and cell-tracking algorithms and imaging. (gradient sensing, chemotactic, etc.). In the area of numerical analysis, the candidate will develop novel numerical methods along the lines of evolving coupled bulk-surface multi-grids finite elements and finite differences, phase-fields, optimal control and data-fitting. The candidate will acquire top-of-the-range high performance and parallel computing skills that allow for fast, efficient and adaptive 2-D and 3-D implementations within realistic computing times. The computational algorithms and tools developed will be used to confirm, suggest and guide experimental observations and manipulations respectively.

The PhD candidate will be exposed to both industrial as well as academic cutting-edge knowledge transfer in the general area of cell motility and this will be achieved through substantial attachments to partner laboratories of InCeM and/or Industrial Partners across Europe. The ultimate goal is to train a new generation of scientists with unique expertise at the interface between fundamental disciplines and experimental sciences as well as in-depth industrial knowledge transfer.

We are therefore looking for an outstanding candidate from outside the UK who holds a first class or distinction at Masters level in mathematics, numerical analysis, computer science and/or physics. We will recruit a motivated individual who will pursue a highly interactive multi-disciplinary project toward a PhD degree.

Further details about InCeM and the rest of the PhD studentships can be found at:
http://incem.rwth-aachen.de/jobs.html

Application deadline: Applications can be submitted immediately but no later than the end of March to be considered. They should be directed with a list of preference for up to three host laboratories to the coordinator of InCeM:

Prof. Dr. Rudolf E. Leube
InCeM Coordinator
Institute of Molecular and Cellular Anatomy
RWTH Aachen University
Wendlingweg 2
52074 Aachen
rleube@ukaachen.de