

OXFORD UNIVERSITY COMPUTING LABORATORY

Translating Biophysical Models to the Heart of the Clinic

Grade 7S Post-Doctoral Research Assistant

Further Details

The Computing Laboratory has a vacancy for a Post-Doctoral Research Assistant, as part of an EPSRC funded research project working on the development of computational, electro-mechanical, cardiac models. Specifically, this post will involve applying multi-scale modelling techniques and numerical methods, to produce personalised models from unique clinical data to assist in the diagnosis and treatment of heart failure. With the U.K.'s elderly population expanding, Coronary Heart Disease (CHD) is rapidly becoming an epidemic. There is currently a 1 in 4 life-time risk of CHD and costs associated with acute and long term hospital treatments are accelerating.

The impact of CHD has motivated a number of state of the art developments in clinical imaging which are now being applied to measure cardiac wall motion, chamber flow patterns and electrical wave propagation. Using these patient-specific measures there are now a significant opportunities to tailor treatment. However, the majority of clinical treatment decisions remain based on relatively simple population based metrics which do not account for the specific physiology of a given individual. The scientific challenge is thus to integrate multiple types of functional data from single patients and use this information to customise clinical care.

An exciting, and highly promising, strategy for meeting this challenge is through the integration of multiple data types into personalised and bio-physically consistent mathematical models. The development of such models offers the ability to capture the complex and multi-factorial cause and effect relationships which link underlying patho-physiological mechanisms to clinical observations. This, in turn, provides the capacity to derive parameters that are not directly observable, but which play a key mechanistic role in the disease process (for example tissue stress and measures of pump efficiency) to assist treatment decisions.

Detailed, finite element based, models of the heart now accurately represent both cardiac anatomy and detailed microstructure. These mathematical descriptions serve as spatial frameworks for solving governing equations to represent contraction and electrical activation of heart tissue. The present position is funded to develop and apply these frameworks for humans, using extensive, but only minimally-invasive, clinical measurements. The role will form a central part of a multi-disciplinary collaboration between academic, clinical (at St Thomas's hospital in London), industrial (Philips Medical research) and academic (Imperial College, University College London) partners working across modelling, imaging and device design.

Main Duties and Responsibilities

Main duties for this role will include:

- The development of existing continuum mechanics software to the perform coupled electro-mechanical simulations
- The customisation and personalisation of cardiac models to patient specific data
- The interpretation of medical image data using the modelling
- Travel and interaction with academic and industrial partners engaged in data collection and imaging technologies respectively.

Selection Criteria

The successful applicant will have many, but not necessarily all, of the following skills:

- A PhD or equivalent qualification in the Engineering, Mathematical Biology, Applied Mathematics, Physics or Computer Science.
- A strong background in mathematical modelling. Previous work in linear or nonlinear mechanics and/or solving partial differential equations will be an advantage.
- Experience in the application of numerical techniques applied to complex mathematical models such as FEM, finite differencing and ALE based approaches.
- Experience in visualisation and analysis of multi-dimensional data sets
- A high level of Fortran90 and/or C++ programming ability
- A desire to translate scientific research into clinical outcomes.
- Good English language skills, both written and verbal;

Salary and Benefits

The post, which is a full-time three year appointment, has a salary on the University grade 7S scale (currently £28,839 to £34,469 pa), includes membership of the University Superannuation Scheme (USS), has an annual leave entitlement of 38 days per year, (inclusive of all public holidays and university closed periods), and is available from 1 January 2010.

Method of Application

Applications should be in the form of a *letter of application* relating the candidate's skills to the post selection criteria, together with a full Curriculum Vitae which includes the names and addresses of two referees. **Candidates should state clearly which post they are applying for.**

The application should preferably be sent by email (most formats accepted) to:

job5@comlab.ox.ac.uk

or by post to: The Administrator, Oxford University Computing Laboratory, Wolfson Building, Parks Road, Oxford, OX1 3QD.

Applications should be sent in time to arrive by 5:00 p.m. on **Friday 11th December 2009**. Applications received after this time will not be considered. It is expected that interviews will be held in early January with short-listed applicants being notified before the Christmas break..

Applicants must ask their referees to consider the further particulars and email the reference directly to job5@comlab.ox.ac.uk or, alternatively, post or fax (+44 1865 283532) it to the above address so that references arrive by the closing date.

The policy and practice of the University of Oxford require that all staff are offered equal opportunities within employment. Entry into employment with the University and progression within employment will be determined only by personal merit and the application of criteria which are related to the duties of each particular post and the relevant salary structure. In all cases, ability to perform the job will be the primary consideration. Subject to statutory provisions, no applicant or member of staff will be treated less favourably than another because of his or her age, sex, marital or civil partnership status, sexual orientation, religion or belief, racial group or disability.

Applicants who would need a work visa if appointed to the post are asked to note that under the UK's new points-based migration system they will need to demonstrate that they have sufficient points, and in particular that:

(i) they have sufficient English language skills (evidenced by having passed a test in basic English, or coming from a majority English-speaking country, or having taken a degree taught in English)

and

(ii) that they have sufficient funds to maintain themselves and any dependants until they receive their first salary payment.

Further information is available at:

<http://www.ukba.homeoffice.gov.uk/workingintheuk/tier2/generalarrangements/eligibility/>

All data supplied by applicants will be used only for the purposes of determining their suitability for the post and will be held in accordance with the principles of the Data Protection Act 1998 and the University's Data Protection Policy, but if the person appointed to the post is a migrant sponsored under the UK's new points-based migration system, we are required to retain all applications for the duration of the sponsorship.