

Three Post-doctoral Research Posts

Vacancies for three post-doctoral research fellows are available on the project 'Diversity in blood flow control to the brain: moving from individualized modelling towards personalized treatment of the injured brain'. This three-year project is funded by EPSRC (UK) with linked studies in Southampton (David Simpson, Tony Birch, Diederik Bulters), Oxford (Stephen Payne) and Leicester (Tom Robinson, Ronney Panerai).

The brain, more than any other organ in the body, requires a constant supply of blood in order to maintain its function. When blood pressure drops, small arteries dilate to restore flow levels, and when pressure rises, they constrict to protect the most delicate blood vessels and avoid bleeding in the brain. This control system can however become impaired for example following stroke, head trauma, in dementia or following premature birth and this has been associated with worse outcomes for the patient. Failure of the control system also has important implications for the management of patient's blood pressure: changes in blood pressure could be dangerous without the protection of this 'autoregulatory' system.

This project aims to improve methods for measuring cerebral autoregulation and to gain a deeper understanding of the complex relationship between blood pressure and blood flow in healthy individuals and patients following stroke. While much work has been done in this field, experimental and technical challenges in assessing the control function has so far led to only limited benefit to patients. The control system is highly complex and, typical of such biological systems, there are multiple complementary physiological mechanisms working in parallel. There are indications that even in healthy individuals there are differences in the manner and the extent to which they control the flow. Impairment may also affect different mechanisms to a varying extent in different individuals. This has important implications for grading an individual's autoregulation, as the conventional approach, based on a single number to quantifying the strength of autoregulation, is likely to be inadequate.

The key objectives of this project are to:

1. Develop, evaluate and optimize new signal processing and mathematical modelling approaches to assess cerebro-vascular and cardiovascular control, and their interaction;
2. Quantify and test intra and inter-individual differences in normal and impaired cardio/cerebro-vascular control;
3. Propose multi-dimensional metrics of autoregulatory control and its impairment, suitable for use at the bedside;
4. Test whether such metrics can benefit in the acute management of stroke patients and improve outcome prediction.

In order to carry out the necessary work, we are seeking three research fellows (one in each centre) with a PhD/Doctorate in suitable areas of engineering, mathematics, physics, physiology or clinical science. In Southampton and Oxford signal processing/mathematical modelling will be the primary tasks and in Leicester the main focus will be on the clinical/physiology applications. Previous experience in cerebro- or cardio-vascular control will be a distinct advantage.

Please direct any enquiries and apply directly to each of the centres:

- **Southampton:** Dr David Simpson (ds@isvr.soton.ac.uk); Dr Tony Birch (tony.birch@uhs.nhs.uk): <https://www.jobs.soton.ac.uk/Vacancy.aspx?ref=297913KR>
- **Oxford:** Dr Stephen Payne (stephen.payne@eng.ox.ac.uk)
- **Leicester:** Prof Ronney Panerai (rp9@leicester.ac.uk); Prof Tom Robinson (tgr2@leicester.ac.uk)