

The University of Manchester

THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF NATURAL SCIENCES

DIVISION OF APPLIED MATHEMATICS

RESEARCH ASSOCIATE IN APPLIED MATHEMATICS

VACANCY REF: SAE-015739

Salary: Grade 6 £32,816 to £40,322 per annum (according to relevant experience)

Hours: 1 FTE

Duration: Fixed term, January 2021 for 24 Months

Location: Oxford Road, Manchester

Enquiries about the vacancy, shortlisting and interviews: Manager: Dr Igor Chernyavsky Email: igor.chernyavsky@manchester.ac.uk

BACKGROUND

Applications are invited for a 2-year post-doctoral position focused on mechanistic and data-based modelling of blood flow rheology and transport in the human placenta. The position is supported by the EPSRC grant "Novel Models for Haemodynamics and Transport in Complex Media: Towards Precision Healthcare for Placental Disorders".

This interdisciplinary project will investigate how altered placental structure impairs the organ's function. Pre-term and stillbirths affect up to 10% of all deliveries, including in developed countries, and pregnancy complications cost over £1.2 billion each year to the health services in the UK alone. There is currently a gap in the understanding of the role of red blood cell dynamics in solute transport in complex spatial domains, such as the human placenta.

The Research Associate will join a rapidly-growing mathematical physiology and biomechanics group within the Department of Mathematics, working directly with Dr Igor Chernyavsky and Professor Oliver Jensen, and in close collaboration with computational and experimental microfluidics experts, clinicians and biomedical engineers in the UK and internationally. This



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position benefits from being a part of a large project that will provide unique experimental and computational input to the mathematical modelling effort.

The University of Manchester is the largest single-site university in the UK and has produced more than 20 Nobel Laureates. The Department of Mathematics enjoys strong engagement with industry and a long tradition for excellence in Applied Mathematics. The Department, the School of Natural Sciences and the University as a whole are committed to the well-being and work-life balance of all staff. In addition to attractive rewards and benefits, the University offers a suite of family-friendly policies. For more details please see www.manchester.ac.uk/connect/jobs/benefits-working-here/.

Overall Purpose of the Job:

This project lies at the interface between applied mathematics, continuum mechanics, multi-scale physics, spatial statistics and image analysis. The primary aim of a post-holder would be to develop and validate an upscaled image-based model for fully coupled transport of red blood cells and solutes in disordered porous media. The model will provide fundamental insight into spatio-temporal microscopic localisation of red blood cells and associated emerging macroscopic constitutive relationships. Long-term, this work will contribute to transforming obstetrics and neonatal critical care into technology-enabled precision medicine, including design optimisation of an 'artificial placenta' for the support of extremely premature babies.

Key Responsibilities, Accountabilities or Duties:

The range of duties will include:

- Develop research objectives and proposals for own or joint research, with guidance if required.
- Conduct individual and collaborative research projects.
- Write up research work for publication in high impact journals and contribute to project reports.
- Continually update knowledge and understanding in relevant field or specialism.
- Translate knowledge of advances in the subject area into research activity.
- Communicate complex information, orally, in writing and electronically.
- Communicate material of a specialist or highly technical nature.
- Interact closely with other members of the research team.
- Attend and contribute to relevant meetings, seminars and conferences.
- Use and develop new research resources, techniques and methods, as appropriate.
- Use creativity to analyse and interpret research data and draw conclusions on the outcomes.
- Plan and manage own research activity in collaboration with others.
- Be aware of the risks in the work environment and their potential impact on their own work and that of others.

Post holders are also required to familiarise themselves with the University's Equality, Diversity and Inclusion policies and to actively support these wherever possible.



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PERSON SPECIFICATION

Essential Knowledge, Skills and Experience:

Essential

- Have a good first degree (or equivalent) in mathematics, physics or a relevant branch of engineering.
- Have, or be about to obtain, a PhD in relevant area of applied mathematics, physics, or a closely related field.
- Have high-level expertise in mathematical modelling, numerical simulation techniques and programming.
- Possess specialist knowledge and have experience in at least one of the following areas: theoretical continuum mechanics; stochastic modelling; spatial statistics.
- Have an enthusiasm for research at the interface of mathematics and biological sciences.
- Have strong journal publication record in an area relevant to the project, including evidence of significant contributions to high quality research publications, commensurate with research experience.
- Excellent written and oral communication skills.
- Excellent time management and organisational skills; ability to meet deadlines.
- Ability to work independently and as part of a team.
- Ability to liaise confidently and effectively with a range of individuals across different disciplines.
- Willingness to learn and develop.

Desirable Knowledge, Skills, Experience and Qualifications:

- Experience of collaboration with researchers from experimental microfluidics or life sciences.
- Knowledge of fluid mechanics of complex fluids and suspensions, or multi-physics transport processes in porous media.
- Knowledge of reduced-order modelling, uncertainty quantification and asymptotic upscaling techniques.
- Experience of theoretical or computational image-based modelling.
- Familiarity with multiple computer operating systems.