



UNIVERSITY OF LEEDS

# Access to Research

Research Internship Programme



**Candidate brief:**

Multi-scale modelling of articular cartilage (Leeds Institute for Fluid Dynamics)



Access to Research (A2R) Internships give you the opportunity to experience the research environment in your chosen field, think about whether a career in research is the right choice for you, and develop invaluable knowledge and skills to strengthen your application to PhD programmes.

## Multiscale modelling of articular cartilage

**Project supervisors:** Emily Butler, Dr Greg de Boer, Dr Basil Mathai

**Department:** Leeds Institute for Fluid Dynamics (Centre for Doctoral Training in Fluid Dynamics)

**Role type:** Full-time

**Duration:** 6 weeks

**Start date:** June/July 2024 (flexible)

**Salary:** £2,709 (£12.90/hr)

**Location:** Flexible

### Project summary

Articular cartilage (AC) is a soft tissue found at opposing surfaces in joints, for example in the knee and hip. It provides a smooth bearing surface, which allows for low friction articulation and facilitates continuous operation under relative motion. A lack of cells within AC renders a low capacity for intrinsic healing or repair. This leaves it prone to degeneration and disease, resulting in a high clinical demand for cartilage repair. To streamline treatment, an accurate computational model of the tissue is essential to inform rapid pre-screening of therapeutic interventions.

This project will provide an insight into computational models of cartilage tissue designed to understand its mechanical properties and function. The candidate will get first-hand experience with the research procedure pipeline, from developing an understanding of the literature, computational modelling and post-processing results and finally report writing. There will also be an opportunity to get some hands-on lab experience with real bovine cartilage tissue and the chance to attend or contribute to a research group meeting.

This project is dynamic and can be tailored to the applicants' interests, expertise and desired skill set development. Various pathways include continuum poroelastic modelling, image driven analytical micro-scale fiber modelling, model validation against experimental data or disease modelling of cartilage degeneration/osteoarthritis. The project scope will be determined in the first week between the student and supervisor.

You will attend weekly meetings with the project's supervisory team and have the opportunity to meet other members of the cartilage modelling team and watch short presentations of their work. You will also have the opportunity to attend the centre's internal seminar for exposure to research presentations and a chance to see a broad range of projects that are studied at post-doctoral level.

## **Developmental benefits**

This project will provide the successful applicant with the opportunity to:

- Learn how to effectively literature review and pick out key points
- Develop an understanding of cartilage function and mechanical properties and the relevance of this from a healthcare perspective
- Gain exposure to image driven mathematical modelling - learn how to implement, run and develop computational models with integrated experimental data
- Be involved in an interdisciplinary project that strides the whole pipeline from mathematical code conceptualization to the end product of a biologically relevant model that can inform clinical treatment procedures to prevent a need for total joint replacement
- Gain lab environment exposure with the opportunity to carry out a hands-on experiment using bovine articular cartilage (with Dr Greg de Boer and Dr Basil Mathai)
- Learn the process of report writing and how to formally present research findings
- Possibly contribute to a journal paper - get a first-hand chance to see the construction of an academic paper and potentially be involved in contributing through running some results for the report

## **Essential criteria**

Applicants to this project should have:

- An interest in biological modelling/human health
- Some experience with coding (ideally MATLAB/Python language, but this is not essential) – the complexity of the project can be tailored to your experience level
- Mathematical understanding of numerical methods and mechanics or a general background in mathematics/computing/mechanical engineering
- Self-motivation for pursuing modelling and scientific understanding on their own basis
- Competent writing and reporting skills

## **Who should apply**

This research internship is funded by the Yorkshire Consortium for Equity in Doctoral Education (YCEDE). In line with the consortium's mission, applications are open to individuals who:

- Are currently registered on a relevant undergraduate or taught postgraduate degree programme at any UK university
- Are eligible for Home (UK) rate of higher education tuition fees
- Self-identify as being Black, Asian or belonging to another minoritised ethnic group

If your application is successful you will need to provide proof of your right to work, such as a UK passport, as well as confirmation of enrolment on your current degree programme (if not currently a student at the University of Leeds).

If you have any questions or would like to discuss your eligibility, please contact [pgrdiversity@leeds.ac.uk](mailto:pgrdiversity@leeds.ac.uk)

## **How to apply**

You should review the essential and eligibility ('Who should apply') criteria carefully, then complete the [A2R Internship Application Form](#), specifying which research project you are applying to. If your application is shortlisted, you will be invited to attend a short online panel interview with the project supervisor and colleagues from the Faculty of Biological Sciences.

**Applications open on Wednesday 13 March and close at 17:00 on Monday 29 April**

## **Support in completing your application**

If you have any questions about your application, require information for candidates with disabilities, impairments or health conditions, or would like to request alternative formats, please do not hesitate to contact [pgrdiversity@leeds.ac.uk](mailto:pgrdiversity@leeds.ac.uk)