Fully funded PhD Opportunity
Development of a patient specific osteosarcoma-on-a-chip device for drug discovery and therapeutic innovation.

About this Project: Osteosarcoma is a highly aggressive bone cancer largely affecting children. Treatment is often radical and debilitating, and despite the clinical urgency for newer more effective therapies, there has been no change in treatment options since the introduction of chemotherapy in the 1970s. As result the current 5-year survival rate in aggressive forms of osteosarcoma is still below 20%. Accelerating cures for those poor outcome patients remains a challenge and this in part is due to a lack of accurate osteosarcoma preclinical models. Traditionally, two dimensional (2D) cell culture and animals have been used as primary cancer drug development models. Although 2D cell culture is relatively easy to perform, it fails to mimic the 3D complexity of the primary tumour microenvironment. On the other hand, animal models for drug testing are labour and time intensive, costly, and most significantly, often yield untranslatable results due to the physiological differences between humans and animals, with estimated drug failure rates as high as 90%. Despite this, animal models remain the main pre-clinical model for validating potential drug candidates for osteosarcoma patients.

Organ-on-a-chip technologies using patient-specific cells, represent a promising alternative as they allow for controllable cell culture within an organotypic microarchitectural environment, providing a simple yet more physiologically relevant platform for drug screening than traditional cell culture/animal models. Specifically, for rare paediatric diseases like osteosarcoma where full clinical trials are challenging, they provide a repeatable, cost-effective, medium-throughput alternative for drug screening. This emerging field hit a major milestone in December 2022, when the US Congress approved the FDA Modernization Act 2.0 allowing the use of organ-on-chip data for drug discovery instead of animal models.

This clearly indicates the immense potential organ-on-chip devices will have in the future for treating rare diseases like osteosarcoma, further emphasising the distinct critical need for the development of the proposed device. This interdisciplinary PhD project will involve developing and optimising an osteosarcoma-on-a-chip device integrating patient derived tumour spheroids, microfluidic technology, and novel biomaterial design to provide an accurate model of the tumour microenvironment for use by both the pharmaceutical industry and research community.

University College Dublin (UCD) Ad Astra Studentships: A four year PhD studentship award includes full tuition fee waiver, a PhD stipend of €18,500 per annum (tax free), and a research budget to cover research costs associated with the project. Students will be enrolled onto UCD's structured PhD programme which includes some taught elements and transferrable skills training providing an excellent foundation for a research career (www.ucd.ie/graduatestudies/researchstudenthub/researchprogrammes/).

About the research team: Dr Fiona Freeman is an Ad Astra Fellow, Conway Fellow, and Assistant Professor in the School of Mechanical and Materials Engineering at UCD. Her research focuses on the fields of mechanobiology, biomaterials, 3D bioprinting and developing *in vitro* and *in vivo* disease models, but particularly in using novel engineering techniques to understand and develop new therapeutics to treat injured and diseased musculoskeletal tissue.

Minimum Qualifications: A Master's Degree (or equivalent) in Biomedical Engineering, Mechanical Engineering, Molecular Bioengineering, Medicine, Veterinary Medicine, Biomedical Sciences or a closely related area. Candidates should enjoy working as part of a team and have a keen interest in biomedical device design.

For further information and to apply please email Dr Freeman (she/her) at fiona.freeman@ucd.ie. Applicants should submit the following as a single pdf document:

1. A cover letter outlining their interest in the project any relevant experience and their future goals.
2. A detailed CV (including a list of any publications if applicable).
3. The names and contact details of two academic referees.

Interviews will take place in May 2023 via video calls. The candidate should be in a position to start their PhD by September 2023.