**PhD Scholarship**

**Computational Modelling of Additive Manufacturing with Metals**

Additive Manufacturing is a new way of creating 3D metallic components for which the raw material is loose powder of the alloy composition in question. The part is built-up layer-by layer, guided by a computer model of the final shape required, by selective melting (using scanning laser or electron beam) of portions of the powder which then solidify and fuse. The process is at the forefront of a new and exciting wave in manufacturing for aerospace and biomedical engineering.

The mechanical properties of the 3D printed part are largely determined by its microstructure, which in turn depends on the solidification process. In this PhD project the student will use computer simulation to predict this microstructure, by computational modelling of the nucleation and growth of grains during such rapid solidification. Numerical techniques such as phase field and/or cellular automata will be deployed to simulate such microstructural evolution, building upon recent progress in this area in the active research team of Prof. David Browne – the Phase Transformation Research Group (PTRG) in the UCD School of Mechanical and Materials Engineering. In this way a so-called “Digital Twin” of the process will be created.

The computer model developed will be validated using experimental data from X-ray equipment currently on loan to UCD from the European Space Agency. This enables in-situ observation and recording of real microstructural evolution during alloy solidification, and determination of the effects of gravity on same.

The successful candidate will become a member of the PTRG, and also part of the Irish national Advanced Manufacturing Research Centre known as [I-Form](https://www.i-form.ie/). PhD graduates in this field at UCD have been recently in high demand by employers.

A full 4-year scholarship will be offered, to include a competitive tax-free stipend, at rates approved by Science Foundation Ireland, and fully-covered tuition fees. Funding will also be available for travel to present at international conferences, and for laboratory expenses. A new computer will be provided for the duration of the PhD project. A start in late 2023 or early 2024 is foreseen.

Candidates should have an honours Bachelors degree in Materials Science & Engineering, Metallurgy, Mechanical Engineering, or a related and cognate subject. A Masters degree would also be beneficial.

Applicants should provide a cover letter and CV, by 31st October 2023 at the latest, to:

Professor David J. Browne

School of Mechanical & Materials Engineering

University College Dublin

Belfield

Dublin 4

Ireland

tel: +353 1 716 1901             email  david.browne@ucd.ie