

Title: Experimental Validation of Variable Acceleration Rayleigh-Taylor Instability

Type of award PhD Research Studentship

Department Mechanical Engineering

Scholarship Minimum £17,668 p.a. plus an industrial top-up of £5,600 p.a.
Details subject to eligibility criteria and award.

Duration 4 years

Eligibility Home/UK

Start Date From October 2023

PhD Topic Background/Description

Turbulence remains the greatest unsolved problem in classical physics. One of the most fundamental examples of turbulence is that driven by the Rayleigh-Taylor instability at interfaces between fluids with differing density. The University of Bristol has developed a world-leading experimental capability for variable acceleration Rayleigh-Taylor instability: an 11-metre-tall vertical railway with a carriage driven by an electric motor delivering 75kW at peak output, with a 40kg experimental payload accelerating at up to +/-5g. The system is very flexible and will enable the student to explore a broad parameter regime in pursuit of the scientific goals of the project, which include characterising the rate of molecular mixing at density interfaces subject to sequences of unstable growth and stable relaxation. The student will also develop digital twinning techniques, inspired by recent progress in machine learning, which seeks to extend the reach of experimental results to provide full field physical data. The ultimate aim is to validate sophisticated computational fluid dynamical models for the turbulent mixing processes found in Rayleigh-Taylor instability, knowing that current approaches to simulation have several well-known deficiencies. The overarching scientific purpose of this project is to improve our predictive capability by pulling simulations towards the ground-truth of experimental reality.

Candidate Requirements

Applicants must hold/achieve a minimum of a master's degree (or international equivalent) in a relevant discipline: Mechanical Engineering, Aerospace Engineering, Chemical/Process Engineering, Physical Sciences, Applied Mathematics.

Please note, acceptance will also depend on evidence of readiness to pursue a research degree.

Basic skills and knowledge required

Strong analytical skills, comfortable with the prospect of performing experiments and developing experimental apparatus. Some previous experience with software development is desirable.

Scholarship Details

An enhanced stipend starting at £23,268 p.a. will include tuition fees subject to confirmation of award.

Informal enquiries

Please email Dr Andrew Lawrie (Andrew.Lawrie@bristol.ac.uk)

For general enquiries, please email came-pgr-admissions@bristol.ac.uk

Application Details

To apply for this studentship, submit a PhD application using our [online application system](https://www.bristol.ac.uk/pg-howtoapply) [www.bristol.ac.uk/pg-howtoapply]

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the **Mechanical Engineering Department**” and specify the title of the scholarship in the “other” box below with the name of the supervisor.

Closing date for applications: **30 June 2023**