

MASTER/PFE/PHD ON THE TRANSITION TO TURBULENCE IN PARTICULATE PIPE FLOWS

A PhD position, or (MSC/PFE internship with PhD follow-up) in experimental fluid mechanics is open at the Centre for Fluid and Complex Systems (FCS), Coventry University, in collaboration with Oxford University, under the joint supervision of Prof. Alban Pothérat, (Coventry University, UK, <http://users.complexity-coventry.org/~potherrat/>) and Prof. Tom Mullin (Oxford University).

The topic concerns the experimental study of pipe flows seeded with particles. At high enough flowrates, flows of liquids in pipes become turbulent. The transition process involves complex nonlinear mechanisms that are still not fully understood. Yet predicting, delaying or triggering – in other words controlling – the onset of turbulence is a pressing need both as one of the fundamental challenges of fluid mechanics and for the vast range of practical problems where the radically different energy and pressure losses incurred in laminar or turbulent flows have drastic consequences.

A more recent angle to this problem emerged with the growing practical importance of flows seeded with particles that can either prevent or induce transition to turbulence depending on their size and concentration. The underlying mechanisms were unknown until recently. The centre for Fluid and Complex systems developed a fully transparent pipe flow device of hitherto unmatched accuracy fitted with a unique optical detection device capable of mapping the motion of fluid and particles simultaneously to make the first breakthrough in this problem of fundamental importance. The question now is to understand how the motions of fluid and particles interact in detail, ultimately manipulate this interaction with electric fields and control the transition. This is precisely the objective of this PhD, that offers a unique opportunity to use and develop cutting edge experimental techniques to tackle one of the great challenges of nonlinear physics, for both fundamental and practical purposes.

The fluid and Complex Systems Research Centre (<https://www.coventry.ac.uk/research/areas-of-research/centre-for-fluid-and-complex-systems/>) gathers fluid dynamicists, physicists and engineers to tackle fundamental, but also real-life problems involving fluids and complexity with mathematical rigour. For example, aside of its more traditional forte in fluid dynamics and statistical physics, the centre is also developing novel approaches in engineering fluid mechanics, flow measurement and socio-physics. The Fluid Dynamics Group currently comprises 15 Staff and PhD students and runs projects combining theory, numerical simulations and experiments, supported by a number of grants from research funding bodies (EPSRC, The Leverhulme Trust, the Royal Society...) and international partnerships. The group forms part of Coventry University's Mathematics Unit of Assessment (10) for the Research Excellence Framework. 87% of the submission's output was deemed internationally excellent at REF 2014. The centre prides itself in its active integration of PhD students in its academic life (events, seminars, interaction with its staff) and provides a vibrant international and interdisciplinary environment conducive to the production of world-class research.

Candidates must hold, or be on course for a 1st class Bsc. or Msc. degree in engineering or physics, with previous experimental experience and be motivated to conduct technically advanced experimental projects. Experience in fluid mechanics and/or measurement technology is strongly advised. The position is suitable for final year MSc or Engineering school student seeking an internship and the PhD position is fully funded (Fee+Stipend) for a period of 3.5 years and is available to start from January 2021 or after the end of the internship period.

To express interest in this PhD opportunity, please send a CV and a full transcript of academic records to Alban Pothérat (Coventry University, alban.potherat@coventry.ac.uk). Informal enquiries are encouraged.