Catastrophic Transition in Rotation-Dominated Flows

Postdoctoral Research Fellowship

Join an international team
Supported by a PhD Research Project

Background
Flows with dominant background rotation can be found in a wide range of engineering and geophysical applications. The Coriolis force in these flows can support oscillatory behaviour, leading to a range of unique phenomena. One of these is an energetic and rapid catastrophic transition from laminar to turbulent flow as shown below. First noted in the 1960s, this catastrophic transition remains unexplained and has even been proposed as underpinning the general turbulent cascade. Our research aims to better understand this transition mechanism via laboratory experiments coordinated with theory and numerical simulation.

The postdoctoral fellow would be based in Melbourne.

A successful candidate from a theoretical background would investigate different aspects of transition to turbulent flow in rotating systems using developments to an existing simulation and analysis package. Computations will employ Australia's largest supercomputer at the NCI National Facility.

A successful candidate from an experimental background would design and commission new equipment, utilising our funding for specialised new laser flow diagnostics. Data on transitions to turbulence would be obtained using the new apparatus in Melbourne and the existing apparatus at Marseille.

The project provides funding to attend international conferences and also to travel to work with international project partners.

Remuneration
The postdoctoral fellow would be appointed on a three-year contract at Australian academic level A6, or above, depending on experience.

How to Apply
Email an application to Prof Hugh Blackburn,
hugh.blackburn@monash.edu
by 31 May 2013, comprising:

• a cover letter explaining your interest in the position, and the date you would be able to commence if successful;

• a CV, including full publications list, clearly identifying papers accepted from those under review;

• a detailed statement explaining via examples how you meet either the experimental or theoretical/numerical Selection Criteria below. If you do not explicitly address the Selection Criteria, your application will not be considered.

• Names and contact details (phone and email) of at least two academic or professional referees.

Position
This position will suit an established or recent PhD graduate with advanced expertise in rotating flows. We are seeking a postdoctoral research fellow to undertake either the experimental or the theoretical work. Our philosophy focuses on the person: we intend to recruit an outstanding candidate from either background. Once the postdoctoral fellow is identified, we will recruit an outstanding PhD student from the complimentary background.

Project outline
The Australian Research Council funded project is led by investigators Blackburn, Manasseh, Lopez and Meunier. Project partners are based at Monash and Swinburne Universities in Melbourne, Australia, at Arizona State University, USA (Lopez), and at IRPHE in Marseille, France (Meunier).
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### Selection Criteria

#### Experimental Applicants

**Essential Selection Criteria**

1. A PhD in experimental fluid dynamics.
2. Experience in one or more of: rotating flows; turbulent flows; transitions to turbulence; dynamical systems and chaos.
3. Experience in independent design of a complex experimental apparatus.
4. Experience with one or more of: laser fluid-flow diagnostics, image processing of fluid flows, or intrusive velocity, pressure or conductivity measurement systems.
5. Ability and desire to work with other people, (preferably in multi-disciplinary teams).
6. Evidence of well-developed written and verbal communication skills.

**Desirable Selection Criteria**

1. A record of publications submitted or published in high-impact fluid dynamics journals.
2. Experience in independent sourcing of equipment or parts.
3. Experience in liaison with workshop or fabrication staff, or in hands-on manufacture of experimental equipment.
4. Initiative and resourcefulness.
5. Ability to manage time and meet deadlines.
6. Ability to work across multiple organisations.

#### Theoretical / Numerical Applicants

**Essential Selection Criteria**

1. A PhD in theoretical or numerical fluid dynamics.
2. Experience in one or more of: rotating flows; turbulent flows; transitions to turbulence; dynamical systems and chaos.
3. Experience in independent derivation of analytic formulations or authoring of computational fluid dynamics codes.
4. Experience with one or more of: analysis of hyperbolic partial differential equations, linear and nonlinear stability theory, direct numerical simulation, or large-eddy simulation.
5. Ability and desire to work with other people, (preferably in multi-disciplinary teams).
6. Evidence of well-developed written and verbal communication skills.

**Desirable Selection Criteria**

1. A record of publications submitted or published in high-impact fluid dynamics journals.
2. Experience in managing and visualising large numerical data sets.
3. Experience in nonlinear dynamical systems tools and metrics.
4. Initiative and resourcefulness.
5. Ability to manage time and meet deadlines.
6. Ability to work across multiple organisations.

It will be a **condition of employment** that the incumbent becomes familiar with and adopts university **Equal Employment Opportunity** principles, and becomes familiar with and adopts university **Occupational Health and Safety** principles and directives. These are legal requirements. For more information, see: [http://www.adm.monash.edu.au/human-resources/induction/orientation-online.html](http://www.adm.monash.edu.au/human-resources/induction/orientation-online.html)