Dr. Yuan Li

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Personal

Born on April 19, 1982.

Chinese Citizen.

Professional Experience

Post-doctoral Research Assistant, Division of Civil Engineering, University of Dundee, 2012 - present.

Education Experience

Background

Ph.D., Applied Mathematics, University of East Anglia, 2006-2011.

M.Sc. by Research, Mathematics, University of East Anglia, 2005-2006.

Graduate Diploma, Mathematics, University of East Anglia, 2004-2005.

Graduate Certificate, Physics, University of Zhengzhou(China), 1998-2002.

Scholarship

Faculty Scholarship Award Winner of Faculty of Science at UEA, which funded my Ph.D. research in 2006-2009.

Entrance Scholarship at University of Zhengzhou. September, 1998.

Research Experience

Post-doctoral Research: Mathematical and computational modelling of particle-flow interactions in deformable porous structure. (Supervisor: Dr. Jonathan Kobine)

Ph.D. Research: Linear instability of two-layer flows within an oscillating channel or pipe at arbitrary Reynolds number. (Supervisor: Dr. Mark Blyth)

M.Sc. Research: Linear instability of interfacial flows with surfactants. (Supervisor: Dr. Mark Blyth)

Teaching Experiences

Teaching Assistant of Mathematics for Engineers in Division of Civil Engineering at University of Dundee, 2012

Associate Tutor for various undergraduate courses in Mathematics at University of East Anglia, 2005-2010.

Part-time lecturer of Advanced Mathematics in INTO at University of East Anglia, in 2007.

Part-time lecturer of Core Math in INTO at University of East Anglia, in 2006.

Part-time lecturer of Basic Mathematics in the CEB at University of East Anglia, in 2006.

Publications

Y. Li & M. G. Blyth. Axisymmetric flow of two fluids in a pulsating pipe, 2009, *Journal of Engineering Mathematics* 63, 135–151.

Y. Li & M. G. Blyth. Two-layer fluid flows in a pulsating channel, *On Submission.*

A. C. Muir, P. McKeown, Y. Li, J. J. Kobine & M. R. Bird. The removal of food fat based soils during the washing of fabrics, *Accepted by Chemical Engineering Research and Design(ChERD).*

Y. Li & J. J. Kobine. Steady fluid flow through the pores of woven fabrics, *On Preparation.*

Presentations

Conferences

Presentation in the 25th Scottish Fluid Mechanics Meetings(SFMM) at Heriot-Watt University, 2012.

Presentation in British Applied Mathematics Colloquium(BAMC) at UCL, 2012

Presentation in BAMC at University of Nottingham, 2009.

Presentation in BAMC at University of Bristol, 2007.

Presentation in European Postgraduate Fluid Dynamics Conference at University of Birmingham, 2007.

Research Seminars

Presentation in Research Seminar of Fluid Dynamics group, Division of Civil Engineering, University of Dundee, 2012.

Presentation in Research Seminar of Applied Mathematics at University of East Anglia, 2010.

Presentation in Research Seminar of Math PHD at University of East Anglia, 2008.

Further Trainings

Graduate Courses

Hydrodynamic Stability Theory at University of Keele, 2007.

Analytical Method, at London Taught Course Centre for PhD students in the mathematical sciences, 2007.

Others

COMSOL Multiphysics intensive training course, Cambridge, 2012.

Computer Skills

Operating system: Linux, Windows.

Computing language: Fortran, C, LaTeX, Linux Shell Script.

Software package: Maple, Matlab, COMSOL Multiphysics.

Non-academic Activities

Administrator: IT Support for Chinese Students and Scholars Association at Norwich, 2007-2009.

SUMMARY OF PREVIOUS RESEARCH AT THE NEXT PAGE

Summary of previous researches

Ph.D Research

Project: Linear instability analysis of two-layer flows within an oscillating channel or pipe at arbitrary Reynolds numbers.

This mathematical problem has been raised in a number of biological applications. For example, in the airways of lungs, there exist a thin layer of mucus coating the inside of airways and the air flowing in the center. During normal rhythmic breathing, closure of the smaller airways may occur due to the formation of a liquid mucus lens. In terms of those studies in two-layer flows, this problem happens due to the unstable interface between the core-layer flow and the annular-layer flow, which means, giving a small perturbation at the interface, it grows in time. It is interesting to know the mechanism at its initial stage of the linear instability.

This project is a theoretical investigation of the effect of wall pulsations, on an axisymmetric arrangement of two fluids in a cylindrical pipe and a parallel arrangement of two fluids in a two-dimensional channel, in which the basic flows are driven by the wall motions. It includes three parts: (i) linear instability analysis at zero Reynolds number; (ii) the trajectories of an unperturbed interface at arbitrary Reynolds numbers; (iii) linear instability analysis of two-layer fluids within a very thin channel at arbitrary Reynolds number with the lubrication approximation. The fluid flows have been governed by Navier-Stokes equation. The boundary conditions have been defined according to the fluid nature of non-penetration and non-slip at the walls, the continuity, the kinematic and the dynamic conditions at the interface. The Floquet theory has been applied to erase the complication caused by the periodic motion of walls. A few numerical schemes in the finite difference method have been used for the numerical computation of our initial-value problems or boundary-value problems, such as Runge-Kutta method, Crank-Nicolson method and MacCormack Method. The nonlinear terms in Navier-Stokes equations have been dealt with a fixed-point iteration in the part (ii). The spectral method of Chebyshev-tau method has been used to solve the Orr-Sommerfeld equation for stability analysis in the part (iii). All of the codes have been developed in Fortran77. The Maple has been used for those ODEs' and PDEs' derivatives. The Matlab has been used for data processing. One part of this work has been published in 2009, another part is on submission.

Postdoctoral Research

Project: Mathematical and computational modelling of particle-flow interactions in deformable porous structure.

This is an EPSRC project to investigate the hydrodynamic effects that are involved in cleaning soiled fabrics at low temperatures, with the collaborators in School of Chemical Engineering at University of Bath and the industrial partners at Procter & Gamble. To mainly consider the cleaning process of hand washing, a low velocity of fluid has been assumed. My part of work is developing a mathematical and computational modelling to investigate the particle removal of fluid flows over a woven fabrics.

A few suppositions have to be made at the current stage: (i) the fabric has mono-filamental yarns with an ideal geometry description; (ii) the fabric has a homogeneous distribution of a certain pattern of unit cells; (iii) the fabric has no or very little deformation only; (iv) the yarns do not shift within the phase of fabrics; (v) the yarns do not swell. Suggested by the previous authors, the hydrodynamic effect of cleaning is mainly due to the shear force of flows on the surface.

In the modelling, the geometry of fabric has been generated by TexGen, a free software developed by University of Nottingham. The finite element analysis software package, COMSOL Multiphysics, has been used for the CFD analysis and fluid-particle-interaction investigations. The current achievements include: (i) an analytical permeability-porosity relation for the fabric has been developed to allow predicting the permeability from the measurements of its geometric parameters; (ii) the numerical comparisons, of the hydrodynamic cleaning ability and the relation of flow rate to the pressure drop, have been made with the experiments at University of Bath. The ongoing work is mainly investigating the removal of the fouling on the woven fabrics with the turbulent flows. One peer-reviewed conference paper has been accepted by ChERD, another one journal paper is on preparation.