

# HELEN J. WILSON

*Department of Mathematics, University College London*

*helen.wilson@ucl.ac.uk*

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## EMPLOYMENT HISTORY

- 2004– Lecturer in Applied Mathematics, **University College London**, UK.  
Senior Lecturer (2007); Reader (2009); Professor of Applied Mathematics (2016).
- 2000–2004 Lecturer in Applied Mathematics, **University of Leeds**, UK.
- 1998–2000 Postdoctoral Research Associate, Department of Chemical Engineering,  
**University of Colorado at Boulder**, USA.
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## EDUCATIONAL QUALIFICATIONS

- 2000–2002 **PGCLTHE** (Higher Education teaching qualification), University of Leeds.
- 1995–1998 **Ph.D.**, DAMTP, University of Cambridge.  
*Shear Flow Instabilities in Viscoelastic Fluids.*
- 1994–1995 **Part III** Mathematics (now MMath), University of Cambridge, **Distinction.**
- 1991–1994 **B.A.(Hons)** (now MA) Mathematics, University of Cambridge, **First Class.**
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## OTHER APPOINTMENTS AND AWARDS

- 2016– Member of Editorial Advisory Board, *Physics of Fluids*
- 2015–2017 **President**, British Society of Rheology
- 2015– Member of *A-Level Mathematics Advisory Board*
- 2015 Member of review panel for Czech Academy of Sciences equivalent of REF.
- 2014–2017 Council member and Trustee, *Institute of Mathematics and its Applications*
- 2014 Member of Mathematics panel, *A-Level Content Advisory Board*
- 2013– Research Committee, *Institute of Mathematics and its Applications*
- 2013– Nominating Committee, *European Society of Rheology*
- 2011– **Editor** of the *Journal of Engineering Mathematics*
- 2009– **Editor** of the *Journal of Non-Newtonian Fluid Mechanics*
- 2003– Fellow of the Higher Education Academy
- 1997 Smith's Prize (University of Cambridge)
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## FUNDING

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### GRANTS: UNDER REVIEW

- 2017 MaPPeD: Mathematics of Populations for Persistence–Decay (under review)  
Proposal to DSTL; £99,000, PI.
- 2017 Non-Newtonian Fluids for Cryopreservation (under review)  
Innovate UK's Open programme round 3 competition; £60,798, PI.
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### GRANTS: FUNDED

- 2016–20 Complex ORAL health products (CORAL)  
EPSRC EP/N024915/1, £2,499,437, Co-I.
- 2016–17 ExtRheMe: Extensional Rheology Matters.  
EPSRC Post-Break award (internal); £26,971, PI.
- 2016–17 Shear-thickening fluids for cryopreservation  
Innovate UK project 132314, £74,436, PI
- 2014–15 Mathematics teaching at undergraduate level for research students in mathematics  
UCL-IoE Strategic Partnership Teaching & Learning Fund, £5,000, PI
- 2008 Royal Society conference grant, £1,160, PI
- 2007 Shear-banding phenomena in entangled systems  
Euromech grant to run colloquium, €2000, Co-PI
- 2006 Royal Society conference grant, £600, PI
- 2005–09 The Microscale Polymer Processing Consortium for Macromolecular Engineering  
EPSRC GR/T11807/01, £2,599,490, Co-I, University of Leeds
- 2004–05 Modelling gene networks of *Staphylococcus Aureus*  
MRC Discipline-Hopping Award, Co-I, University of Leeds
- 2002–06 Suspension mechanics  
Nuffield Newly-Appointed Lecturers Award, £4,120, PI, University of Leeds
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### UNSUCCESSFUL APPLICATIONS

- 2017 Leverhulme ORPG-6224, £315,080, Co-I.
- 2014 EPSRC EP/M012702/1, £591,957, PI
- 2009 EPSRC EP/H015175/1, £413,889, Co-I
- 2009 EPSRC Fellowship Outline, EP/G045828/1, £749,318, PI
- 2009 EPSRC EP/G027285/1, £213,559, PI
- 2007 EPSRC EP/E057764/1, £450,959, Co-I
- 2007 EPSRC Advanced Research Fellowship, EP/E050840/1, £488,743, PI
- 2007 EPSRC EP/E062237/1, £167,113, Co-I
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## DISSEMINATION

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### SEMINARS AND CONFERENCE PRESENTATIONS (LAST 10 YEARS)

- 2017 Conference presentation, *Society of Rheology Annual Meeting*, Denver
  - 2017 Seminar, University of Leeds
  - 2017 Keynote lecture, *UWINNFM Meeting*, Lake Vyrnwy
  - 2017 Keynote lecture, *Imperial-UCL Postgraduate Mathematics Conference*
  - 2017 Seminar, TU Wien
  - 2016 Invited talk, *Smart Polymer Processing*, Durham
  - 2016 Two contributed talks, *ICTAM*, Montreal
  - 2016 Invited talk, *BAMC*, Oxford
  - 2016 Seminar, Cambridge University
  - 2015 Seminar, University of Cardiff
  - 2015 Invited talk, *Annual European Rheology Conference*, Nantes
  - 2014 Seminar, University of Kent
  - 2014 Invited talk, *Micro and Nano Fluids*, UCL
  - 2014 Keynote lecture, *UWINNFM Meeting*, Ruthin
  - 2013 Keynote lecture, *UWINNFM Meeting*, Chicheley Hall
  - 2012 Seminar, Imperial College London
  - 2011 Invited talk, *Society of Rheology Annual Meeting*, Cleveland
  - 2009 Invitation (declined due to maternity leave) to participate in 9 month research program *Complex Fluids and Complex Flows*, IMA, University of Minnesota.
  - 2009 Invited talk, *Annual European Rheology Conference*, Cardiff
  - 2008 Contributed talk, *Society of Rheology Annual Meeting*, Monterey
  - 2008 Invited talk, *BAMC*, Manchester
  - 2007 Invited talk, *UK Polymer Showcase*, London School of Fashion
  - 2007 Seminar, Liverpool University
  - 2007 Seminar, Cambridge University
  - 2007 Contributed talk, *IWNMNNFM Meeting*, Rhodes
  - 2007 Contributed talk, *UWINNFM Meeting*, Lake Vyrnwy
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### DISSEMINATION OF ALCAB WORK

Following my work on ALCAB, designing the content of the new A Level Mathematics (for first teaching 2017), I have participated in several events for teachers to learn more about the ethos and practicalities of the change.

- 2017 KS5 teachers' event, UCL
  - 2017 Maths HUB meeting, Marylebone
  - 2015 Local teachers' network event (50 delegates)
  - 2014 *Preparing for the new A Levels* conference
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## KNOWLEDGE TRANSFER AND EXCHANGE

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### OUTREACH PRESENTATIONS (LAST 2 YEARS)

Through UCL's *Inspiring Women* list and elsewhere, I give many talks about mathematics and my research.

- 2017.09 Girls in Mathematics day, University of Kent
  - 2017.06 Invited talk at Fairfield Park Lower School
  - 2017.06 Women in Mathematical Sciences, UCL
  - 2017.05 IMA London Branch Lecture
  - 2017.05 Café Scientifique, Salisbury
  - 2016.11 Department of Mathematics Undergraduate Colloquium
  - 2016.06 Women in Mathematical Sciences, UCL
  - 2016.03 Keynote speaker (twice), "Maths in Action" days for GCSE students
  - 2016.02 UCL Lunch Hour Lecture
  - 2016.02 Invited talk at Featherstone High School, Ealing
  - 2015.09 Presentation at the European Skeptics Conference  
(Mathematics themed pre-event including Simon Singh and Rob Eastaway)
  - 2015.07 Science fair, Ravensbourne School
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### OTHER MEDIA

- 2016 I reworked the Chocolate Fountain project as a pair of light-hearted articles, suitable for teenagers, which appeared in US magazine *Girls' Angle*.
  - 2016 In collaboration with Professor Dame Celia Hoyles (UCL IoE), I wrote an essay on the landscape of mathematical practice today, for publication in a book to accompany the National Science Museum's mathematics exhibition.
  - 2015 I was interviewed by International Innovation, producing an article highlighting the widespread applications of mathematics.
  - 2014 When the Fields Medal was awarded to Maryam Mirzakhani – the first female mathematician in its 70+ year history – I wrote a blog for the UCL website and was interviewed on BBC World News.
  - 2013 I wrote a case study of my own experience for the Royal Society's webpage on Best practice in recruitment and retention for diversity.
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## ACADEMIC SUPERVISION

MSci and MSc students have a single supervisor. For all PhD students listed below, I am (or was) first supervisor, with the exception of Sally Everitt, for whom I was second supervisor.

### CURRENT STUDENTS

- 2015–2018 PhD: Hugo Castillo Sánchez. *Shear-thinning instabilities in viscoelastic fluids.*  
2016–2019 PhD: Liam Escott. *Processing suspensions with a non-Newtonian fluid matrix.*  
2017–2018 MSci: Cameron Thomas. *Sand resuspension in an annulus.*  
2017–2018 MSci: Zhihui (Summer) Zhao. *The mathematics of rainbows.*  
2017 MSc: Oscar Freeman. *Instability of a viscoelastic fluid in cross-slot flow.*  
2017 MSc: Weitao Ying. *Herd models in financial markets.*
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### COMPLETED DEGREE PROJECTS

- 2017 PhD: Adam Townsend. *The mechanics of suspensions.*  
2016 MSci: Liam Escott. *Material timescales in viscoelastic fluid instabilities.*  
2015 MSci: Nicholas Beale. *Interfacial instability in elastic fluids.*  
2014 MSc: Vivien Loridan. *Instabilities in non-Newtonian fluids.*  
2012 MSci: Adam Townsend. *The fluid dynamics of the chocolate fountain.*  
2012 MPhil: Thomas Brickell. *General 2D linear flows of particle suspensions.*  
2007 MSci: Jayson Ramdany. *Non-Newtonian Fluid Mechanics*  
2006 MSci: Stuart Linney. *Non-Newtonian Fluid Mechanics*  
2004 PhD: Sally Everitt. *Bubble dynamics in polymeric foams.* (U. of Leeds)
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### SUMMER PROJECTS (UNDERGRADUATE LEVEL OR BELOW, SOLE SUPERVISOR)

- 2017 Yijie (Maria) Li – *Determining the viscosity of a fluid from a velocity field* – LMS bursary.  
2015 Sophie MacLean – *The mathematics of instabilities* – Self-funded project.  
2014 Antigoni Kleanthous – *Simulations of swimming cells* – Department-funded project.  
2006 Anushi Weliwita – *Stokes flow around three spheres* – Dean's summer studentship.
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### STAFF MANAGEMENT: POSTDOCTORAL RESEARCH ASSOCIATES

- 2017–2020 Dr Jurriaan Gillissen.  
2007–2008 Dr Tim Reis. Now Senior Lecturer at the University of Greenwich.  
2005–2007 Dr Mehmet Sahin. Now Associate Professor at Istanbul Technical University.
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## TEACHING

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### LECTURE COURSES

Feedback ratings are on a scale -2 to +2. My feedback has always been positive and my examination results always within departmental norms.

#### **Core undergraduate mathematics modules**

- MATH1301 Applied Mathematics. Core first year module,  $\approx$ 100 students, 30 lectures. Taught 2004–2007. Average feedback rating +0.66.
- MATH1302 Newtonian Mechanics. Core first year module,  $\approx$ 100 students; 30 lectures. Taught 2010–present. Redesigned in 2013. Average feedback rating with new structure +1.2.
- MATH7402 Mathematical Methods 4. Optional second year module,  $\approx$ 60 students, 30 lectures. Taught 2008.

#### **Ancillary teaching**

- MATH6106 Mathematics for Science 2. Largely first-year chemistry,  $\approx$ 50 students; 30 lectures. Taught 2004–2006. Average feedback rating +1.38.
- MATH6502 Mathematics for Engineers 2. Core engineering module,  $\approx$ 150 students; 24 lectures. Taught 2006–2008. Average feedback rating +0.64.

#### **Graduate teaching**

- MATHGM01 Analytical Methods in Mathematical Modelling. Core MSc module, optional MSci module;  $\approx$ 25 students; 10–15 lectures. Taught 2005–2012. Average feedback rating +1.39.
- MATHGM05 Research Frontiers. Core MSc module,  $\approx$ 15 students; 6 lectures. Taught 2005–6, 2015–17. Feedback rating +1.00.
- LTCC Analytical Methods: “Basic” (i.e. first year PhD) course;  $\approx$ 20 students; 10 lectures. Taught 2007–2015. Average feedback rating +1.21. Book chapter published 2016.
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### TEACHING DEVELOPMENT

**Strategic Overview** I am the member of Departmental Teaching Committee with responsibility for the oversight of all Applied Mathematics modules.

**Teaching innovation** In 2012–13 I introduced an element of lecture flipping into my teaching on MATH1302. With some lessons learnt, I amended this for 2013–14 and used it for several years. In 2014 I gave a CALT “Summits and Horizons” lunchtime session and my experience was used as a case study on the Teaching and Learning Portal.

**Spreading good practice** In collaboration with the Institute of Education, I launched (2014–15) a discipline-specific induction course for our postgraduate students who teach undergraduates. This idea has now also been taken up by Statistics.

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## ENABLING ACTIVITIES: RESEARCH

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### CONFERENCE ORGANISATION

- 2018 *European Fluid Mechanics Conference 12*, Vienna: Minisymposium co-organiser
  - 2016 *Polymer Dynamics and Rheology* (BSR Midwinter Meeting), Reading: Co-organiser.
  - 2016 *BAMC*, Oxford: Minisymposium organiser
  - 2009 *Annual European Rheology Conference*, Cardiff: Minisymposium organiser
  - 2014 *British-German Frontiers of Science* meeting, Potsdam: Minisymposium organiser
  - 2012 *BAMC*, UCL: Treasurer (of large national meeting of roughly 300 delegates)
  - 2011 *Complex Flows of Complex Fluids* (BSR Midwinter Meeting), UCL: Co-organiser
  - 2009 *Annual European Rheology Conference*, Cardiff:  
Member of Scientific Committee and minisymposium co-organiser
  - 2008 *Society of Rheology Annual Meeting*, Monterey: Poster judge
  - 2008 *BAMC*, Manchester: Minisymposium organiser
  - 2007 *Foams and Emulsions* (BSR Midwinter Meeting), Imperial College: Co-organiser
  - 2007 *Shear-banding phenomena in entangled systems* (Euromech Colloquium): Co-organiser
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### RESEARCH DEGREE EXAMINING

- 2016 Huda Mohd Ramli, PhD, UCL.
  - 2014 Claire McIlroy, PhD, Leeds University.
  - 2013 Catherine Saunders, PhD, Manchester University.
  - 2013 Catriona McArdle, PhD, Strathclyde University.
  - 2011 Aidan O'Byrne, PhD, Bath University.
  - 2007 Marianna Grammatika, MPhil, University of Birmingham.
  - 2005 Joel Miller, PhD, Cambridge University.
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### EXTERNAL EXAMINING: POSTGRADUATE TAUGHT COURSES

I was Applied Mathematics external examiner for the SMSTC (Scottish Mathematical Sciences Training Centre) from 2014–2016.

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## ENABLING ACTIVITIES (CONTINUED)

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### DEPARTMENTAL ROLES

- Deputy Head of Department / Departmental SMT
  - Departmental Research Committee
  - Departmental Promotions Committee
  - Departmental Teaching Committee (DTC)
  - Departmental Staff-Student Consultative Committee (DSSCC)
  - Co-chair, Athena SWAN Committee
  - Departmental Appraiser
  - Fire Evacuation Marshal
  - First Aider
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### INSTITUTIONAL ENABLING WORK

- Treasurer of UCL Women (group acting to promote women in STEMM subjects).
  - I took part in UCL's inaugural Women in Higher Education Leadership Programme, 2014–15.
  - Member of the *Programme Board* and the *Consultative Group of the Learning Spaces Programme Board*.
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### EXTERNAL ENABLING WORK

#### **British Society of Rheology**

As Immediate Past President my current role is to support the President with the context in which he was elected.

#### **Institute of Mathematics and its Applications**

The Research Committee endeavours to assist mathematicians in their research by lobbying for funding, administering our own Small Grants Scheme, and communicating the importance of mathematics to those in government. We also disseminate information about events and funding streams likely to be of use to mathematics researchers based in the UK: I take responsibility for doing this through twitter (@IMAmaths).

#### **European Society of Rheology**

The role of the Nominating Committee (which I chair) is to ensure balance and diversity in the pool of candidates standing for the major leadership roles of the Society. This includes issues of nationality, geographical location and research standing as well as ethnicity and gender.

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## PUBLICATION LIST

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### TEXTBOOK CHAPTER

- 2015** H.J.Wilson  
Practical Analytical Methods for PDEs  
in *Advanced Techniques in Applied Mathematics*,  
Book 1 of *LTCC Advanced Mathematics Series*.  
S.R.Bullett, T.Fearn, F.T.Smith (Eds.). World Scientific.
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### REFEREED JOURNAL ARTICLES

- 2017** A.K.Townsend & H.J.Wilson  
Frictional shear thickening in suspensions: The effect of rigid asperities  
*Physics of Fluids*, submitted.
- 2017** A.K.Townsend & H.J.Wilson  
Simulations of a heavy ball falling through a sheared suspension  
*Journal of Engineering Mathematics*, in press.
- 2017** H.A.Castillo & H.J.Wilson  
Towards a mechanism for instability in channel flow of highly shear-thinning viscoelastic fluids  
*Journal of Non-Newtonian Fluid Mechanics* **247**, 15–21.
- 2017** H.J.Wilson & R.H.Davis  
Shear stress of a monolayer of rough spheres – CORRIGENDUM  
*Journal of Fluid Mechanics* **814**, 614–617.
- 2016** A.K.Townsend & H.J.Wilson  
The fluid dynamics of the chocolate fountain  
*European Journal of Physics* **37**, 015803.
- 2015** H.J.Wilson & V.Loridan  
Linear instability of a highly shear-thinning fluid in channel flow  
*Journal of Non-Newtonian Fluid Mechanics* **223**, 200–208.
- 2013** H.J.Wilson  
Stokes flow past three spheres  
*Journal of Computational Physics* **245**, 302–316.
- 2013** T.Reis & H.J.Wilson  
Rolie-Poly fluid flowing through constrictions: Two distinct instabilities  
*Journal of Non-Newtonian Fluid Mechanics* **195**, 77–87.
- 2012** H.J.Wilson  
Open mathematical problems regarding non-Newtonian fluids  
*Nonlinearity* **25**, R45.
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## PUBLICATION LIST (CONTINUED)

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### REFEREED JOURNAL ARTICLES (CONTINUED)

- 2010** S.M.Fielding & H.J.Wilson  
Shear banding and interfacial instability in planar Poiseuille flow  
*Journal of Non-Newtonian Fluid Mechanics* **165**, 196–202.
- 2008** D.G.Hassell, M.R.Mackley, M.Sahin, H.J.Wilson, O.G.Harlen & T.C.B.McLeish  
Molecular physics of a polymer engineering instability: experiments and computation  
*Physical Review E* **77**, 050801.
- 2008** M.Sahin & H.J.Wilson  
A parallel adaptive unstructured finite volume method for linear stability (normal mode) analysis of viscoelastic fluid flows  
*Journal of Non-Newtonian Fluid Mechanics* **155**, 1–14.
- 2007** M.Sahin & H.J.Wilson  
A semi-staggered dilation-free finite volume method for the numerical solution of viscoelastic fluid flows on all-hexahedral elements  
*Journal of Non-Newtonian Fluid Mechanics* **147**, 79–91.
- 2006** H.J.Wilson  
Instabilities and constitutive modelling  
*Philosophical Transactions of the Royal Society A* **364**, 3267–3283.
- 2006** H.J.Wilson & S.M.Fielding  
Linear instability of planar shear banded flow of both diffusive and non-diffusive Johnson-Segalman fluids  
*Journal of Non-Newtonian Fluid Mechanics* **138**, 181–196.
- 2006** S.L.Everitt, O.G.Harlen & H.J.Wilson (2)  
Competition and interaction of polydisperse bubbles in polymer foams  
*Journal of Non-Newtonian Fluid Mechanics* **137**, 60–71.
- 2006** S.L.Everitt, O.G.Harlen & H.J.Wilson (1)  
Bubble growth in a two-dimensional viscoelastic foam  
*Journal of Non-Newtonian Fluid Mechanics* **137**, 46–59.
- 2005** H.J.Wilson  
An analytic form for the pair distribution function and rheology of a dilute suspension of rough spheres in plane strain flow  
*Journal of Fluid Mechanics* **534**, 97–114.
- 2005** J.T.Bradley, H.J.Wilson  
Iterative convergence of passage-time densities in semi-Markov performance models  
*Performance Evaluation* **60**, 237–254.
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## PUBLICATION LIST (CONTINUED)

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### REFEREED JOURNAL ARTICLES (CONTINUED)

- 2004** J.T.Bradley, N.J.Dingle, W.J.Knottenbelt & H.J.Wilson  
Hypergraph-based parallel computation of passage time densities in large semi-Markov models  
*Linear Algebra and its Applications* **386**, 311–334.
- 2003** R.H.Davis, Y.Zhao, K.P.Galvin & H.J.Wilson  
Solid-solid contacts due to surface roughness and their effects on suspension behaviour  
*Philosophical Transactions of the Royal Society A* **361**, 871–894.
- 2003** S.Everitt, O.G.Harlen, H.J.Wilson & D.J.Read  
Bubble dynamics in viscoelastic fluids with application to reacting and non-reacting polymer foams  
*Journal of Non-Newtonian Fluid Mechanics* **114**, 83–107.
- 2002** H.J.Wilson & R.H.Davis  
Shear stress of a monolayer of rough spheres  
*Journal of Fluid Mechanics* **452**, 425–441.
- 2000** H.J.Wilson & R.H.Davis  
The viscosity of a dilute suspension of rough spheres  
*Journal of Fluid Mechanics* **421**, 339–367.
- 2000** H.J.Wilson, L.A.Pietraszewski & R.H.Davis  
Aggregation of charged particles under electrophoresis or gravity at arbitrary Péclet numbers  
*Journal of Colloid and Interface Science* **221**, 87–103.
- 1999** H.J.Wilson & J.M.Rallison  
Shear-flow instability of a highly shear-thinning White–Metzner fluid  
*Journal of Non-Newtonian Fluid Mechanics* **87**, 75–96.
- 1999** H.J.Wilson & J.M.Rallison  
Instability of channel flows of elastic liquids having continuously stratified properties  
*Journal of Non-Newtonian Fluid Mechanics* **85**, 273–298.
- 1999** H.J.Wilson, M.Renardy & Y.Y.Renardy  
Structure of the spectrum in zero Reynolds number shear flow of the UCM and Oldroyd-B liquids  
*Journal of Non-Newtonian Fluid Mechanics* **80**, 251–268.
- 1997** H.J.Wilson & J.M.Rallison  
Short wave instability of co-extruded elastic liquids with matched viscosities  
*Journal of Non-Newtonian Fluid Mechanics* **72**, 237–251.
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## PUBLICATION LIST (CONTINUED)

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### PUBLIC ENGAGEMENT PUBLICATIONS

- 2016** C.M.Hoyles, H.J.Wilson  
Mathematics: a living, changing landscape  
in *Mathematics: how it shaped our world*,  
D.Rooney (Ed.). London: The Science Museum.
- 2015** H.J.Wilson  
Institute of Mathematics and its Applications  
*International Innovation* **191**, 48–51.
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### CONFERENCE REPORTS

- 2008** S.J.Cox, H.J.Wilson & S.Neethling  
British Society of Rheology mid-winter meeting on The Rheology of Foams and Emulsions  
*Applied Rheology* **18**, 193–195.
- 2008** H.J.Wilson & M.P.Lettinga  
Euromech Colloquium no. 492: Shear-banding Phenomena in Entangled Systems  
*Applied Rheology* **18**, 63468.
- 

### CONFERENCE PROCEEDINGS

- 2014** H.J.Wilson  
Macroscopic effects of microscopic roughness in suspensions  
*4th Micro and Nano Flows Conference*, .
- 2008** J.A.Weliwita, H.J.Wilson, R.H.Davis  
Interactions Between Aggregated Particles in Stokes Flow  
*AIP Conference Proceedings* **1027**, 788–790.
- 2008** T.Reis, M.Sahin, H.J.Wilson  
Co-Extrusion Instabilities Modeled with a Single Fluid  
*AIP Conference Proceedings* **1027**, 150–152.
- 2008** D.G.Hassell, M.R.Mackley, M.Sahin, H.J.Wilson  
Experimental and Computational Identification of a Polymer Melt Flow Instability  
*AIP Conference Proceedings* **1027**, 147–149.
- 2008** H.J.Wilson  
Shear-banding: When Can We Ignore Diffusion?  
*AIP Conference Proceedings* **1027**, 195–197.
- 2000** H.J. Wilson & R.H. Davis  
Numerical flow simulation of suspensions of rough spheres  
*Proc. XIIIth Congress on Rheology* **2**, 14–16.
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