Dr Michael Smith

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Tel: 0115 9515162 Researcher ID: B-4036-2011

Education

2004-2008	PhD in Physics, School of Physics & Astronomy, University of Nottingham (Supervisors: Dr James S. Sharp & Prof Clive J. Roberts)
2000-2004	MPhys in Physics (1st Class), School of Physics & Astronomy, University of Manchester.

Career Highlights

- Explanation of the physical mechanism behind the anti-rebound effect of droplets of dilute polymer solution. This resulted in a publication in ***Physical Review Letters*** which was highlighted as an Editor's suggestion and featured in ***'Physics – Spotlighting exceptional Research'***, May 2010. Discussing this work in his plenary lecture at the 18th Ostwald Kolloquium, Professor Jens Eggers described it as *"...some of the best experiments on drop impact ever"*.

- Awarded a Royal Society University Research Fellowship

- Principal Investigator funding awards totalling **~ £1.4 million**

Research Interests

My research interests centre on understanding how the interactions of particles in a fluid give rise to their collective larger scale structures and properties,

- Dynamics / rheology of concentrated colloidal fluids
- Film formation in colloidal suspensions
- Quasi-2D granular fluids
- The anti-rebound phenomenon in dilute polymer solutions

Career Outline

- Proleptic lectureship, School of Physics, University of Nottingham (2016)
- Royal Society University Research Fellow (2012-Present), School of Physics, University of Nottingham
- Postdoctoral Research Associate (2009-2012),
  School of Physics, University of Nottingham (Employer: Dr James Sharp),
- Postdoctoral Research Associate, (2008-2009)
  School of Engineering, University of Edinburgh (Employer: Dr Volfango Bertola),
- PhD in Physics, (2004-2008)
  School of Physics & Astronomy, University of Nottingham
  (Supervisors: Dr James Sharp & Prof Clive Roberts)
- MPhys in Physics - 1st Class, (2000-2004)
  School of Physics & Astronomy, University of Manchester

Prizes and awards

Royal Society University Research Fellowship
'*Extensional flow and jamming of concentrated colloidal suspensions*' Oct 2012

Best poster award – Institute of Physics Polymer Physics Group Biennial,
University of Surrey, 12-14th Sept 2011 *"Coloured Spherulites"*

Best paper award – Institute for Liquid Atomization and Spray Systems 2010,
Brno, Czech Republic, 6-8 Sept 2010 *"The anti-rebound effect of flexible polymers on impacting drops"*

Funding

Principal investigator:

Royal Society Enhancement Award — £81,092.00
Dynamic Fluctuations in Granular Fluids (12/2017)

EPSRC ICase PhD studentship — £111,096.00
Dynamic break-up in glassy fluids (10/2017)

Royal Society University Research Fellowship Renewal — £356,408.00
"*Dynamic Fluctuations and Break-up in Glassy Particle Fluids*" (10/2017)

ESRF X-ray Beam time — ~£25,822.20
"*Shear band formation in a drying colloidal film*" (12/2016)

EPSRC-Royal Society fellowship engagement — £332,590.00
"*Ageing, film formation and cracking in colloidal glasses*" (11/2013)

NNNC Early Career Research Competition £2,000.00
Equipment time in Nottingham nanoscience & nanotechnology centre (15/01 – 31/03/2013)

Royal Society University Research Fellowship £543,720.64
"*Extensional flow and jamming in concentrated colloidal suspensions*" (10/2012)

Named Researcher:
STFC ISIS neutron scattering time ~ £27,000.00

Publications

1. 'Shear bands and the evolving microstructure in a drying colloidal film studied with scanning μ-SAXS'
   B. Yang, N. D. Smith, A. Johannes, M. Burghammer, M. I. Smith*, Sci. Rep. 8, 12979 (2018)*

2. 'Boundary effects in a quasi-two-dimensional driven granular fluid'
   N.D. Smith, M.I. Smith, *Physical Review E 96:062910 (2017)*

3. 'Interplay of Crack Hopping, Delamination and Interface Failure in Drying Nanoparticle Films'
   B. Yang, J.S. Sharp, M.I. Smith, *Sci. Rep. 6:32296 (2016)*

4. **'Fracture of Jammed Colloidal Suspensions'**
   M.I. Smith, *Sci. Rep. 5:14175 (2015)*

5. 'Mechanical vibrations of pendant liquid droplets'
   R.H. Temperton, M.I. Smith, J.S. Sharp *Eur. Phys. J. E 38:79 (2015)*

6. **'Shear Banding in Drying Colloidal Nanoparticles'**
   B. Yang, J.S. Sharp, M.I. Smith, *ACS Nano 9:4077-4084 (2015)*

7. 'Origin of contact line forces during the retraction of dilute polymer solution drops.'
   M.I. Smith, J.S. Sharp, *Langmuir 30, 5455-9, (2014)*

8. 'Giant Amyloid Spherulites reveal their true colours'
   M.I. Smith, J.S. Sharp, C.J. Roberts, Soft Matter 8, 3751-5 (2012)

9. 'Factors affecting the formation of Insulin Spherulites'

M.I. Smith, V. Fodera, J.S. Sharp, C.J. Roberts, A.M. Donald, *Colloids & Surfaces B: Biointerfaces 89, 216-222 (2011)*

10. 'The effects of substrate constraint on crack pattern formation in thin films of colloidal polystyrene particles'
    M.I. Smith, J.S. Sharp, *Langmuir 27, 8009 (2011)*

11. 'Dilatancy in the flow and fracture of stretched colloidal suspensions'
    M.I. Smith, R. Besseling, M.E. Cates, V. Bertola, *Nature Communications. 1, 114 (2010)*

(Featured in "Science Daily" under the title 'Smashing fluids – the physics of flow', Dec 2010)

12. 'Particle Velocimetry inside Newtonian and non-Newtonian droplets impacting a hydrophobic surface'
    M.I. Smith, V. Bertola, *Experiments in Fluids 50, 1385-1391* (2010)

13. 'Effect of polymer additives on the wetting of impacting droplets'
    M.I. Smith, V. Bertola, *Physical Review Letters 104, 154502 (2010)*

(Highlighted as Editor's suggestion – Featured in "Physics – spotlighting exceptional research", May 2010)

14. 'Insulin fibril nucleation: the role of prefibrillar aggregates'
    M.I. Smith, J.S. Sharp & C.J. Roberts, *Biophysical J. 95 3400-3406 (2008)*

15. Nucleation and Growth of Insulin Fibrils in Bulk Solution and at Hydrophobic Polystyrene Interfaces' M.I. Smith, J.S. Sharp & C.J. Roberts, *Biophysical J. 93, 2143-2151 (2007)*

16. 'Spinodal wrinkling in thin-film poly(ethylene oxide)/polystyrene bilayers'
    J.S. Sharp, D. Vader, J.A. Forrest, M.I. Smith, M. Khomenko & K. Dalnoki-Veress,
    Eur. Phys. J. E 19, 423-432 (2006)

Conference Papers

1. 'The anti-rebound effect of flexible polymers on impacting drops'
    M.I. Smith, V. Bertola, *Proc. 23rd European Conference on Liquid Atomization and Spray Systems, Brno, Czech Republic, 6 -8 September 2010.*

(ILASS 2010 best paper award)

2. 'Velocity measurements inside impacting drops of dilute polymer solutions,' M.I. Smith, V. Bertola, *DIPSI Workshop 2010 on droplet impact phenomena and spray investigation, Bergamo, Italy 27 -28 May 2010.*

Invited Talks

- M.I. Smith, Drying Days Conference, Toulouse *'The interplay of instabilities in a drying colloidal film (23-24th March 2017)*

Invited Seminars

- M.I. Smith, Materials Physics seminar, University of Durham,
  'Stretching dense colloidal suspensions: from flow to fracture' (14th January 2015).
- M.I. Smith, Polymer physics seminar, University of Sheffield,
  'Watching paint dry (& crack)' (6th Dec 2013)
- M.I. Smith, J.S.Sharp, C.J. Roberts, Polymer physics seminar, University of Sheffield,
  'Nucleation and growth of insulin fibrils' (21st March 2008)

Conference presentations - Oral

- M.I. Smith, American Physical Society, New Orleans *'The interplay of instabilities in a drying colloidal film (13-17th March 2017)*
- M.I. Smith, American Physical Society, Baltimore *'The flow and fracture of concentrated colloidal suspensions (14-18th March 2016)*
- B. Yang, J.S. Sharp, M.I. Smith, European Coating Symposium 2015, Eindhoven, Netherlands (9-11th September 2015) *'Shear banding in drying colloidal films'*
- M.I. Smith, R. Besseling, A. Schofield, J.S. Sharp, M.E. Cates, V. Bertola, American Physical Society, Boston, USA (27th February – 2nd March 2012) *'Stretching dense suspensions from flow to fracture'*
- M.I. Smith, V. Bertola, Institute of Physics: Biennial meeting of the polymer physics group, University of Surrey, (12-14th September 2011) *'Controlling droplet impact by polymer additives'*
- M.I. Smith, R. Besseling, A. Schofield, J.S. Sharp, M.E. Cates, V. Bertola, 8th Liquid Matter Conference, Universitat Wien, Austria (5-10th September 2011) *'Stretching Dense Colloidal Suspensions: from flow to fracture'*
- M.I. Smith, V. Bertola, Institute of Physics: Condensed Matter and materials physics, University of Warwick (14-16th December 2010) *'Controlling droplet impact by polymer additives'*
- M.I. Smith, J.S. Sharp, C.J. Roberts, Institute of Physics: Biennial meeting of the polymer physics group, University of Durham (10th-12th September 2007) *'Nucleation and Growth of Insulin Fibrils in Bulk Solution and at hydrophobic polystyrene interfaces'*
- M.I. Smith, J.S. Sharp, C.J. Roberts, Institute of Physics: Interface of Medical and Biological Physics, University of Southampton (May 2007) *'Nucleation and Growth of Insulin Fibrils in Bulk Solution and at hydrophobic polystyrene interfaces'*

Conference presentations - Poster

- M.I. Smith, J.S. Sharp, American Physical Society, Boston, USA (27th February – 2nd March 2012) *'Cracking in thin films of colloidal particles on elastomeric substrates'*
- M.I. Smith, J.S. Sharp, C.J. Roberts, American Physical Society, Boston, USA (27th February – 2nd March 2012) *'Optical properties of large amyloid spherulites'*

- M.I. Smith, V. Bertola, American Physical Society, Boston, USA (27th February – 2nd March 2012) *'Controlling droplet impact with polymer additives'*
- M.I. Smith, J.S. Sharp, Institute of Physics: Polymer Physics Group, University of Surrey, (12-14th September 2011) *'Crack formation in colloidal films: the role of substrate constraint'*
- M.I. Smith, J.S. Sharp, Institute of Physics: Polymer Physics Group, University of Surrey, (12-14th September 2011) *'Coloured Spherulites'*
  (IOP PPG Biennial Best poster award)
- M.I. Smith, R. Besseling, A. Schofield, J.S. Sharp, M.E. Cates, V. Bertola, Institute of Physics: Polymer Physics Group, University of Surrey, (12-14th September 2011) *'Stretching colloidal suspensions: from flow to fracture*
- M.I. Smith, V. Bertola, 8th Liquid Matter Conference, Universitat Wien, Austria (5-10th September 2011) *'Controlling droplet Impact with polymer additives'*
- M.I. Smith, J.S. Sharp, 8th Liquid Matter Conference, Universitat Wien, Austria (5-10th September 2011) *'Cracking Colloids: the role of substrate constraint'*
- M.I. Smith, V. Bertola, SET for Britain 2011, Houses of Parliament (14th March 2011) '*Making droplets stick*'
- M.I. Smith, R. Besseling, M.E. Cates, V. Bertola, Institute of Physics: Condensed Matter and Material Physics, University of Warwick (14-16th December 2010) *'Stretching colloidal suspensions: from flow to fracture*'
- M.I. Smith, J.S. Sharp, Institute of Physics: Condensed Matter and Material Physics, University of Warwick (14-16th December 2010) *'Cracking Colloids: the role of substrate constraint'*
- M.I. Smith, V. Fodera, J.S. Sharp, A.M. Donald, C.J. Roberts, Institute of Physics: Condensed Matter and Material Physics, University of Warwick (14-16th December 2010) *'Towards an understanding of polymorphism in protein aggregation'*
- M.I. Smith, V. Fodera, J.S. Sharp, A.M. Donald, C.J. Roberts, Institute of Physics: Physics meets Biology, University of Oxford (1st-3rd September 2010) *'Towards an understanding of polymorphism in protein aggregation'*
- M.I. Smith, J.S. Sharp, C.J. Roberts, Institute of Physics: Self-assembling peptides, IOP London, (22nd March 2007) *'Nucleation and growth of insulin fibrils in bulk solution and at hydrophobic polystyrene interfaces'*

Referee for International Journals

Physical Review Letters (3 papers), European Physical Journal E (2 paper), Soft Matter (3 papers) , Experimental & Thermal Fluid Sci. (1 paper), J. Colloid & Int. Sci. (1 paper), Langmuir (2 paper), Physics of Fluids (1 paper)

Teaching Experience

Lecturer and Assessor, Force and Function at the Nanoscale (F33ON1) for 2nd Yr students (Autumn 2018-present)

Lecturer and Assessor, Modern Applications of Physics (F34AAP) for 4th Yr students (Spring 2017-current)

3rd Yr Laboratory Teaching (Autumn 2016)

Frontiers in physics lecture / problems class for 1st Year students (March 2013)

Co-convenor for "Materials, Microstructure & Microscopy" 4th year module (Spring 2011)

Supervision of Research projects

Postdocs:

Dr Bin Yang: *Ageing, film formation and cracking in colloidal glasses" (Supervision of PGRA, University of Nottingham, 2013-Present)*

Phds: Nathan Smith: "*Interactions in a quasi-2D granular fluid" (2014-Present)*

Matthew Hayes: *"Dynamic break-up in glassy fluids" (EPSRC Icase studentship)*

James Downs: *"Phase transitions in a 2D granular fluid"*

Masters Projects:

12 students on 4th year Masters projects.

Summer Internships:

8 summer internships

Outreach

- *'Introduction to Nanoscience'* –Sutton Trust widening participation summer school (July 2015 - present) consisting of an introductory lecture and related laboratory practicals
- *'Introduction to Nanoscience'* – Nottingham Potential widening participation summer school (July 2015 - present) consisting of an introductory lecture and related laboratory practicals
- *'Seeing the unseeable'* – University of Nottingham widening participation campaign for sixth formers. Delivered introductory talk on nanoscience and lead UV-vis laboratory demonstration (11th February 2015)
- *'The electromagnetic spectrum'* - University of Nottingham outreach to primary school children (Easter 2014)

Administration

- Member of the research committee (School of Physics, UoN, 2013-present)
- Nanoscience group meeting co-ordinator (2013-2016)

Referees

Dr James Sharp - School of Physics & Astronomy, University of Nottingham, NG7 2RD
e-mail: james.sharp@nottingham.ac.uk tel: 0115 9515142

Dr Volfango Bertola - Centre for Engineering Dynamics , University of Liverpool, Liverpool
e-mail: volfango.bertola@liverpool.ac.uk tel: 0151 794 4804