

# Dr Michael Smith

School of Physics and Astronomy, University of Nottingham, Nottingham, NG7 2RD

[www.nottingham.ac.uk/~ppzmis](http://www.nottingham.ac.uk/~ppzmis)

E-mail: [mike.i.smith@nottingham.ac.uk](mailto:mike.i.smith@nottingham.ac.uk)

Tel: 0115 9515162

ORCID ID: [0000-0002-8210-1264](https://orcid.org/0000-0002-8210-1264)

[Google Scholar](#)

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## 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 (1 <sup>st</sup> Class), School of Physics & Astronomy, University of Manchester.

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## Career Highlights

- Created a 2D vibrated granular system using novel structured surfaces. Demonstrated that the correct surface structure can modify the classic 2D hard sphere phase transition from 2 step continuous to 1<sup>st</sup> order. This was published in **Physical Review Letters** and highlighted as an Editor's suggestion and featured in '**Physics – Spotlighing exceptional research**'.
  - 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 – Spotlighing exceptional research**'. Discussing this work in his plenary lecture at the 18<sup>th</sup> 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**
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## 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,

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

## Career Outline

- Assistant Professor (2020-present), School of Physics, University of Nottingham
  - Proleptic lectureship, School of Physics, University of Nottingham (2016)
  - Royal Society University Research Fellow (2012-2020), 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
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## Prizes and awards

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

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*"

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## Funding

Principal investigator:

Royal Society Enhancement Award <i>Dynamic Fluctuations in Granular Fluids</i> (12/2017)	£81,092.00
EPSRC ICASE PhD studentship <i>Dynamic break-up in glassy fluids</i> (10/2017)	£111,096.00
Royal Society University Research Fellowship Renewal "Dynamic Fluctuations and Break-up in Glassy Particle Fluids" (10/2017)	£356,408.00
ESRF X-ray Beam time "Shear band formation in a drying colloidal film" (12/2016)	~£25,822.20
EPSRC-Royal Society fellowship engagement "Ageing, film formation and cracking in colloidal glasses" (11/2013)	£332,590.00

NNNC Early Career Research Competition	£2,000.00
<i>Equipment time in Nottingham nanoscience &amp; nanotechnology centre</i> (15/01 – 31/03/2013)	
Royal Society University Research Fellowship	£543,720.64
“ <i>Extensional flow and jamming in concentrated colloidal suspensions</i> ” (10/2012)	
Named Researcher:	
UNICAS	~£5000.00
STFC ISIS neutron scattering time	~ £27,000.00

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## Publications

1. **Torque about electrostatically charged spheres makes them more attractive**  
M.R. Swift, M.I.Smith Soft Matter 20, 7038 (2024)
2. **Studying the aging of Laponite suspensions using extensional rheology**  
M.J. Hayes, M.I.Smith Eur. Phys. J. E 45, 91 (2022)
3. **Collective behavior of composite active particles**  
J. Eglinton, M.I.Smith, M.R.Swift Phys. Rev. E 105, 044609 (2022)
4. **Fluid dynamics and cell-bound Psl polysaccharide allows microplastic capture, aggregation and subsequent sedimentation by *Pseudomonas aeruginosa* in water**  
M.Romero, A.Carabelli, M.R.Swift, M.I.Smith J. Environ. Microbiology 24, 1560 (2022)
5. **Topographic control of order in quasi-2D granular phase transitions**  
J.G.Downs, N.D.Smith, K.K.Mandadapu, J.G.Garrahan, M.I.Smith Phys. Rev. Letts 127, 268002 (2021)

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

6. **ParticleTracker: a gui based particle tracking software**  
M.I.Smith, J.G.Downs J. Open Source Software 6, 3611 (2021)
7. **Slip in Adhesion Tests of a Kaolin Clay**  
M.J.Hayes, M.I.Smith Eur. Phys. J. E 44, 102 (2021)
8. **Collision-enhanced friction of a bouncing ball on a rough vibrating surface**  
N.D.Smith, M.R.Swift, M.I.Smith Sci. Rep. 11, 442 (2021)
9. **Shear bands and the evolving microstructure in a drying colloidal film studied with scanning  $\mu$ -SAXS**  
B. Yang, N. D. Smith, A. Johannes, M. Burghammer, M. I. Smith, Sci. Rep. 8, 12979 (2018)
10. **Boundary effects in a quasi-two-dimensional driven granular fluid**  
N.D. Smith, M.I. Smith, Physical Review E 96:062910 (2017)
11. **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)

- 12. Fracture of Jammed Colloidal Suspensions**  
M.I. Smith, *Sci. Rep.* 5:14175 (2015)
- 13. Mechanical vibrations of pendant liquid droplets**  
R.H. Temperton, M.I. Smith, J.S. Sharp *Eur. Phys. J. E* 38:79 (2015)
- 14. Shear Banding in Drying Colloidal Nanoparticles**  
B. Yang, J.S. Sharp, M.I. Smith, *ACS Nano* 9:4077-4084 (2015)
- 15. Origin of contact line forces during the retraction of dilute polymer solution drops**  
M.I. Smith, J.S. Sharp, *Langmuir* 30, 5455-9, (2014)
- 16. Giant Amyloid Spherulites reveal their true colours**  
M.I. Smith, J.S. Sharp, C.J. Roberts, *Soft Matter* 8, 3751-5 (2012)
- 17. 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)
- 18. 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)
- 19. 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)
- 20. Particle Velocimetry inside Newtonian and non-Newtonian droplets impacting a hydrophobic surface**  
M.I. Smith, V. Bertola, *Experiments in Fluids* 50, 1385-1391 (2010)
- 21. 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 )

- 22. Insulin fibril nucleation: the role of prefibrillar aggregates**  
M.I. Smith, J.S. Sharp & C.J. Roberts, *Biophysical J.* 95 3400-3406 (2008)
- 23. 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)
- 24. 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. 23<sup>rd</sup> 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.*
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## Invited Talks

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

## Invited Seminars

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

## Conference presentations - Oral

- M.I. Smith, American Physical Society, New Orleans '*The interplay of instabilities in a drying colloidal film* (13-17<sup>th</sup> March 2017)
- M.I. Smith, American Physical Society, Baltimore '*The flow and fracture of concentrated colloidal suspensions* (14-18<sup>th</sup> March 2016)
- B. Yang, J.S. Sharp, M.I. Smith, European Coating Symposium 2015, Eindhoven, Netherlands (9-11<sup>th</sup> 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 (27<sup>th</sup> February – 2<sup>nd</sup> 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, (12-14<sup>th</sup> September 2011) '*Controlling droplet impact by polymer additives*'
- M.I. Smith, R. Besseling, A. Schofield, J.S. Sharp, M.E. Cates, V. Bertola, 8<sup>th</sup> Liquid Matter Conference, Universitat Wien, Austria (5-10<sup>th</sup> 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 (14-16<sup>th</sup> 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 (10<sup>th</sup>-12<sup>th</sup> 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 (27<sup>th</sup> February – 2<sup>nd</sup> 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 (27<sup>th</sup> February – 2<sup>nd</sup> March 2012) ‘*Optical properties of large amyloid spherulites*’
- M.I. Smith, V. Bertola, American Physical Society, Boston, USA (27<sup>th</sup> February – 2<sup>nd</sup> March 2012) ‘*Controlling droplet impact with polymer additives*’
- M.I. Smith, J.S. Sharp, Institute of Physics: Polymer Physics Group, University of Surrey, (12-14<sup>th</sup> 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, (12-14<sup>th</sup> 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, (12-14<sup>th</sup> September 2011) ‘*Stretching colloidal suspensions: from flow to fracture*’
- M.I. Smith, V. Bertola, 8<sup>th</sup> Liquid Matter Conference, Universitat Wien, Austria (5-10<sup>th</sup> September 2011) ‘*Controlling droplet Impact with polymer additives*’
- M.I. Smith, J.S. Sharp, 8<sup>th</sup> Liquid Matter Conference, Universitat Wien, Austria (5-10<sup>th</sup> September 2011) ‘*Cracking Colloids: the role of substrate constraint*’
- M.I. Smith, V. Bertola, SET for Britain 2011, Houses of Parliament (14<sup>th</sup> 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 (14-16<sup>th</sup> 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 (14-16<sup>th</sup> 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 (14-16<sup>th</sup> 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 (1<sup>st</sup>-3<sup>rd</sup> 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, (22<sup>nd</sup> March 2007) ‘*Nucleation and growth of insulin fibrils in bulk solution and at hydrophobic polystyrene interfaces*’

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## Referee for International Journals

Physical Review Letters, European Physical Journal E, Soft Matter, Experimental & Thermal Fluid Sci., J. Colloid & Int. Sci., Langmuir, Physics of Fluids

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## Teaching Experience

Module Convenor, Scientific Python (PHYS4038/ AS1) for PGT and PhD students at the University of Nottingham and other Universities in the Midlands Physics Alliance.  
(Autumn 2023-present)

Module Convenor, Force and Function at the Nanoscale (PHYS3009) for 2<sup>nd</sup> Yr students  
(Autumn 2018-present)

Lecturer and Assessor, Modern Applications of Physics (PHYS4025) for 4<sup>th</sup> Yr students  
(Spring 2017-2023)

3<sup>rd</sup> Yr Laboratory Teaching (Autumn 2016)

Frontiers in physics lecture / problems class for 1<sup>st</sup> 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*” (2014-2018)

Matthew Hayes: “*Dynamic break-up in glassy fluids*” (EPSRC Icase studentship, 2017-2021)

James Downs: “*Phase transitions in a 2D granular fluid*” (2018-2022)

Oliver LunnL: “*Interfacial fluctuations in 2D granular fluids*”(2024-present)

*Masters Projects and Summer Internships:*

A large number of student projects and internships

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## 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 (11<sup>th</sup> February 2015)
  - ‘*The electromagnetic spectrum*’ - University of Nottingham outreach to primary school children (Easter 2014)
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## Administration and Community

- Disability Liaison Officer for the school of physics (2022-present)
  - Membership of EDI and teaching committees (2022-present)
  - Member of the research committee (School of Physics, UoN, 2013-2019)
  - Nanoscience group meeting co-ordinator (2013-2016)
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## Referees

- Dr James Sharp - School of Physics & Astronomy, University of Nottingham, NG7 2RD  
e-mail: [james.sharp@nottingham.ac.uk](mailto: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](mailto:volfango.bertola@liverpool.ac.uk) tel: 0151 794 4804