

# Tom Montenegro-Johnson

Professor of Applied Mathematics

University of Warwick

Google Scholar: [tinyurl.com/96fvjx25](https://tinyurl.com/96fvjx25)

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<b>Field:</b>	Interdisciplinary work at the intersection of Soft mechanics, Active Matter, and Biophysics.
<b>Publications:</b>	37 impactful peer-reviewed publications in top mono- and interdisciplinary journals, including Science Advances, Nature Comms, Developmental Cell, and Journal of Fluid Mechanics.
<b>Funding:</b>	£1.4M funding as PI, £2.5M as Co-I: strong track-record of delivering on research funding.
<b>Impact and KE:</b>	U. Birmingham (UoB) Mathematics REF 2021 Impact Lead, raising Impact GPA from 2.3 (REF 2014) to 3.5 (REF 2021). Led the redevelopment of UoB School of Mathematics Industrial Strategy (2022). U. Warwick Mathematics Impact Committee member.
<b>Teaching:</b>	PGCHE, Fellow of the HEA, with consistently excellent student feedback.
<b>Public Engagement:</b>	Permanent exhibit in the Birmingham Science Museum. Lead Science Advisor on a large movie in preproduction. Sci-Art collaboration with award winning origami artist, with exhibitions in Westminster Abbey, Georg Jensen (Mayfair), and a large-scale student-staff cocreated exhibit for the University of Birmingham Commonwealth Games Cultural programme.

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## Education and Training

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<b>PGCHE</b> <i>U. Birmingham, UK</i>	09/2017 - 03/2019
<b>PhD Applied Mathematics</b> <i>School of Mathematics, U. Birmingham, UK</i>	09/2009 - 06/2013
<b>MPhil Earth Sciences</b> <i>The BP Institute, U. Cambridge, UK</i>	09/2008 - 08/2009
<b>BA Mathematics</b> <i>U. Cambridge, UK</i>	09/2005 - 06/2008

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## Employment History

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<b>Professor of Applied Mathematics</b> <i>Department of Mathematics, U. Warwick</i>	04/2023 –
<b>Professor of Applied Mathematics</b> <i>School of Mathematics, U. Birmingham</i>	08/2022 - 03/2023
<b>Reader in Applied Mathematics</b> <i>School of Mathematics, U. Birmingham</i>	08/2021 - 07/2022
<b>Senior Lecturer</b> <i>School of Mathematics, U. Birmingham</i>	08/2019 - 07/2021
<b>Lecturer</b> <i>School of Mathematics, U. Birmingham</i>	08/2016 - 07/2019
<b>1851 Fellow</b> <i>DAMTP, U. Cambridge</i>	10/2014 - 07/2016
<b>Research Associate</b> <i>DAMTP, U. Cambridge</i>	01/2014 - 09/2014
<b>Research Fellow</b> <i>School of Mathematics, U. Birmingham</i>	01/2013 - 12/2013

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## Honours and Awards

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Cultural Engagement Award - <i>University of Birmingham: £6k prize.</i>	2018
STEM4Britain Silver Medal - <i>Parliamentary Science Committee: £2k Poster competition prize.</i>	2016
Undergraduate Research Bursary <i>London Mathematical Society: £1k for summer student.</i>	2015
COST Fellowship <i>COST Action MP1305: £2k to attend CISM summer school.</i>	2014
Young Researcher Prize - <i>British Andrology Society: £100 annual conference prize.</i>	2013
Crighton Fellowship - <i>U. Cambridge: £3k.</i>	2011
BP Opportunity Award - <i>BP: £15k prize distinct from Masters funding.</i>	2009

### **0. A New Class of Single-Material, Non-Reciprocal Microactuators**

*C. Maslen, A. Gholamipour-Shirazi M. Butler, J. Kropacek, I. Rehor, and T. D. Montenegro-Johnson.*  
Macromolecular Rapid Communications, 2022

### **-1. Swelling and shrinking of thermo-responsive hydrogels**

*M. Butler and T. D. Montenegro-Johnson.*  
Journal of Fluid Mechanics, 947, 2022.

### **-2. Colloidal active matter mimics the behaviour of biological microorganisms - an overview...**

*A. Nsamela, A. I. Garcia Zintzun, T. D. Montenegro-Johnson and J. Simmchen.*  
Small, 2022

### **-3. Chemically active filaments: Analysis and extensions of Slender Phoretic Theory**

*P. K. Katsamba, M. Butler, L. Koens, and T. D. Montenegro-Johnson.*  
Soft Matter, 2022

### **-4. The Role of the Double-Layer Potential in Regularised Stokeslet Models of Self-Propulsion**

*D. J. Smith, M. T. Gallagher, R. Schuech, and T. D. Montenegro-Johnson.*  
Fluids, 6 (11), 2021

### **-5. Fundamental Modes of Swimming Correspond to Fundamental Modes of Shape: Engineering I-, U-, and S-Shaped Swimmers**

*P. Sharan, C. Maslen, B. Altunkeyik, I. Rehor, J. Simmchen, and T. D. Montenegro-Johnson.*  
Advanced Intelligent Systems, 2021

### **-6. Local drag of a slender rod parallel to a plane wall in a viscous fluid**

*L. Koens and T. D. Montenegro-Johnson.*  
Physical Review Fluids, 6, 2021

### **-7. A Universal Scaling Law of Mammalian Touch**

*J. Andrews, M. Adams, and T. D. Montenegro-Johnson.*  
Science Advances, 6 (41), 2020

- Altmetric score of [127](#).
- Reported by several national newspapers, including the [Independent](#)

### **-8. Slender Phoretic Theory of Chemically-Active Filaments**

*P. K. Katsamba, S. Michelin, and T. D. Montenegro-Johnson.*  
Journal of Fluid Mechanics, 898, 2020.

### **-9. Simulations of particle tracking in the oligociliated mouse nose and implications for left-right symmetry breaking mechanics**

*M. T. Gallagher, T. D. Montenegro-Johnson, and D. J. Smith.*  
Philosophical Transactions B, 375, 2019.

### **-10. Shape-programmed 3D printed swimming microtori for the transport of passive and active agents**

*R. Baker, T. D. Montenegro-Johnson, A. Sediako, M. Thomson, A. Sen, E. Lauga, and I. Aronson.*  
Nature Communications, 10, 2019.

### **-11. Efficient Implementation of Elastohydrodynamics via Integral Operators**

*A. L. Hall-McNair, M. T. Gallagher, T. D. Montenegro-Johnson, H. Gadélha, and D. J. Smith.*  
Physical Review Fluids, 4, 2019.

### **-12. 3DCellAtlas Meristem - a tool for the global cellular annotation of shoot apical meristems**

*T. D. Montenegro-Johnson, S. Strauss, M. D. B. Jackson, L. Walker, R. S. Smith, and G. W. Bassel.*  
Plant Methods, 15 (1), 2019.

- Selected for a Faculty Opinions [recommendation](#).

### **-13. Symmetry breaking cilia-driven flow in embryogenesis**

*D. J. Smith, T. D. Montenegro-Johnson, and S. S. Lopes.*  
Annual Reviews of Fluid Mechanics, 51, pp. 105-128, 2019.

### **-14. Wall stress enhanced exocytosis of extracellular vesicles as a possible mechanism of left-right symmetry-breaking in zebrafish development**

*J. Solowiej-Wedderburn, D. J. Smith, S. S. Lopes, and T. D. Montenegro-Johnson.*  
J. Theoretical Biology, 460, pp. 220-226, 2019.

### **-15. Microtransformers: controlled microscale navigation with flexible robots**

*T. D. Montenegro-Johnson.*  
Physical Review Fluids, 3, pp. 062201, 2018.

**-16. Clustering-induced self-propulsion of isotropic autophoretic particles**

*A. Varma, T. D. Montenegro-Johnson, and S. Michelin.*

Soft Matter, 14, pp. 7155-7173, 2018.

**-17. Thrifty swimming with shear-thinning: a note on out-of-plane effects for undulatory locomotion through shear-thinning fluids**

*D. Gagnon and T. D. Montenegro-Johnson.*

The ANZIAM Journal, 59 (4), pp. 443-454, 2018.

**-18. Fake  $\mu$ s: A cautionary tail of shear-thinning locomotion**

*T. D. Montenegro-Johnson.*

Physical Review Fluids, 2, pp. 081101, 2017.

**-19. Dynamics of cilia length in left-right development**

*P. A. Pintado, P. Sampaio, B. Tavares, T. D. Montenegro-Johnson, D. J. Smith and S. S. Lopes.*

Royal Society Open Science, 4 (3), 2017.

**-20. Autophoretic flow on a torus**

*L. Schmieding, E. Lauga, and T. D. Montenegro-Johnson.*

Physical Review Fluids, 2 (3), pp. 034201, 2017.

- Highlighted with a [commentary](#) in Nature Physics.

**-21. Microscale Flow Dynamics of Ribbons and Sheets**

*T. D. Montenegro-Johnson, L. M. Koens, and E. Lauga.*

Soft Matter, 13 (3), pp. 546-553, 2017.

- Issue [front cover](#).

**-22. In Silico Methods for Cell Annotation, Quantification of Gene Expression, and Cell Geometry at Single-Cell Resolution Using 3DCellAtlas**

*P. Stamm, S. Strauss, T. D. Montenegro-Johnson, R. Smith and G. W. Bassel.*

Plant Hormones: Methods and Protocols, pp. 99–123, 2017.

**-23. Flow analysis of swimming *C. Elegans*: experiments and simulations**

*T. D. Montenegro-Johnson, D. A. Gagnon, P. E. Arratia and E. Lauga.*

Physical Review Fluids, 1 (5), pp. 053202, 2016.

**-24. Three-dimensional flow in Kupffer's Vesicle**

*T. D. Montenegro-Johnson, D. I. Baker, D. J. Smith and S. S. Lopes.*

Journal of Mathematical Biology, 73 (3), pp. 705-725, 2016.

**-25. A regularised singularity approach to phoretic problems**

*T. D. Montenegro-Johnson, S. Michelin and E. Lauga.*

European Physical Journal E, 38 (12), pp. 139, 2015.

- Issue [front cover](#).

**-26. Geometric pumping in autophoretic channels**

*S. Michelin, T. D. Montenegro-Johnson, G. De Canio, N. Lobato-Dauzier and E. Lauga.*

Soft Matter, 11 (29), pp. 5804-5811, 2015.

- Issue [front cover](#).

**-27. Complex fluids affect low-Reynolds number locomotion in a kinematic-dependent manner**

*F. A. Godínez, L. Koens, T. D. Montenegro-Johnson, R. Zenit and E. Lauga.*

Experiments in Fluids, 56 (6), pp. 97, 2015.

**-28. Digital single cell analysis of plant organ development using 3DCellAtlas**

*T. D. Montenegro-Johnson, P. Stamm, S. Strauss, A. T. Topham, M. Tsagris, A. Wood, R. S. Smith and G. W. Bassel.*

The Plant Cell, 27 (4), pp. 1018-1033, 2015.

- Selected for a Faculty Opinions [recommendation](#).
- Global Plant Council [paper of the month](#).

**-29. Spermatozoa scattering by a microchannel feature: an elasto-hydrodynamic model.**

*T. D. Montenegro-Johnson, H. Gadélha and D. J. Smith.*

Royal Society Open Science, 2 (3), 2015.

### **-30. The other optimal Stokes drag profile**

*T. D. Montenegro-Johnson and E. Lauga.*  
Journal of Fluid Mechanics, 762, R3, 2015.

### **-31. Organized chaos in Kupffer's vesicle: how a heterogeneous structure achieves consistent left-right patterning**

*D. J. Smith, T. D. Montenegro-Johnson and S. S. Lopes.*  
BioArchitecture, 4 (3), pp. 119-125, 2014.

### **-32. Left-right organizer flow dynamics: how much cilia activity reliably yields laterality?**

*A. Smith, T. D. Montenegro-Johnson, D. Smith, and S. S. Lopez.*  
Developmental Cell, 29 (6), 2014

### **-33. Optimal swimming of a sheet**

*T. D. Montenegro-Johnson and E. Lauga.*  
Physical Review E, 89 (6), 2014

### **-34. Physics of rheologically enhanced propulsion : different strokes in generalized Stokes**

*T. D. Montenegro-Johnson, D. Smith, and D. Loghin.*  
Physics of Fluids, 25 (8), 2013

### **-35. Symmetry breaking cilia-driven flow in the zebrafish embryo**

*A. Smith, T. D. Montenegro-Johnson, D. Smith, and J. R. Blake.*  
Journal of Fluid Mechanics, 705, 2012

### **-36. Modelling the fluid mechanics of cilia and flagella in reproduction and development**

*T. D. Montenegro-Johnson, A. Smith, D. Smith, D. Loghin, and J. R. Blake.*  
European Physical Journal E, 35 (17), 2012

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## Research Grants

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<b>Role:</b>	<b>Dates:</b>	<b>Description:</b>	<b>Funder:</b>	<b>Value:</b>
PI	12/2020- 11/2026	Shape Transforming Active Microfluidics <i>Research Leadership Award.</i>	Leverhulme	£1M
Col	10/2018- 04/2022	H-Reality <i>H2020 FET project. £230k Share.</i>	ERC	€3M
PI	06/2018- 05/2020	Artificial Transforming Swimmers for Precision Microfluidics Tasks <i>Bright Ideas Award.</i>	EPSRC	£230k
PI	10/2014- 09/2017	Foundations of Biomedical Microbots <i>Research Fellowship.</i>	RCftE 1851	£110k

### **Smaller grants:**

QR Funding (Col) for GRR: Grant and Research Retreats - *UoB: £47k.* 2023 –  
Capital Award - *EPSRC: £16k.* 2020

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## Scientific Leadership

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**International Research Assessment Consultant:** *The University of Hong Kong, China* 2023 –

- Evaluation of the full (current) portfolio of mathematics publications to be submitted to the University Grants Committee (UGC) of Hong Kong Research Assessment Exercise (2026).
- Advice and support with preparation of Impact Case Studies for Faculty of Science.
- Assessment Impact Case Study Portfolio (mathematics).

**Deputy Director of Research:** *School of Mathematics, U. Birmingham, UK* 2017 - 2023

- Responsible for Applied Mathematics and School Industrial Strategies.
- Maths representative on the U. Birmingham EPS College Innovation Subcommittee.
- Centre for Systems Modelling and Quantitative Biology Steering Committee Member.
- Developed links between U. Birmingham Mathematics and Industry.

- Led the REF 2021 Impact submission for UoA 10 (Mathematics, 5 Case Studies).
- Strong results: Impact GPA raised from 2.3 (REF 2014) to 3.5 (REF 2021).
- Lead author of 2 Impact Case Studies.
- Drafting support and advice for other Impact Case Study Leads.

**Management and Mentoring:**

- Mentor (meeting 6x/year) for Zeeman Lecturer Ellen Luckins.
- Mentor for Assistant Prof. Jiahua Jiang.
- Regular speaker at U. Birmingham “Applying for grants and fellowships” workshops.
- Mentored Research Fellows into several productive collaborations, one of which resulted in a £430k grant.
- Supervised 4 Undergraduate summer project students who have all gone on to PhDs.
- Supervised a Nuffield Bursary A-level student, and a year 10 work experience student.
- Managed 5 PDRAs, each of whom have advanced to higher positions (grade 8/fellowships).
- Lead writer for UoB Leverhulme Research Centre application (CoI, 2021) on “Touch”.
- Grant support: an active role in supporting the careers of colleagues via providing feedback on dozens of grant and fellowship applications in a formal and informal capacity.

**Other citizenship**

- EPSRC Mathematics Early Career Forum Member (2016 - 2018).
- Bioactive Fluids UK Fluids SIG Webmaster (2017 - 2021).
- Grants and research Reboots: CoI on QR scheme to support grant writing at UoB.
- Member of the University of Warwick Mathematics department Impact and Research Committees (2023 -).
- External examiner for a number of PhDs (inc. Cambridge, Imperial, E. Polytechnique).

**Engagement**

- Birmingham Science Museum: Developed a permanent exhibit based on my work.
- “Unify” Movie Consultancy: Lead Science Advisor for the latest science fiction film project (in preproduction) of director [Jonathan Hopkins](#), which will star Olga Kurylenko.
- Origami Art Collaboration: Collaborative exhibitions with Coco Sato in Westminster Abbey, Georg Jensen’s flagship Mayfair store, and the UoB Commonwealth Games Cultural Programme.
- Industry Engagement: Relationships with DSTL, Ultraleap, and Nanoscribe; outcomes include contribution to UoB careers provision (DSTL), an H2020 FET grant (Ultraleap), and ongoing applications.
- Recent media: Articles in *inter alia* [The Independent](#), [The Daily Mail](#), [The Daily Star](#), [Science News](#), [Cosmos](#).

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**Highlighted Seminars (Independent Career)**


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Impact: Preparing your submission <i>Faculty of Science, HKUST, Hong Kong</i>	02/2023
New perspectives on active matter <i>Physics Day Conference, U. Warwick</i>	01/2023
Biofilms and Bioactive Fluids <i>Early Career Workshop, U. Liverpool, UK</i>	05/2022
Engineering Mathematics Series <i>U. Bristol, UK</i>	05/2022
Physical Applied Mathematics Series <i>U. Manchester, UK</i>	04/2022
TJP80: Biological Fluids & Flows <i>U. Cambridge, UK</i>	03/2022
BioActive Fluids Series <i>International SIG</i>	12/2021
Applied Mathematics Series <i>U. Leeds, UK</i>	12/2021
Mathematics Colloquium <i>U. Warwick, UK</i>	12/2021
Applied Mathematics Seminar Series <i>U. Warwick, UK</i>	12/2021
Complex Active and Adaptive Material Systems <i>Gordon Research Conference - Career Panelist</i>	07/2021
MNF2021 <i>Imperial College London, UK</i>	05/2021
Dynamics Seminar Series <i>U. Exeter, UK</i>	03/2021
SimEA Seminar Series <i>The Cyprus Institute, Cyprus</i>	03/2021
Softbio Seminar Series <i>U. Warwick, UK</i>	06/2019
Microswimmers Lecture Series - Inaugural Lecture <i>TU Dresden, Dresden, Germany</i>	06/2019

