

# Tom Montenegro-Johnson

Professor of Applied Mathematics

University of Warwick

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

Clickable links in [blue](#).



- Leadership:** Dep. Director: Centre for Applications in Mathematical and Computing Sciences, U. Warwick. U. Birmingham REF 2021 Impact Lead UoA10 - raised GPA from 2.3 (2014) to 3.5 (2021).
- Publications:** Impactful peer-reviewed publications in top mono- and interdisciplinary journals, including Science Advances, Nature Comms, Developmental Cell, and Journal of Fluid Mechanics.
- Funding:** £1.4M funding as PI, £2.5M as Co-I: strong track-record of delivering on research funding. Shortlisted (top 10 nationally in Physical Sciences and Engineering) for UK Blavatnik Award.
- Teaching:** PGCHE, Fellow of the HEA, with consistently excellent student feedback.
- Public Engagement:** Permanent exhibit in the Birmingham Science Museum. Scientific Advisor on a large movie in preproduction. Sci-Art collaboration with award winning origami artist, with exhibitions in Westminster Abbey and Georg Jensen (Mayfair).

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## Employment History

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

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## Education and Training

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

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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>	RCfE 1851	£110k

### Smaller grants:

IDRF Spotlight Award - Maths for Resilient Cities in Extreme Weather <i>UoW: £15k.</i>	<a href="#">2024</a>
QR Funding (Col) for GRR: Grant and Research Retreats - <i>UoB: £47k.</i>	<a href="#">2023</a>
Capital Award - <i>EPSRC: £16k.</i>	<a href="#">2020</a>
Other small awards and prizes - <i>Various: £30k.</i>	<a href="#">2009 –</a>

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## Leadership

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### **Deputy Director of CAMaCS** *University of Warwick*

2024 –

- The Centre for Applications of Mathematical and Computing Sciences.
- Developed the Centre's flagship "Thinkubator" engagement model.
- Facilitated events with numerous BIG (Business, Industry, Government) partners including Bosch, Barber Boss, and Warwickshire Police.
- Contributing to wider shaping and delivery of Centre strategy.

### **REF 2021 Impact Lead (Mathematics):** *U. Birmingham, UK*

2017 - 2021

- 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.

### **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.

### **Research Assessment Consultancy:** *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).

### **Leadership in the UK Gel mathematics community** 2024 –

- Co-founder of the UK Gels Network.

### **Management and Mentoring:**

- Mentor (meeting 6x/year) for Zeeman Lecturers Ellen Luckins and Lukas Eigentler.
- Former mentor for Assistant Prof. Jiahua Jiang and Assistant Prof. Josephine Evans,.
- Currently managing 5 PDRAs.
- Previously managed 5 PDRAs, each of whom have advanced to higher positions (grade 8/fellowships).
- 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.
- Grant support: an active role in supporting the careers of colleagues via providing feedback/sitting on mock interview panels for dozens of grant and fellowship applications in a formal and informal capacity.

### **Other citizenship**

- Member of Warwick Mathematics Institute Research Committee, Impact Committee, and CAMaCS Executive Committee (2024–).
- Supervised 3 summer project students on a widening participation scheme, a Nuffield Bursary A-level student, and year 10 work experience student.
- 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.
- External examiner for a number of PhDs (inc. Cambridge, Imperial, E. Polytechnique).

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## Teaching Statement

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<b>Module Lecturer:</b>	Masters, Transport Processes in Mathematical Biology, 15 credits. <span style="float: right;">2024 –</span>
	UG 3rd Year, Numerical Analysis & PDEs, 15 credits. <span style="float: right;">2023 - 24</span>
	Masters, Advanced Mathematical Biology, 10 credits. <span style="float: right;">2016 - 22</span>
<b>Module redesign:</b>	Led the processes of redesigning a masters module from a 10 to 20 credit course, submitting relevant paperwork to the University for approval. <span style="float: right;">2018 - 19</span>
<b>Personal tutor:</b>	Weekly small group teaching and pastoral care role for between 1-3 groups of 8 taught-course students each year. <span style="float: right;">2016 - 22</span>
<b>Project supervision:</b>	Regular supervision of 3rd year undergraduate projects (20 credits), MSci projects (40 credits), PGT (MRes) projects (60 credits), as well as undergraduate summer projects, and school students (Nuffield bursary, work experience). A number of these projects have resulted in publications. <span style="float: right;">2016 - 25</span>
<b>Examinations:</b>	Chair of the UoB Mathematics Year 2 Examinations scrutiny panel. <span style="float: right;">2021 - 22</span>

My teaching style is enthusiastic, approachable, multimodal, and applications-focused. I typically combine traditional lectures at the blackboard, plenty of worked examples, short video tutorials on challenging aspects, and coding challenges, often with live/prerecorded coding examples. I have an excellent track-record of student satisfaction; some sample comments from module feedback include:

*“Tom is a fantastic lecturer who ensures that his lectures are not only engaging but also very interesting”, “Just as an aside, I would like to say that Transport Processes has been my favourite module this term, and I have always looked forward to attending the classes.”, “Enthusiastic, tells us about the relevance of what we are learning”, “Excellent lectures, really clear and well-structured”, “I really appreciate the effort the lecturer made for this course. Made things fun and interesting”, “Engaging lecturer”, “Approachable, friendly and enthusiastic”, “So sad you won’t be teaching next Sem”, “Friendly, funny and approachable, makes it easy to learn and easy to ask for help.”*

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## Research Student Supervision

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Degree:	Dates:	Title:	Role:
PhD	09/2024 - 03/2027	Machine-Learning Accelerated Simulation of Suspensions of Elastic Microfilaments	Lead
PhD	09/2020- 03/2024	Shape-shifting bubble-driven hydrogel microbots	Lead
PhD	09/2018- 08/2022	Modelling multicellular, multiciliate, motility	Lead
PhD	09/2017- 11/2021	Efficient Methods for Stokesian elastohydrodynamic problems	Co-S
PhD	09/2017- 11/2021	Finite element modelling of microswimmers with applications in reproductive biology	Co-S
MRes	09/2017- 03/2019	Microvascular Anastomosis: The effect of sutures on blood flow	Lead

Additionally supervision of several taught student research projects leading to pubs 13, 17, and 23 above.

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## Highlighted Seminars

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Applied Mathematics Series <i>UCL, UK</i>	03/2025
Applied Mathematics Series <i>U. Oslo, Norway</i>	02/2025
Applied Mathematics Series <i>U. Exeter, UK</i>	12/2024
Journal of Fluid Mechanics Seminar Series <i>U. Cambridge, UK</i>	08/2024
Nonlinear Dynamics at Zero Reynolds Number <i>Euromech Colloquium, Imperial</i>	05/2024
Impact: Exciting and Achievable <i>Mathematics Colloquium, U. Warwick</i>	12/2023
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
Complex Fluids in Biological Systems <i>BIRS, Banff, Canada</i>	07/2018
Biophysics Series <i>U. Cambridge, UK</i>	02/2018
UK Bioactive Fluids SIG <i>Birmingham, UK - Workshop lead</i>	07/2017
Mathematical and Computational Biology <i>U. Melbourne, Australia - seminar</i>	03/2017
1851 Alumni Science Evening <i>London, UK - lecture</i>	02/2017
UK Fluids Summer School <i>Imperial College London, UK - lecture</i>	07/2016
LadHyX Seminar series <i>École Polytechnique, France - seminar</i>	03/2016
Flowing Matter 2016 <i>U. Porto, Portugal</i>	01/2016
York Mathematical Biology <i>U. York, UK - seminar</i>	12/2015
Applied Mathematics Seminar Series <i>Imperial College London, UK - seminar</i>	02/2015

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## Public Engagement

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- Birmingham Science Museum: Co-developed a permanent exhibit for the Futures Gallery, based on my EPSRC-funded research, that has run for 5 years.
- “Unify” Movie Consultancy: Scientific Advisor for “Unify” the latest science fiction film project 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.
- Recent media: Articles in *inter alia* [The Independent](#), [The Daily Mail](#), [The Daily Star](#), [Science News](#), [Cosmos](#).



Figure 1: L to R: Permanent exhibit in the Birmingham Science Museum, a section of the Georg Jensen exhibit, a close-up of the deployable cone designed for exhibition at Westminster Abbey, “The Butterfly Affect”, a student engagement installation of origami butterflies highlighting mental health impacts of the pandemic.

**45. Surfing on chemical waves: A simple yet dynamically rich two-sphere responsive gel swimmer**

*J. J. Webber and T. D. Montenegro-Johnson.*

Under review

**44. Controllable microfluidics through active droplets**

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

Under review

**43. Oscillating chemical reactions enable communication between responsive hydrogels**

*J. J. Webber and T. D. Montenegro-Johnson.*

Under review

**42. Poromechanical modelling of responsive hydrogel pumps**

*J. J. Webber and T. D. Montenegro-Johnson.*

To appear in Journal of Fluid Mechanics, 2025

**41. Dynamics of active poroelastic filaments in Stokes flow**

*B. Altunkeyik, A. Rahmat, and T. D. Montenegro-Johnson.*

Physical Review E, 111 (2), 2025

**40. Modelling smart stimuli-responsive hydrogels: a particle-based approach**

*A. Rahmat, B. Altunkeyik, M. Safdari Shadloob, and T. D. Montenegro-Johnson.*

To appear in Physical Review E, 110 (5), 2024

**39. Introduction to theories and modelling of active colloids**

*P. K. Katsamba and T. D. Montenegro-Johnson.*

Book Chapter to appear in "Active Colloids", published by RSC, 2024

**38. Slender Phoretic Loops and Knots**

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

Physical Review Fluids, 9, 2024

**37. 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, 2023

**36. Swelling and shrinking of thermo-responsive hydrogels**

*M. Butler and T. D. Montenegro-Johnson.*

Journal of Fluid Mechanics, 947, 2023.

**35. 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

**34. 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

**33. 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

**32. 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

**31. 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

**30. 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](#)

**29. Slender Phoretic Theory of Chemically-Active Filaments**

*P. K. Katsamba, S. Michelin, and T. D. Montenegro-Johnson.*

Journal of Fluid Mechanics, 898, 2020.

**28. Simulations of particle tracking in the oligociliated mouse node and implications for left-right symmetry breaking mechanics**

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

**27. 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.

**26. 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.

**25. 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](#).

**24. 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.

**23. 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.

**22. Microtransformers: controlled microscale navigation with flexible robots**

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

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

*A. Varma, T. D. Montenegro-Johnson, and S. Michelin.*  
Soft Matter, 14, pp. 7155-7173, 2018.

**20. 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.

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

*T. D. Montenegro-Johnson.*  
Physical Review Fluids, 2, pp. 081101, 2017.

**18. 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.

**17. 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.

**16. 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](#).

**15. 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.

**14. 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.

**13. 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.

## **12. 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](#).

## **11. 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](#).

## **10. 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.

## **9. 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](#).

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

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

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

## **7. The other optimal Stokes drag profile**

*T. D. Montenegro-Johnson and E. Lauga.*

Journal of Fluid Mechanics, 762, R3, 2015.

## **6. 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.

## **5. 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

## **4. Optimal swimming of a sheet**

*T. D. Montenegro-Johnson and E. Lauga.*

Physical Review E, 89 (6), 2014

## **3. 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

## **2. 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

## **1. 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