

# Marcus Roper

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## RESEARCH INTERESTS

Microfluidics: low Reynolds number swimming and weak inertial effects, jamming in sheared suspensions. Biomechanics: shape selection and environmental and developmental constraints upon explosively launched propagules, posture control in labriform swimming fish. Free-surface flows: surfactant and texture driven thin film flows.

## ACADEMIC EMPLOYMENT

Sep 2007 – Postdoctoral Fellow, Department of Organismic and Evolutionary Biology, Harvard University  
Jun – Aug 2002 Cryptanalyst, Government Communications Headquarters, Cheltenham.

## EDUCATION

Sep 2003 – Sep 2007 PhD Applied Math, School of Engineering and Applied Science, Harvard University  
Thesis title: “Symmetry breaking and un-breaking in microhydrodynamical systems. Pumping, swimming and bio-ballistics”  
Thesis advisors: Howard A. Stone and Michael P. Brenner  
Oct 2002 – Jun 2003 Certificate of Advanced Study in Mathematics, Cambridge University  
Oct 1999 – Jun 2002 BA (Hons) Mathematics at Christ’s College, Cambridge University

## AWARDS

2007 Farlow Postdoctoral Fellowship, Harvard University Herbarium  
2006-7 Kodak Graduate Student Fellowship  
2004-5 Kao Graduate Student Fellowship SEAS, Harvard University  
2000-3 JP Whelan Prize, Junior and Senior Undergraduate Scholarships, Christ’s College, U. Cambridge  
1999 Bronze Medal in the 40<sup>th</sup> International Mathematical Olympiad

## PUBLICATIONS

- “Imbibition by polygonal spreading on microdecorated surfaces” *Nat. Materials*, **6**, 661-664 (2007)  
L. Courbin, E. Denieul, E. Dressaire, M. Roper, A. Ajdari and H.A. Stone
- “On the dynamics of magnetically driven elastic filaments” *J. Fluid Mech.*, **554**, 167–190 (2006)  
M. Roper, R. Dreyfus, J Baudry, M. Fermigier, J. Bibette, J. and H.A. Stone

- “Microscopic artificial swimmers” *Nature*, 436, 862-865 (2005)  
R. Dreyfus, J. Baudry, M.L. Roper, M. Fermigier, H.A. Stone, and J. Bibette
- “Do magnetic micro-swimmers move like eukaryotic cells?” *submitted to Proc. Roy. Soc. Lond. Ser. A*  
M. Roper, R. Dreyfus, J Baudry, M. Fermigier, J. Bibette, J. and H.A. Stone
- “A linear approximation for flow at moderate Reynolds numbers” *submitted to J. Fluid Mech.*  
M. Roper and M.P. Brenner
- “Symmetry un-breaking in perfect projectiles” *submitted to Phys. Fluids.*  
M. Roper, T.M. Squires and M.P. Brenner
- “Are spores of ascomycete fungi perfect projectiles?” *to be submitted*  
M. Roper, M.P. Brenner and A. Pringle
- “Locomotion with a reversible stroke in a weakly inertial or weakly viscoelastic fluid” *to be submitted*  
M. Roper and H.A. Stone

Preprints of unpublished papers can be supplied on request.

## INVITED PRESENTATIONS

Oct 2007	WAM Seminar, SEAS Harvard, ‘Symmetry breaking puzzles in microhydrodynamics’
Sep 2007	ESF Workshop on Microswimming, Munich, Germany ‘What can asymptotic studies teach us about microswimming?’
Sep 2007	Harvard University Herbarium, ‘Are ascospores perfect projectiles?’
Feb 2007	James Franck Institute, U. Chicago, ‘The onset of irreversibility in sheared suspensions’
Jan 2007	Physical Math Seminar, MIT, ‘Life at small Reynolds number’
Oct 2006	Cond. Mat. Kids Seminar, Physics Dept. Harvard University ‘Growing drag-minimising shapes’
Jan 2006	Rowland Institute Methods Seminar ‘Microscopic artificial swimmers’

## CONTRIBUTED PRESENTATIONS

Nov 2006	APS-DFD Annual Meeting Tampa ‘Is there a finite onset of irreversibility in sheared suspensions?’
Apr 2006	IPAM Workshop on Microfluidic Flows in Nature ‘Microscopic artificial swimmers’ (poster)
Jan 2006	IPAM Workshop on Thin-Film Flows ‘Wall climbing in <i>B. subtilis</i> biofilms’ (poster)
Nov 2005	APS-DFD Annual Meeting Chicago ‘Symmetry breaking for drag minimization’
Nov 2005	U. Chicago workshop on singularity flows ‘Wall climbing in <i>B. subtilis</i> biofilms’ (poster)
Nov 2004	APS-DFD Annual Meeting Seattle ‘On swimming paramagnetic filaments’

## TEACHING EXPERIENCE

Autumn 2005	Appl. Math. 201, Physical Applied Mathematics I (teaching assistant)
Autumn 2004, 2006	Eng. Sci. 220, Introduction to Fluid Dynamics (teaching assistant)

## **PROFESSIONAL ACTIVITIES**

*Peer Review* Journal of Fluid Mechanics, Nonlinearity, Proceedings of the National Academy of Sciences USA, Physical Review E, SIAM Journal of Applied Mathematics.