

Marco Polin, Ph.D.

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Employment

- Sept 2013-present
Assistant Professor, University of Warwick.
- Oct 2007-Aug 2013
Postdoctoral Research Fellow. DAMTP, University of Cambridge.
Experimental study of the dynamics of eukaryotic flagella in Volvocalean algae (see research statement for more details). Funded by a **Marie-Curie** Intra-European Fellowship (2008-2010) and an **EPSRC** Postdoctoral Fellowship (2010-2013).

Awards

- Oct. 2012 *Visiting Fellowship* (€1300). University of the Balearic Islands
- Oct. 2010 - Sept. 2013 *Fellow of Clare Hall, Cambridge*. United Kingdom.
- 2010-2013 *EPSRC Postdoctoral Fellowship* (£ **282k**). United Kingdom.
- 2008-2010 *Marie Curie Intra-European Fellowship* (£ **128k**). European Commission.
- 2006-2007 *Dean's Dissertation Fellowship*. New York University.
(Full scholarship for last year of Ph.D.)

Patents

- Manipulation of objects in potential energy landscapes
with Y. Roichman, D. G. Grier, S. H. Lee, and K. Ladavac.
U.S. Patent 20090101807, New York University (2009).

Education

- 2001-2007 Ph.D. in Physics. Advisor Prof. David G. Grier
Direct measurement of colloidal interactions with holographic optical tweezers
Center for Soft Matter Research, New York University.
- 1995-1999 B.S. in Physics, *cum laude* (highest honour). Advisor: Prof. Mario Tonin
Anomalies and their cancellation in string and superstring theories
Università degli Studi di Padova, Padova, Italy.

Scientific Workshops and Courses

- Microscale Interactions in Aquatic Environments
March 11-March 17 2013, École de physique des Houches, Les Houches, France.
- EMBO Course on Advanced Microscopy
March 21- March 31 2012, Marine Biological Association. Plymouth, UK.
- The Geometry and Mechanics of Growth in Biological Systems
July 14 - July 26 2008, Institut d'Études Scientifiques de Cargèse. Corsica, France.
- Understanding Molecular Simulations
January 8 - January 19 2007, University of Amsterdam, Amsterdam, The Netherlands.
- Physics of Soft Matter: Complex Fluids and Biological Materials
June 26 - July 21 2006, University of Colorado at Boulder, Boulder, CO.
- 2005 Soft Condensed Matter School
March 2005, Utrecht University, Utrecht, The Netherlands.

Technical Skills and Expertise

- Soft condensed matter, with a particular interest in colloidal physics (I worked on experiments, simulations and theory of colloidal interactions).
- Experimental techniques in soft matter and biophysics (optical tweezers, holographic microscopy, particle image velocimetry, microfluidics, micromanipulation).
- Optical microscopy.
- Scientific computing (data analysis, image analysis, Monte Carlo simulations, numerical solution of differential equations).
- Microhydrodynamics.
- Motility of eukaryotic flagella.

Publications (Researcher ID: H-4202-2011)

Note: Several of my papers (nos. 4,8-11) deliberately list the authors in alphabetical order. On request I can provide full details of my individual contributions to all the papers.

- 14 K. C. Leptos, Y. K. Wan, M. Polin, I. Tuval, A. Pesci, and R. E. Goldstein
Antiphase synchronisation in a flagellar-dominance mutant of Chlamydomonas.
Physical Review Letters, 111, 158101 (2013).
- 13 V. Kantsler, J. Dunkel, M. Polin, and R.E. Goldstein
Ciliary Contact Interactions Dominate Surface Scattering of Swimming Eukaryotes.
Proceedings of the National Academy of Sciences (USA), 110(4), 1187-1192 (2012).
- 12 D. R. Brumley, M. Polin, T. J. Pedley, and R. E. Goldstein
Hydrodynamic synchronization and metachronal waves on the surface of the colonial alga Volvox carteri.
Physical Review Letters, 109, 268102 (2012).
Selected for a **Synopsis in Physics**:
M. Rini. *Paddling in Sync.*

- 11 R. E. Goldstein, M. Polin, and I. Tuval
Emergence of synchronized beating during the regrowth of eukaryotic flagella.
Physical Review Letters, 107, 148103 (2011).
- 10 T. M. Garoni, G. Ossola, M. Polin, and A. D. Sokal
Dynamic critical behavior of the Chayes-Machta algorithm for the random-cluster model. I. Two dimensions.
Journal of Statistical Physics, 144(3), 459-518 (2011).
- 9 K. Drescher, R. E. Goldstein, N. Michel, M. Polin, and I. Tuval
Direct measurement of the flow field around freely swimming microorganisms.
Physical Review Letters, 105, 168101 (2010).
Selected for a **Viewpoint in Physics**:
D. Saintillan, *A quantitative look into microorganism hydrodynamics.* *Physics* 3, 84 (2010).
- 8 R. E. Goldstein, M. Polin, and I. Tuval
Noise and synchronization in pairs of beating eukaryotic flagella.
Physical Review Letters, 103, 168103 (2009).
- 7 M. Polin, I. Tuval, K. Drescher, J. P. Gollub, and R. E. Goldstein
Chlamydomonas swims with two “gears” in a eukaryotic version of run-and-tumble locomotion.
Science, 325, 487-490 (2009).
Selected for **Perspective** article: R. Stocker, and W. M. Durham, *Tumbling for Stealth?*, *Science* 325, 400 (2009).
- 6 M. Polin, Y. Roichman, and D. G. Grier
Auto-calibrated colloidal interaction measurements with extended optical traps.
Physical Review E, 77, 051401 (2008).
- 5 M. Polin, D. G. Grier, and Y. Han
Colloidal electrostatic interactions near a conducting surface.
Physical Review E, 76, 041406 (2007).
- 4 Y. Deng, T. M. Garoni, J. Machta, G. Ossola, M. Polin, and A. D. Sokal
Critical behavior of the Chayes-Machta-Swendsen-Wang dynamics.
Physical Review Letters, 99, 055701 (2007).
- 3 M. Polin, D. G. Grier, and S. Quake
Anomalous vibrational dispersion in holographically trapped colloidal arrays.
Physical Review Letters, 97, 088101 (2006).
- 2 M. Polin, K. Ladavac, S. Lee, Y. Roichman, and D. G. Grier
Optimized Holographic Optical Traps.
Optics Express, 13, 5831-5845 (2005).
- 1 S. Lee, K. Ladavac, M. Polin, and D. G. Grier
Observation of flux reversal in a symmetric optical thermal ratchet.
Physical Review Letters, 94, 110601 (2005).

Recent Presentations

- Bio Phys Math Meeting: 2nd Edition, Nice, France, December **2013**. Invited Talk.
- International Soft Matter Conference, Rome, Italy September **2013**. Talk.
- Physics of Emergent Behaviour, Brighton, UK June **2013**. Talk.
- Microscale Interactions in Aquatic Environments, Les Houches, France March **2013**. Invited Talk.
- Department of Chemical Engineering, Cambridge, UK September **2012**. Invited Talk.
- DAMTP Fluid Mechanics Seminar, Cambridge, UK. February **2012**. Invited Talk.
- APS March Meeting 2012, Boston, MA. March **2012**. Talk.
- Cell Physics Days 2011, ISIS, Strasbourg, France. November **2011**. Invited Talk.
- British Applied Mathematics Colloquium 2011, Birmingham. April **2011**. Talk.
- APS March Meeting 2011, Dallas, TX. March **2011**. Talk.
- Soft Matter, Biomaterials and Interfaces Seminar Series, Oxford, UK. February **2011**. Invited Talk.
- DFD 2010, Long Beach, CA. November **2010**. Talk.
- ORFLOW 2010, Mallorca, Spain. June **2010**. Talk.
- APS March Meeting 2010, Portland, OR. March **2010**. Talk.
- Dynamics in Systems Biology, Aberdeen, UK. September **2009**. Poster. Awarded prize for Best Poster of the Conference.
- Fluid and Elasticity 2009, Carry-le-Rouet, France. June **2009**. Talk.
- APS March Meeting 2009, Pittsburgh, PA. March **2009**. Talk.

Teaching

- Member of the examination committee for:
 - Nicolas Bruot, Cavendish Laboratory (University of Cambridge).
First year report for Ph.D. candidacy.
 - Sujoy Ganguly, DAMTP (University of Cambridge).
First year report for Ph.D. candidacy.
- University of Cambridge. Supervisor for:
 - Lent 2008/2009. Mathematical Biology
 - Lent 2007/2008. Mathematical Biology
- New York University. Teaching Assistant for:
 - Summer 2004. General Physics II
 - Spring 2004. Statistical Mechanics (Graduate course)
Electricity and Magnetism II
 - Fall 2003. Quantum Mechanics I (Graduate Course)
 - Summer 2002. General Physics I

- Spring 2002. Morse Academic Plan Course
- Fall 2001. General Physics I
- University of Cambridge. Outreach activities:
 - Summer 2012. Group to Encourage Ethnic Minority Applications Summer School. Lecturer.
 - Summer 2012. Further Education and Mature Students Summer School. Lecturer.

Students Supervised

- From Sept 2011. *Douglas Brumley* (Ph.D. cand. University of Cambridge) Co-supervisor together with Profs. Timothy Pedley and Raymond Goldstein.
- Jul-Oct 2011. *Thomas Johnson* (Ph.D. cand. University of Birmingham) Internship financed by the David Crighton Fellowship.
- Apr-Aug 2011. *Bastien Bruneau* (Undergraduate at École Polytechnique) Internship.
- Oct 2010-Jul 2011. *Latifah Hamzah* (Undergraduate at MIT) Internship under the exchange program MIT-University of Cambridge.
- Oct 2010-Jan 2011. *Bati Sengul* (Ph.D. cand. Cambridge Centre for Analysis, University of Cambridge) Mini-project required for Ph.D. candidacy.

Additional Training

- Level 3 Award in First Line Management (ILM) University of Cambridge, June-July 2012.
- Workshop on Supervising Graduate Students CCPD University of Cambridge, 14 Nov. 2011.
- Introduction to Lecturing techniques for the Sciences CCPD University of Cambridge, 27 Oct. 2011.

Committee membership and referee service

- Oct. 2011-present. Fellowship Committee, Clare Hall.
The Fellowship Committee is responsible for selecting the candidates for both Visiting Fellowships ($\sim 50/y$) and Research Fellowships ($\sim 4/y$) at the College. The successful candidates are then submitted to the Governing Body for formal approval.
- Oct. 2010-present. Governing Body, Clare Hall.
- Referee for PNAS, Physical Review Letters, Physical Review E.

Referees

- **Prof. Raymond E. Goldstein** (Postdoc Supervisor)
DAMTP, University of Cambridge
Wilberforce road, Cambridge CB3 0WA, UK
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E-mail: R.E.Goldstein@damtp.ac.uk

- **Prof. David G. Grier** (Ph.D. Advisor)
Center for Soft Matter Research, New York University
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- **Prof. Jerry P. Gollub** (Collaborator)
Haverford College
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- **Prof. Timothy J. Pedley** (Collaborator)
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- **Dr. Pietro Cicuta** (Collaborator)
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