Carl A. Whitfield

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Research Experience

Feb 2016 - Present **Post Doctoral Research Assistant** University of Warwick
Advisor: Dr. Gareth Alexander. Project Title: Topology of Soft Materials. Techniques include:
— Applying low Reynolds' Number hydrodynamics (both analytically and numerically) to calculate flows around an active shell with topological defects.
— Simulating topological disclinations and vortex lines in liquid crystals and reaction diffusion systems in Matlab and C++.
— Studying the effect of long range chirality in active liquid crystals using analytics and Lattice Boltzmann simulations.
— Use of Mathematica, Paraview and Matlab for 3D visualisation.

Dec 2015 - Jan 2015 **Post Doctoral Research Assistant** University of Sheffield
Continuation of PhD Research with a focus on writing and submitting articles to high quality journals.

Oct 2012 - Oct 2015 **PhD Research in Biological Physics** University of Sheffield
Supervisor: Dr. Rhoda Hawkins. Theoretical physics project using a hydrodynamic active liquid crystal model to investigate physical mechanisms for spontaneous symmetry breaking and swimming/motility. Techniques used include:
— Analytical calculations on systems of partial differential equations in finite droplets.
— Manipulation and solution of analytical equations using Maple software.
— Finite difference simulations written in C++ and executed with shell scripting.
— Worked with Lattice-Boltzmann, Immersed Boundary method and spectral methods for fluid simulations.

2011 - 2012 **Masters Project in Quantum Mechanics** University of Sheffield
"Weak Measurement and the Path of a Quantum Particle".
— Analytical calculations of quantum measurements using the "Weak measurement formalism".

Summer 2011 **Summer Project in Condensed Matter Physics** University of Leicester
"Ab-initio Calculations of the Electronic Propeties of a single Carbon Nanotube".
— Worked with specialised software (ABINIT) for calculation of the band structure of a single-walled Carbon Nanotube from its atomic structure.

Academic Qualifications

2012 - 2015 **PhD in Biological Physics** University of Sheffield
— Thesis Title: Modelling Spontaneous Motion and Deformation of Active Droplets.
— Viva Date: November 2015

2008 - 2012 **MPhys Physics with Mathematics** University of Sheffield
— First class degree with honours.
— Awarded the Milner prize for Theoretical Physics.

2006 - 2008 **4 A-levels** Fenton Sixth Form College, Stoke-on-Trent
— A in Mathematics and in Physics, B in Business Studies, C in Geography.
— Awarded the College prize for Physics.

Publications

- **"Instabilities, motion and deformation of active fluid droplets"**
  C. A. Whitfield and R. J. Hawkins
  Under Review arXiv preprint: 1605.01864
- **"Immersed Boundary Simulations of Active Fluid Droplets"**
  C. A. Whitfield and R. J. Hawkins
  Under Review arXiv preprint: 1605.01621
- **"Spontaneous motility of passive emulsion droplets in polar active gels"**
  G. De Magistris, A. Tiribocchi, C. A. Whitfield, R. J. Hawkins, M. E. Cates and D. Marenduzzo
  Soft Matter **10**:7826-7837 (2014), DOI: 10.1039/c4sm00937a
- **"Active polar fluid flow in finite droplets"**
  C. A. Whitfield, D. Marenduzzo, R. Voituriez and R. J. Hawkins
  Eur. Phys. J. E **37**:8 (2014), DOI: 10.1140/epje/i2014-14008-3

Conference Presentations

March 2016	**Conference of the British & German Liquid Crystal Societies** Edinburgh, UK Poster Presentation "Instabilities and phase behaviour of active liquid crystal droplets"
March 2015	**APS March Meeting 2015** San Antonio, TX, USA Oral Presentation "*Instabilities and boundary effects in a droplet of active polar liquid crystal*"
April 2014	**The Physics of Soft and Biological Matter** - Cambridge, UK Poster presentation "*Active polar fluid flow in deformable droplets*"
Sept. 2013	**5$^{\mathrm{th}}$ European Cell Mechanics Meeting** - Obergurgl, Austria Oral Presentation "*Active polar fluid flow in finite droplets: modelling cell motility*"

Teaching Experience

Oct 2015	**Teaching Assistant at "Modelling Cellular Processes in Space and Time"**, (Summer School, Porquerolles, France) Assisted in teaching at workshops focussing on continuum modelling of the cell cytoskeleton. In particular, my teaching focussed on numerical methods.
2012 - 2015	**Graduate Teaching Assistant at University of Sheffield** Undergraduate problems classes in, Biological Physics (Year 4), Problem Solving in Physics (Year 3), Numerical Methods in C and C++ (Year 2),and Mathematics for Physicists (Year 1).

Other

University of Sheffield Tenpin Bowling Club Club Secretary (2015), Tournament Secretary (2013), Club Captain (2012) and Vice Captain (2011).
Carbon Neutral University Network - Sheffield Publicity and social media officer (present).
Attended Sheffield University Graduate School 2015 3 day grad-school programme focussing on personal and professional development.

REFEREES

Dr. Rhoda Hawkins
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