Sam Cusworth

Professional Profile

I am in the final year of my PhD in theoretical astrophysics, studying the formation and growth of clusters of galaxies using simulations. During my MPhys degree and PhD I have demonstrated an aptitude for problem solving using analytic and numerical techniques. In addition I have proven myself able to communicate infomation in writen form and in oral presentations. I am looking to use the skills and techniques I've developed as a researcher in a new field of interest.

Education

2012–Present **PhD Astronomy and Astrophysics**, *Jodrell Bank Centre for Astrophysics*, Manchester, *Expected Completion: October 2015.*

2008–2012 **MPhys (Hons) Physics with Astrophysics**, *University of Manchester*, Manchester, *1st Class Honours, Ranked second in year group.*

2006–2008 **Secondary Education**, *North Berwick High School*, North Berwick, *SQA Highers (6As) & SQA Advanced Highers (3As).*

Software

During my PhD, I wrote software for large ($\sim 1000^3$ element) numerical simulations. In particular I modified an existing massively parallel N-body simulation code to solve the equations of motion of alternative models of gravity. This involved writing a new multigrid based solver. Also I wrote software to analyse and visualise the results of simulations.

Languages	Experienced in C and Python. Proficient in C++, FORTRAN and IDL
Libraries	Experienced using Message Passing Interface (MPI) libraries. Familiarity with CUDA and OpenMP libraries
Packages	Mathematica
Computer Admin	Experienced in UNIX, LaTeX& Emacs

Skills

Problem Solving While completing my MPhys degree and PhD I identified and solved a mixture of analytic and numerical problems. On the analytic side I carried out tensor calculations in order to predict observables. For more indepth calculations I developed software for numerical simulations on parallel architectures. As part of the software development process I have run these codes on the DiRAC national computing facility. Analysis of the simulation outputs has involved the use of advanced model fitting procedures including Markov Chain Monte Carlo (MCMC) techniques.

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Teamworking While the writing of a PhD thesis is largely a solitary process, the development of the work within my thesis has been rather collaborative in nature. Working in collaborations from my deptpartment in Manchester, the UK and across the world I took part in a major code comparison project. I also worked on other projects with my direct supervisors during my PhD, one of which lead to a journal article publication and conference talk. In the development of my codebase I was fortunate enough to collaborate with postdoctorial staff and other students in my department.

Communication A crucial component of my research has been the communication of important results and conclusions. In this respect I have given talks to professional and public audiences. As part of my doctorial studies I wrote reports for supervisors and collaborators as well as journal articles aimed at the wider research community. In addition I have given talks to scientific and general audiences, including astronomy societies, on a variety of topics. My role as a teaching assistant has given me the chance to tutor first year undergraduates through courses on mathematics, astronomy and thermodynamics.

Organisational In collaboration with another postgraduate student I founded and run a series of informal lectures on various computing topics. In addition I represented postgraduates in my institute by acting as an academic liaison between staff and students. While carrying out my MPhys degree and PhD I also held my role as Cub Scout Leader. This role involves leading the group, shaping the programme and managing my assistant leaders.

Work Experience

2012–2015 **Teaching Assistant**, *School of Physics and Astronomy*, University of Manchester.

2009–2015 **Cub Scout Leader**, *23rd Manchester Scout Group*, Scout Association, *(Voluntary)*.

2012–2014 **Postgraduate Rep**, *Jodrell Bank Centre for Astrophysics*, University of Manchester, *(Voluntary)*.

2010 **Student Associate**, *Cardinal Langley RC High School*, Middleton.

2009–2010 **General Assistant**, *Leuchie House Respite Centre*, MS Society Scotland, *(Voluntary for first Summer)*.

2008 **Customer Assistant**, *Lothian, Angus and Borders Cooperative*, North Berwick.

Honours and Awards

2012–2015 **President's Doctoral Scholar Award**, *University of Manchester*, Elite scholarship for outstanding PhD students.

2012 **Samuel Bright Research Scholarship in Physical Science**, *University of Manchester*, Awarded for academic excellence in physics & astronomy by the University of Manchester.

2011 **RAS Undergraduate Research Bursary**, *Royal Astronomical Society*, Support to carry out a summer research project at the Jodrell Bank Centre for Astrophysics.

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