James Wurster, Ph.D.

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Highlights of Qualifications

I have a Ph.D. in computational astrophysics and many years of experience performing independent research to solve complex problems, software development, data analysis, and scientific communication. My specialisation is in modelling systems of compressible gas in magnetic fields, however my expertise and skills are easily transferable to modelling and analysing any system. I am highly motivated and have excellent time-management skills to meet internal and external deadlines. I am quick and eager to learn new skills, and I am seeking new opportunities and new challenges to which I can apply my highly adaptable skills.

Software Development

Team lead / Software developer for the *Phantom* Astrophysical Code (phantomsph.bitbucket.io)

- Team lead (1 of 3) of an international software collaboration of approximately 30 developers in 10 countries
- Development occurred in both an agile/scrum-like environment and independently
- Developed three main classifications of algorithms: physical (for improved realism), numerical (for improved stability), optimisation (for improved performance and user-friendliness)
- Developed and used unit and integration tests for debugging and optimisation
- Used in over 40 peer-reviewed studies worldwide since 2017

Lead software developer for the *Nicil* magnetohydrodynamics library (bitbucket.org/jameswurster/nicil)

- Designed and developed this open-source code
- Currently implemented in two astrophysical codes; generically designed for implementation in any code
- Cited by a dozen studies worldwide since 2016

Research and Data Analysis

Research Fellow (University of Exeter, 2016-present & Monash University, 2013-2016)

- Developed and lead world-leading astrophysical research projects to investigate the formation and early evolution of a star in the presence of non-ideal magnetic fields using radiation magnetohydrodynamics
- Investigated new codes and methods to enhance the outcome of the project, and promptly became proficient in them as required
- Performed software development to implement new physical processes into existing numerical codes
- Ran simulations on local and national supercomputers; this often included many simulations per project to investigate a given parameter space
- Developed analysis codes to efficiently analyse terabytes of highly variable data
- Analysed and interpreted big data to extract ground-breaking results and search for trends within the parameter space; my research included solving a decade-old problem regarding the formation of discs around young stars
- Collaborated on international research projects as a primary investigator and as a contributing scientist

Programming Skills

- **Languages**: Fortran, Python, Linux, Bash, MATLAB, Maple, Microsoft Office, LaTeX, IDL, html
- **Distributed computing**: shared- and distributed-memory parallel computing (OpenMP, MPI)
- **Version control**: git, svn
- **Automated testing**: unit testing, integration testing
- **Numerical methods**: compressible Smoothed Particle Magnetohydrodynamics, finite volume
- **Numerical algorithms**: single- and multi-fluid (hybrid) models, boundary conditions, sub-grid physics

Communication

Research publications and presentations

- Published 21 peer-reviewed scientific articles (including one invited review article) in high-impact journals; collectively cited over 425 times by other scientists
- Presented two invited talks at international workshops in Australia and the UK, including a 90 minute review talk on smoothed particle magnetohydrodynamics
- Presented 14 contributed talks (15-25 minutes) at international conferences in Australia, Greece, Italy, Japan, Spain, Taiwan, and the UK
- Presented 11 posters at international conferences in Canada, Chile, Cyprus, Germany, Greece, Italy, the UK, and the USA
- Presented 20 seminars (45 minutes) to physics departments in Australia, Canada, Sweden, Taiwan, and the UK

Public Outreach

- Presented one public talk in Canada
- Created public videos highlighting important scientific findings (youtube.com/user/WursterAstro)

Technical assistance

- Assisted colleagues and student in understanding, modifying, developing, and debugging numerical algorithms

Leadership

Supervision of students

- Supervised an Honours student (Monash University, 2015)
- Supervised two summer students (Monash University, 2015)

MoCA Public Talk Series (Monash, 2015-2016) & MoCA Seminar Series (Monash, 2014)

- Invited speakers, organised travel and accommodation, booked lecture rooms, and advertised the event

Conference organisation

- 14th International SPHERIC Workshop (University of Exeter, June 2019):
  member of the local organising committee
- 1st Phantom Users Workshop (Monash University, February 2018):
  member of the scientific organising committee

Invited to peer-review manuscripts

- Reviewed 11 papers submitted for publication in high-impact astrophysical journals; invited for my world-leading expertise on the manuscript's topic
- Presented ideas for improvements to the submitted manuscripts
- Manuscripts were accepted or rejected based upon my recommendation

Employment

- **Research Fellow**: University of Exeter, Exeter, UK (2016-present)
- **Lecturer of 3rd year Stars & Galaxies**: Monash University, Melbourne, Australia (2015)
- **Research Fellow**: Monash University, Melbourne, Australia (fixed-term contract: 2013-2016)
- **Laboratory Instructor for Introduction to Physics**: Saint Mary's University, Halifax, Canada (2012-2013)

Education

- **Ph.D. Astronomy (Computational astrophysics)**: Saint Mary's University, Halifax, Canada (2008-2013)
- **M.Sc. Astronomy (General Relativity)**: Queen's University, Kingston, Canada (2006-2008)
- **B.Sc. (Honours) Mathematics & Physics**: University of Western Ontario, London, Canada (2002-2006)

References

Available upon request