Paul Bartholomew

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I am a Post-Doctoral Research Associate (PDRA) at Imperial College London with six years' experience working with, and developing, Computational Fluid Dynamics software for research. In the course of this research I have developed extensive skills working with research software and programming in widely used scientific languages including `C`, `Fortran` and `Python` and a passion for developing scientific software.

Education

2013 – 2017 **PhD in Computational Fluid Dynamics**, *Department of Mechanical Engineering, Imperial College London*.
- Contributed to the development of a general-purpose CFD research code, implementing a fully-coupled solver for the two-fluid model.
  - Learned to write `C` and write software intended for parallel computing
- Published in international peer-reviewed journal
- Presented work at national and international conferences
- Contributed to teaching of MSc students as a Graduate Teaching Assistant for the CFD course

2009 – 2013 **MEng. (First class) in Mechanical Engineering**, *Imperial College London*.
- Achieved the 3rd year Dean's list

2007 – 2008 **Advanced Highers**, *AAA in Chemistry, Maths and Physics*.
- Senior Proxime Accessit, Bearsden Academy

2006 – 2007 **Highers**, *AAAA in Chemistry, Maths, Physics and Technical Studies; B in English*.

2004 – 2006 **Standard Grades**, *Grade 1 in Art, Chemistry, French, Geography, Maths, Physics and Technical Studies; grade 2 in English*.

Professional/research experience

2018 – 2019 **eCSE 13-03 *A high-order accurate solver for free-surface flows***, Imperial College London.
- Awarded additional funding to continue work of eCSE 10-02 to develop a free-surface solver
- Key contributor to project to modernise `Incompact3d` codebase
- Presented work at national and international conferences

2017 – 2018 **eCSE 10-02 *An adjoint solver for variable-density flows in the low Mach number limit***, Imperial College London.
- Implemented a low Mach number solver in open-source CFD code `Incompact3d`
  - Learned to write `Fortran`
  - Gained experience working with Tier-1/0 super computers
- Presented work at national conferences
- Published in international peer-reviewed journal

2012 **Undergraduate Research Opportunities Programme**, Imperial College London.
- Won funding to join a research group in the Thermofluids division of the Mechanical Engineering department at Imperial College for the summer between the third and final year of my undergraduate MEng. degree.
- Gained experience working with Paraview
- Developed simple CFD code in Python

2008 – 2009 **Year In Industry**, *BAE Systems*, Glasgow.
- Worked in the operations department at the Scotstoun shipyard
- Implemented a requisition tracking system to facilitate transfer of materials between projects
- Assisted in project management of the charity project to refit the Seagull barge

Publications

P. Bartholomew, S. Laizet, *A New Highly Scalable, High-Order Accurate Framework for Variable-Density Flows: Application to Non-Boussinesq Gravity Currents in Computer Physics Communications* , 2019.

P. Bartholomew, F. Denner, M. H. Abdol-Azis, A. Marquis, B. van Wachem, *Unified Formulation of the Momentum-Weighted Interpolation for Collocated Variable Arrangements in Journal of Computational Physics* , 2018.

Skills and interests

Technical knowledge.
I have a very strong background in numerical software, particularly CFD, having worked with and extended two research codes each using different numerical methods. This experience allows me to not only contribute to the development of new software, but also to effectively troubleshoot problems. It has also guided me to identify areas where improvements can be made, for example when I decided to collaborate with another PDRA to produce a post-processing library from scripts we had developed independently: encouraging code-reuse and is already contributing to the work of others in the research group.

Computer programming and skills.
I have successfully developed software in several of the major languages used in computational science including `C`, `Fortran` and `Python` and have experience using `MATLAB/Octave`. Much of my experience programming has been for distributed systems and I have a good knowledge of `MPI` and the `PETSc` library. I am familiar with Linux, having used it extensively throughout my research career including assisting with the administration of the group's workstations during my PhD and having used multiple HPC systems.

Communication skills.
As a PDRA and PhD student I have developed strong presentation skills, presenting my work to both specialist and non-specialist audiences at several conferences including RSE London South East and EuroHPC 2019. In addition, working as a Graduate Teaching Assistant during my PhD required being able to explain concepts clearly to students during tutorial sessions. I have been able to combine these skills with my knowledge of software development practices to produce a short introduction to git to present to PhD students in the group.

In addition to my thesis, I have published my work in peer-reviewed journals, developing precise and clear writing skills in the process. I have also been able to employ these skills in software development and day-to-day research, having read about literate programming I think it has great potential for scientific software and have used it to produce reports with integrated post-processing code that my supervisor was very pleased with and am exploring its use to develop a new module for our codebase. Furthermore, I will be presenting results from this effort to the wider research software engineering community at the RSE2019 conference in Birmingham.

Teamwork and collaboration.
During both my PhD and PDRA positions I have worked as part of a research group using a common software for research, working effectively as part of a team has thus been vital. With multiple people collaborating on a single codebase I have also become proficient in both svn and git, finding these skills valuable also when working independently.

Personal interests.
I play squash and badminton and cycle both to commute and recreationally. I also enjoy playing guitar and have played in several bands.

Referees

Dr. Sylvain Laizet, *Senior Lecturer*,
Dept. Aeronautical Engineering,
339, City and Guilds Building, South Kensington Campus, Imperial College London,
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