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 INFORMATION [www.malcolmiwroberts.com](http://www.malcolmiwroberts.com)

RESEARCH INTERESTS Mathematical modelling, numerical analysis, and high-performance computing.

EDUCATION PhD in Applied Mathematics, **University of Alberta**, 2011  
 • Adviser: John C. Bowman  
 MSc in Applied Mathematics, **University of Alberta**, 2006  
 • Adviser: John C. Bowman  
 BSc, Honors Applied Mathematics, **University of Alberta**, 2001

WORK HISTORY Postdoctoral Researcher, **IRMA** (Institut de Recherche Mathématique Avancée), Université de Strasbourg, France, since 2014.

- Member of the **TONUS** project for numerical simulation in Tokamaks.
- Developed a **OpenCL**/GPU-based Discontinuous Galerkin solver for numerical solution of the Vlasov equation.

Postdoctoral Researcher, **M2P2**, Aix-Marseille University, France, 2012 to 2014.

- Designed software for simulating magneto-hydrodynamic turbulence in a grid computing environment using spectral methods and penalisation.
- Aided in the supervision of PhD students.

Sessional Lecturer, **University of Alberta**, Canada, 2010.

- Lectured engineering differential equations.
- Design and deliver lectures and exams in a team-teaching environment.

Graduate Student, **University of Alberta**, Canada, 2003 to 2011.

- Develop a coherent research program in applied mathematics.
- Write papers and present results at international conferences.
- Teach undergraduate math labs and help sessions.

English Teacher, Private Academy, South Korea, 2003 to 2004.

- Teach English as a second language in an after-school program.

Summer Undergraduate Researcher, **University of Alberta**, Canada, 1998 to 2000.

PUBLICATIONS  
IN PROGRESS

*Detection of Periods and Stationarity in Agent-Based Models*  
With Frederik Schaff and Anna Klabunde

*Structures in spinup of helically forced MHD Turbulence*  
With Matthieu Leroy and Kai Schneider

*Implicitly Padded Convolutions and Correlations on Real Data*

*Parallel Implementation of Implicitly Padded Convolutions*  
With John C. Bowman.

*Renormalisation Limits of Shell Models of Turbulence*  
With John C. Bowman and Bruno Eckhardt.

SUBMITTED

*Asynchronous OpenCL/MPI numerical simulations of conservation laws*, with Philippe Helluy, Thomas Strub, Michel Massaro. Submitted to Lecture Notes in Computational Science and Engineering (2015).

*Lagrangian/Eulerian Solvers and Simulations for Vlasov*, with Sebastien Guisset, Philippe Helluy, Michel Massaro, Laurent Navoret, and Nhung Pham. Submitted to ESAIM Proceedings and Surveys (2015).

PEER-  
REVIEWED  
ARTICLES

*Adaptive Matrix Transpose Algorithms for Distributed Multicore Processors*, with John C. Bowman. Interdisciplinary Topics in Applied Mathematics, Modeling and Computational Science, Springer Proceedings in Mathematics & Statistics 117, 97-103 (2015).

*Self-organisation of helically forced MHD flows in confined cylindrical geometries*, with M. Leroy, J. Morales, W. Bos, and K. Schneider. Fluid Dynamics Research, (2014).

*Multithreaded Implicitly Dealiased Pseudospectral Convolutions*, with John C. Bowman. Proceedings of the 20th Annual Conference of the CFD Society of Canada (2012)

*Pseudospectral Reduction of Incompressible Two-Dimensional Turbulence*, with John C. Bowman. Communications in Nonlinear Science and Numerical Simulation **17:5**, 2008-2013 (2012)

*Dealiased Convolutions for Pseudospectral Simulations*, with John C. Bowman. Proceedings of the 13th European Turbulence Conference (2011)

*Efficient Dealiased Convolutions without Padding*, with John C. Bowman. SIAM Journal on Scientific Computing, **33:1**, 386-406 (2011)

*Links between dissipation, intermittency, and helicity in the GOY model revisited*, with John C. Bowman, Charles R. Doering, Bruno Eckhardt, Jahanshah Davoudi, and Jörg Schumacher. Physica D **218**, 1-10 (2006)

- DISSERTATIONS *Multispectral Reduction of Two-Dimensional Turbulence*, PhD Thesis, University of Alberta (2011)
- A Multi-Spectral Decimation Scheme for Turbulence Simulations*, M. Roberts, Masters Thesis, University of Alberta (2006)
- CONFERENCE PROCEEDINGS *Dealiased convolutions for pseudospectral simulations*, with John C. Bowman, Proceedings of the 13th EUROMECH European Turbulence Conference, Journal of Physics: Conference Series **318** 072037 (2011)
- Report on the Math-Stat Graduate Education Round table* (2010)
- The Multispectral Method: Progress and Prospects*, with John C. Bowman, and Bruno Eckhardt, Advances in Turbulence XII, Proceedings of the 12th EUROMECH European Turbulence Conference 2009, Marburg, Springer Proceedings in Physics (2009)
- General Statistical Design of an Experimental Problem for Harmonics*, with Bill Mawby, Sean Bohum, Peter Gibson, Michael Lamoureux, et al. Proceedings of the Eighth PIMS-MITACS Industrial Problem Solving Workshop (2004)
- Modelling the temperature distribution in concrete structures*, with Tim Myers et al. Proceedings of the 7th PIMS-MITACS Graduate Math Modelling Camp, (2004)
- OTHER PUBLICATIONS *Notes for Differential Equations*, with S. Marion (2015)
- FFTW++: *Fast Fourier Transform C++ Header Class for FFTW3*, with John C. Bowman. [fftwpp.sourceforge.net](http://fftwpp.sourceforge.net), (2010)
- schnaps: *An OpenCL discontinuous Galerkin solver*, with P Helluy et al. [schnaps.gforge.inria.fr](http://schnaps.gforge.inria.fr), (2015)
- SELECTED PRESENTATIONS *Self-organisation of helically forced MHD flow in confined cylindrical geometries*, Instabilities and Transport in Magnetized Plasmas, Geophysical and Astrophysical Flows, Institute for Advanced Study of Aix-Marseille University, 2014
- Helices in MHD Flow: Numerical Results from Penalized Pseudospectral Simulations*, Seminaire Equations aux derivees partielles, Strasbourg University, France, 2014
- Pseudospectral Simulations in Complex Geometry via Penalisation*, Journee Calcul scientifique performant en mecanique de la Federation Nicolas-Claude Fabri de Peiresc, Aix-Marseille University, France, 2013

*Implicitly Dealiased Convolutions for DNS: Preliminary MPI results*, Euromech 542, Lyon, 2013

*Convolutions for HPC*, CEMRACS 12, Marseille, 2012

*Multithreaded Implicitly Dealiased Pseudospectral Convolutions*, CFD Canada, 2012

*Mathtastic!*, Skeptically Speaking, 2012

*On the Calculation of Higher-Order Convolutions*, CMS Winter Meeting, Toronto, 2011

*The Pseudospectral Method: Recent Advances and Prospects*, The Nature of Turbulence Workshop, UCSB, 2011

*Dealiasing Convolutions for Pseudo-Spectral Simulations*, Ruhr Universität Bochum, Germany, 2011

*The Multispectral Method*, CAIMS Annual Meeting, 2010

*Teaching Collaboration on Hot Topics and Outcomes for Graduate Students*, PIMS Math and Stat Graduate Education Round Table, BIRS, 2010.

*The Multispectral Turbulence Decimation Method*, Politecnico di Torino, Italy, 2009

*Turbulence: Analytic Results from Shell Models*, Complex Systems Research Seminar, Germany, 2008

*The Multi-Spectral Method*, 6<sup>th</sup> International Congress on Industrial and Applied Mathematics, Switzerland, 2007

*Spectral Reduction of the GOY model*, 5<sup>th</sup> International Conference on Scientific Computing and Applications, 2006

*General Statistical Design of an Experimental Problem for Harmonics*, Eighth PIMS-MITACS Industrial Problem Solving Workshop, 2004

#### TEACHING EXPERIENCE

Lecturer, University of Alberta, 2010

- Lectured differential equations for engineers.
- Administered homework and exams.
- High student evaluations and outcomes.

Teaching Assistant, University of Alberta, 2004 to 2010

- Ran undergraduate help sessions covering a wide range of topics.
- Graded homework and exams.
- Lab instructor
  - Designed and delivered lectures and quizzes.

- Excellent evaluation from students.
- Instructor for 38 labs constituting more than 1000 students.

Private Tutor in Mathematics, 2004-2010 English as a Second Language  
Instructor, South Korea, 2003 to 2004

VOLUNTEERING Thousand Faces Performance Art Festival  
& COMMITTEES • President of the Board 2011 to 2013

PIMS Mathematical and Statistical Graduate Education Round table

- Brought together faculty, students, and administration from seven universities, resulting in new policies and programs being implemented.

Canadian Young Researchers Conference in Mathematics and Statistics

- Organizing Committee (2006, 2008, 2010)

Volunteer Mechanic/Instructor, Edmonton Bicycle Commuter's Association, 2009 to 2013, Collectif Vélos en Ville, 2012 to 2013

University of Alberta Mathematics and Statistics Grad Association

- President 2005 to 2006, Treasurer 2006 to 2007

University of Alberta Math Fair and Math Outreach, 2004 to 2011

TECHNICAL  
SKILLS

Project management and public speaking.  
Computer skills:

- Programming languages: C/C++, OpenCL, Python, R, and FORTRAN.
- Parallelism: OpenMP, MPI, and OpenCL (for GPUs).
- Linux, Windows, and Mac operating systems.
- Asymptote, L<sup>A</sup>T<sub>E</sub>X, ParaView, HDF5, gmsh.
- Version control: git, Mercurial, svn.

LANGUAGES

Native English speaker, advanced French, intermediate German.

CITIZENSHIP

Canadian