

Bogdan Toader

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RESEARCH INTERESTS

My interests mostly relate to the numerical solution of differential equations. My current research focuses on preconditioning for iterative linear solvers, and more specifically the methods used in reservoir simulation. My broader interests include high performance and parallel computing, continuous optimization, and mathematical modelling.

EDUCATION

- 2015–present **DPhil Candidate in Mathematics**, *University of Oxford*, Oxford, UK.
Industrially Focused Mathematical Modelling (EPSRC Centre for Doctoral Training) in collaboration with the Schlumberger Abingdon Technology Centre (AbTC).
Expected end date: September 2019.
Thesis Preconditioning for Reservoir Simulation
Supervisor Prof. Andy Wathen
- 2013–2015 **Masters of Science in Mathematics**, *University of Ottawa*, Ottawa, Canada.
Thesis Time-Stepping Methods in Cardiac Electrophysiology
Supervisor Prof. Yves Bourgault
- 2010–2013 **Honours Bsc with Specialization in Mathematics**, *University of Ottawa*, Ottawa, Canada, *GPA – 9.3*.
- 2012 **Student Exchange**, *Korea University*, Seoul, South Korea, *GPA – 9.3*.
One semester international student exchange.
- 2008–2010 **Diplôme d'Études Collégiales (DEC) in Natural Sciences**, *Cégep de l'Outaouais*, Gatineau, Canada.

RESEARCH EXPERIENCE

- 2016 **Research Mini-Project**, *Culham Centre for Fusion Energy*, Abingdon, UK.
Completed a 10-week project as part of DPhil program.
Project Choosing a fast initial propagator for rapid convergence of the parareal algorithm in the context of simple model problems
Supervisors Prof. Andy Wathen, Debasmita Samaddar
- 2016 **Research Mini-Project**, *Schlumberger Abingdon Technology Centre (AbTC)*, Abingdon, UK.
Completed a 10-week project as part of DPhil program.
Project Algebraic Decoupling of Pressure Equation in Reservoir Simulation
Supervisors Prof. Andy Wathen, Tom Jönsthövel, Christopher Lemon
- 2014 **Research Internship**, *French Institute for Research in Computer Science and Automation (INRIA)*, Bordeaux, France.
Completed a two-month research internship as part of my masters' research.
Supervisor Prof. Yves Coudière
- 2012 **Summer Research Project**, *University of Ottawa*, Ottawa, Canada.
Funded by the Natural Sciences and Engineering Research Council of Canada.

Project The Stable Limit Theorem and its Applications
Supervisor Prof. Raluca Balan

TEACHING EXPERIENCE

- 2017–2018 **Class Tutor**, *University of Oxford*, Oxford, UK.
Prepared and taught practical classes. In charge of teaching assistant.
Winter 2018 Finite Element Method for PDEs
Fall 2017 Numerical Linear Algebra
- 2016–2017 **Teaching Assistant**, *University of Oxford*, Oxford, UK.
Marked problem sheets and presented problems during classes.
Winter 2017 Finite Element Method for PDEs
Fall 2016 Numerical Solution of Differential Equations I
- 2011–2015 **Teaching Assistant**, *University of Ottawa*, Ottawa, Canada.
Prepared and delivered course material for classes, marked assignments and exams, was consultant at the Math Help Centre.
2013–2015 Math Help Centre (tutoring)
Winter 2014 Calculus II (teaching)
Fall 2013 Introduction to Calculus and Vectors (teaching)
 Calculus for Life Sciences I (teaching)
Winter 2013 Calculus for Life Sciences II (teaching and marking)
Winter 2012 Calculus I (marking)
 Mathematical methods II (marking)
 Calculus II (marking)
 Calculus for Life Sciences II (marking)
Fall 2011 Calculus for Life Sciences I (teaching)

AWARDS

- 2015 Doctoral Research Scholarship - Fonds de recherche du Québec Nature et technologies (FRQNT) (declined)
- 2013–2015 Masters Admission Scholarship - University of Ottawa
- 2012–2013 Linis Mathematics Scholarship (twice awarded) - University of Ottawa, Department of Mathematics and Statistics
- 2010–2013 Canada's French University Scholarship - University of Ottawa
- 2012 Student Mobility Scholarship - University of Ottawa, International Office
- 2012 Undergraduate Student Research Award (USRA) - Natural Sciences and Engineering Research Council of Canada (NSERC)

SELECTED PRESENTATIONS

- 2018 *Preconditioners for Non-Isothermal Flow Through Porous Media*, 15th Copper Mountain Conference On Iterative Methods, Copper Mountain, USA, Colorado
- 2017 *Preconditioning for Reservoir Simulation*, 27th Biennial Numerical Analysis Conference, University of Strathclyde, Glasgow, UK
- 2017 *Numerical Methods and Preconditioning for Reservoir Simulation*, Junior Applied Mathematics Seminar, Mathematical Institute, University of Oxford, Oxford, UK

- 2015 *Time-Stepping Methods in Cardiac Electrophysiology*, Applied Mathematics, Modeling and Computational Science (AMMCS) and Canadian Applied and Industrial Mathematics Society (CAIMS) Conference, Wilfrid Laurier University, Waterloo, Canada
- 2013 *The Stable Limit Theorem and its Applications*, Probability and Statistics Seminar, Department of Mathematics and Statistics, University of Ottawa, Ottawa, Canada

MINISYMPOSIUM ORGANIZATION

- 2019 *Solvers for Petroleum Reservoir Simulation*, SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS19), Houston, Texas, USA

COMPUTER SKILLS

- Basic C, C++, FORTRAN, PETSc
- Intermediate FIREDRAKE, MPI
- Advanced L^AT_EX, MATLAB, PYTHON

PUBLICATIONS

Articles submitted to peer-reviewed journals

T. Roy, Y. Bourgault and C. Pierre. Analysis of time-stepping methods for the monodomain model. Submitted to *Computational and Applied Mathematics*, November, 2017.

Technical Reports

T. Roy. Algebraic Decoupling of Pressure Equation in Reservoir Simulation. Technical report in collaboration with the Schlumberger Abingdon Technology Centre, 25 pages, 2016.

T. Roy. Choosing a fast initial propagator for rapid convergence of the parareal algorithm in the context of simple model problems. Technical report in collaboration with the Culham Centre for Fusion Energy, 26 pages, 2016.

European Study Group for the Industry (ESGI) reports

H. Hanche-Olsen, T. Petzold, I. Roper, T. Roy, C. Veje. Non-isothermal induction tempering problem. Study group report as part of ESGI137 with EFD Induction, 10 pages, 2018.

S. Baker, H.A. Batarfi, L. Church, M. Dolniak, M.J. Groves, P.J. Hjorth, A. Nixon, K. Piwarska, B. Pooley, I. Roper, T. Roy, M. Zyskin. How Do We Mitigate Against a Marauding Terrorist? Study group report as part of ESGI30 with the Home Office Centre for Applied Science and Technology, 2017.

N. Bootland, F. Brosa Planella, J. Christmas, D. Lunz, J. Dewynne, N. Fadai, A. Gower, P. Hicks, V. Kovalchuk, A. Lacey, M.-L. Lackner, S. Lee, J. Ockendon, V. Pereira, B. Piette, R. Purvis, T. Roy, T. Spelman, R. Timms. Automatic Optimised Design of Umbilicals. Study group report as part of ESGI116 with Technip Umbilicals Ltd, 60 pages, 2016.