# Ronald D. Haynes (PhD)


CONTACT INFORMATION

Department of Mathematics & Statistics
Memorial University of Newfoundland
St. John's, NL, Canada, A1C 5S7

*Work:* (709) 864–8825
*Fax:* (709) 864–3010
*Email:* rhaynes@mun.ca
*Homepage:* www.math.mun.ca/~rhaynes


CURRENT AFFILIATIONS

**Memorial University**, St. John's, Newfoundland and Labrador
*Associate Professor* **As of September 2009**

**Acadia University**, Wolfville, Nova Scotia
*Adjunct Professor* **October 2009 – present**
Department of Mathematics and Statistics

**Saint Mary's University**, Halifax, Nova Scotia
*Adjunct Professor* **August 2008 – present**
Department of Mathematics and Computing Science

**Dalhousie University**, Halifax, Nova Scotia
*Adjunct Professor* **June 2006 – present**
Department of Mathematics and Statistics

PREVIOUS AFFILIATION

**Acadia University**, Wolfville, Nova Scotia
*Associate Professor* **July 2008**
*Tenured* **July 2009**

*Assistant Professor* **July 2004 – June 2008**
Department of Mathematics and Statistics

EDUCATION

**Simon Fraser University**, Burnaby, B.C. Canada

Ph.D., Applied and Computational Mathematics, March 2003
- Supervisors: Dr. Manfred Trummer and Dr. Robert Russell

M.Sc., Applied and Computational Mathematics, 1998
- Supervisor: Dr. Manfred Trummer

**Memorial University of Newfoundland**, St. John's, Newfoundland, Canada

B.Sc. (Hons), Applied Mathematics, May, 1996
- Supervisors: Dr. Herman Brunner and Dr. Richard Charron

OTHER ACADEMIC EXPERIENCE

**University of Waterloo**, Waterloo, Ontario
*NSERC Postdoctoral Research Fellow* **September 2003–June 2004**
School of Computer Science and Department of Applied Mathematics, Dr. Bruce Simpson (Computer Science) and Dr. Kevin Lamb (Applied Math) supervisors.

**Simon Fraser University**, Burnaby, B.C.
*Research Associate* **May–August 2003**
Continued development of a Schwarz Waveform Moving Mesh Solver with Professor Robert Rus-

sell.

*Teaching Assistant* **September 1996 - December 2002**
Duties included presentation of tutorials, assignments and exam grading for undergraduate courses including Linear Algebra, Numerical Analysis and Discrete Mathematics.

OTHER WORK EXPERIENCE

- **Research Assistant, MITACS–PIMS MMSC Group & Ballard Power Systems**, Burnaby, B.C.
- **Coordinator of Parallel Computing Study Group**, Department of Mathematics and Statistics, SFU, Burnaby, B.C.

HONORS AND AWARDS

Faculty of Science, Teaching Remission Award, 2014-2015

Natural Science and Engineering Research Council Post Doctoral Fellowship, 2003

Special Graduate Entrance Scholarship (Ph.D.) 1998

Natural Science and Engineering Research Council Post Graduate Scholarship (Ph.D. Level) 1998

Best Student Exhibit Award, British Columbia Advanced Systems Institute Exchange, 1998

Special Graduate Entrance Scholarship (M.Sc.) Simon Fraser University 1996

Natural Science and Engineering Research Council Post Graduate Scholarship (M.Sc.Level) 1996

University Mathematics Medal, convocation award (B.Sc.), Memorial University of Newfoundland, 1996

Governor General of Canada Silver Medal (B.Sc.), Memorial University of Newfoundland, 1996

# Research

RESEARCH INTERESTS

Broadly my interests involve aspects of scientific computing and numerical analysis with particular interest in the numerical solution of ordinary and partial differential equations. Specifically I work with adaptive numerical methods known as moving mesh methods for PDEs. Related interests include numerical linear algebra, domain decomposition methods including Schwarz waveform relaxation, large scale optimization, and multirate methods for ODEs.

PUBLICATIONS IN REFEREED JOURNALS

**26 accepted**
**2 submitted**

[H1] Cao W., Haynes, R.D., and Trummer, M.R. Preconditioning for a Class of Spectral Differentiation Matrices. J. Sci. Comput. Vol. 24, No.3, pp. 343–371, September 2005.

[H2] Haynes, R.D., Kennedy, S.C. and Trummer, M.R., Persistently Positive Inverses of Perturbed M–Matrices, Linear Algebra and Applications, Volume 422, Issue 2-3, Pages 742-754, 2007.

[H3] Turner, C., Haynes, R.D. A Numerical and Theoretical Study of Blow-up for a System of Ordinary Differential Equations using the Sundman Transformation. Atlantic Electronic Journal of Mathematics, Vol. 2, No. 1, Summer Issue, 2007.

[H4] Haynes, R.D., and Russell, R.D. A Schwarz Waveform Moving Mesh Method. SIAM J. Sci. Comput., Vol. 29, No. 2, pp. 656–673, 2007.

[H5] Haynes, R.D., Huang, W., and Russell, R.D. A Moving Mesh Method for Time–dependent Problems based on Schwarz Waveform Relaxation, Proceedings of the 17th International Domain

Decomposition Methods Meeting, Lecture Notes in Computational Science and Engineering (LNCSE), Springer–Verlag, Vol. 60, pages 229–236, 2008.

[H6] Dulong, B., Haynes, R.D., Robertson, M. A study in the computation time required for the inclusion of strain field effects in Bloch-wave simulations of TEM diffraction contrast images, Ultramicroscopy, Vol. 108, Iss. 5, pp. 415–425, 2008.

[H7] Karsten, R., McMillan, J., Lickley, M., Haynes, R.D. Assessment of Tidal Current Energy for Minas Passage, Bay of Fundy, Proc. IMechE Part A: J. Power and Energy, Vol. 222, pp. 493–507, 2008.

[H8] McMillan, J., Lickley, M., Karsten, R., Haynes, R.D. Potential of Tidal Power and its Effects on the Bay of Fundy. SIAM Undergraduate Research Online, Vol. 1, Iss. 1, 2008.

[H9] Kennedy, S. and Haynes, R.D. Inverse Positivity of Perturbed Tridiagonal M-Matrices, Linear Algebra and its Applications, Vol. 430, Issues 8–9, pp. 2312–2323, 2009.

[H10] Haynes, R.D., Recent Advances in Schwarz Waveform Moving Mesh Methods, Lecture Notes in Computational Science and Engineering (LNCSE), Volume 78, Springer–Verlag, pp. 253–260, 2010.

[H11] Ranjan, P., Haynes, R.D. and Karsten, R., A Computationally Stable Approach to Gaussian Process Interpolation of Deterministic Computer Simulation Data, Technometrics, Volume 53, No. 4, pages 366—378.

[H12] Haynes, R.D., Huang, J., and Haung, T-Z., Monotonicity of Perturbed Tridiagonal M-matrices, SIAM Journal of Matrix Analysis and Applications, Vol. 33, Issue 2, pp. 681-700, 2012.

[H13] Gander, M.J., Haynes, R.D. Domain Decomposition approaches for mesh generation via the Equidistribution Principle, SIAM Journal of Numerical Analysis, Vol. 50, Issue 4, pp. 2111-2135, 2012.

[H14] Christlieb, A., Haynes, R.D. and Ong, B., A Parallel Space–Time Algorithm, SIAM J. Sci. Comput., Vol. 34, No. 5, pp. CC233-C248, 2012.

[H15] Humphries, T.D., Haynes, R.D., and James, L.A., Simultaneous Optimization of Well Placement and Control using a Hybrid Global-Local Strategy, In: Proceedings of the 13th European Conference on the Mathematics of Oil Recovery (ECMOR XIII), Biarritz, France, 10-13, September 2012.

[H16] Haynes, R.D., Huang, W., Zegeling, P.A., A Numerical Study of Blowup in the Harmonic Map Heat Flow using the MMPDE moving mesh method, Numerical Mathematics: Theory, Methods and Applications, Vol. 6, No. 2, pp. 364–383, May 2013.

[H17] Gander, M.J., Haynes, R.D. and Howse, A.M., Alternating and Linearized Alternating Schwarz Methods for Equidistributing Grids, Domain Decomposition Methods in Science and Engineering XX, Lecture Notes in Computational Science and Engineering Volume 91, 2013, pp 395-402.

[H18] Haynes, R.D. and Ong, B., MPI-OpenMP algorithms for the parallel space-time solution of time dependent PDEs, Domain Decomposition Methods in Science and Engineering XXI, Lecture Notes in Computational Sciences and Engineering, pp. 179–188, Volume 98, 2014.

[H19] Haynes, R.D. and Howse, A.J.M, Generating Equidistributed Meshes in 2D via Domain Decomposition, Domain Decomposition Methods in Science and Engineering XXI, Lecture Notes in

Computational Science and Engineering, pp. 167–178, Volume 98, 2014.

[H20] Humphries, T.D., Haynes, R.D., and James, L.A., Simultaneous and sequential approaches to joint optimization of well placement and control, Computational Geosciences, Volume 18, number=3-4, pages 433–448, 2014. DOI:10.1007/s10596-013-9375-x

[H21] Butler, A., Humphries, T.D., Ranjan, P. and Haynes, R.D., Efficient Optimization of the Likelihood Function in Gaussian Process Modelling, Computational Statistics and Data Analysis, Vol. 73, pp. 40–52, 2014.

[H22] Haynes, R.D. and Howse, A.J.M, Alternating Schwarz Methods for partial differential equation-based mesh generation, Int. J. Comput. Math., Taylor & Francis, Published Online April 09, 2014, Vol. 92, Iss. 2, pages 349-376, 2015 DOI: 10.1080/00207160.2014.891733

[H23] Bihlo, A. and Haynes, R.D., A stochastic domain decomposition method for time dependent mesh generation, Accepted Springer Lecture Notes in Computational Sciences and Engineering, May 2014.

[H24] Bihlo, A., and Haynes, R.D., Parallel Stochastic Methods for PDE grid generation , Computers and Mathematics with Applications, Vol. 68, Iss. 8, pages 804–820, October 2014.

[H25] Belliveau, Patrick, Colin Farquharson, and Ronald Haynes, 2014, ArjunAir: Updating and parallelizing an existing time domain electromagnetic inversion program. SEG Technical Program Expanded Abstracts 2014: pp. 875-880. doi: 10.1190/segam2014-1433.1

[H26] Haynes, R.D. and Humprhies, T.D., Joint optimization of well placement and control for nonconventional well types, submitted July 2014, accepted December 2014, Journal of Petroleum Science and Engineering, Vol. 126, pp. 242-253, 2015.

SUBMITTED

[H27] Haynes, R.D., Ladd, K., and Ong, B. W., A OpenMP Parallel in Time Wrapper for the Solution of Time Dependent PDEs, August 2014, http://arxiv.org/abs/1408.3082

[H28] Haynes, R.D. and Kwok, F., Discrete analysis of Domain Decomposition Algorithms for Grid Generation via the Equidistribution Principle, June 2014.

[H29] Carosio, G., Haynes, R.D., and Farquharson, C., A Closer Look at Differential Evolution for the optimal well placement problem, GECCO 2015, April 2015.

[H30] Bihlo, A., Haynes, R.D. and Walsh, E.J., Stochastic Domain Decomposition for Time Dependent Adaptive mesh Generation, April 2015.

IN PREPARATION/PREPRINTS

[31] Haynes, R.D. and Mohammad, K., Rosenbrock Schwarz Waveform Relaxation Methods.

[32] Haynes, R.D. and Mohammad, K., An Accelerated Schwarz Waveform Relaxation Algorithm for Multirate Problems.

[33] Wang, X., and Haynes, R.D., Multiscale regularization with derivative-free algorithms for optimal reservoir management.

[34] Haynes, R.D. and Wang, X., A Multilevel Coordinate Search Algorithm for Well Placement, Control and Joint Optimization.

[35] Wang, X. and Haynes, R.D., Optimization of Well Placement and Production for Mature Fields.

[36] Haynes, R.D., and Ong, B.W., An RIDC-OSM Space-Time Parallel Approach for the Solution of Time Dependent Partial Differential Equations.

PUBLISHED TEACHING MATERIALS

[H37] Brown, M. and Haynes, R.D. Student Solution's Manual for *Numerical Analysis and Scientific Computation: Jeffrey Leader*, Addison–Wesley,ISBN-10: 0321257332 ISBN-13: 9780321257338

NON–REFEREED PAPERS

Haynes, R.D. and Promislow, K., 2002. Degenerate transport and phase change in a porous fuel cell electrode. (Technical Report, Simon Fraser University)

Haynes, R.D., Charron, R. and Brunner, H., 1996. On the Collocation Solution of Ordinary Differential Equations with Blow–up Properties. (Technical Report, Memorial University of Newfoundland)

RESEARCH GRANTS

**Total grants as PI or co–investigator: $1,519,330.50**

AARMS Conference Fund for DD Workshop, $7,500

MUN Conference Fund for DD Workshop 2015, $2,000

Fields Institute Fund for DD Workshop March 2015, $5,000

CRM–AARMS Fund for Adaptivity Workshop January 2014, $4,200

MUN Conference Fund for Adaptivity Workshop October 2013, $6,000

AARMS Workshop Fund for Adaptivity Workshop September 2013, $3,500.

AARMS CRG in Numerical Analysis and Scientific Computing 2013–2015, $12,000 per year, total $24,000

NSERC Discovery Grant 2013–2018, $30,000 per year, total $150,000
- Parallel Space–Time Approaches for the Numerical Solution of Partial Differential Equations

CFI–LOF/RDC Leverage $158,992.50
- GPU–Based High Performance Computer for Geophysical Applications

NVIDA Professor Partnership Program, 2011, $1500
- An Introductory Evaluation of GPUs for Optimization and Grid Generation

Atlantic Innovation Fund, J.P. Whitehead, C. Hurich, C. Farquharson, R. Haynes, $867,500
- Seismic Modeling and Inversion (ends 2013)

IRIF/RDC Research Grant 2010–2012, total $100,000
- Optimization problems in the development of energy technologies.

NSERC Discovery Grant 2008–2013, $15,000 per year, total $75000
- First renewal with an increase in funding. Proposal entitled *Implementation and Analysis of Adaptive Algorithms for the Numerical Solution of Partial Differential Equations*.

Acadia University Research Fund (Article 25.55) 2007-2008 $2000
- University wide competition. Proposal entitled *Grid Selection for Two Point Boundary Value Problems*.

NSERC Research Tools and Instruments (Equipment) Grant 2007 $50,638 (co–applicant)
- Funds used to purchase Acadia University's first high performance computing cluster. Proposal entitled *Computing Equipment for Mathematical and Statistical Modelling*.

MITACS Networking Proposal 2007 $5,000 (co–applicant)
- MITACS funds used to support AARMS–ACENET HPC Workshop and Conference, Acadia University, July 9–14, 2007.

NSERC Discovery Grant 2005–2007 $13,000 per year, total $39000
- Initial NSERC research grant.

Acadia University Research Fund (Article 25.55) 2004–2005 $2500
- University wide competition. Proposal entitled *Practical Aspects of Adaptive Mesh Computations*.

Acadia University Research Startup Award 2004–2005 $15000

## TEACHING GRANTS

Acadia University Teaching & Learning Enhancement Award 2008–2009, $9500

Acadia University Teaching Innovation and Improvement Fund 2005 $18571

## SUPERVISION

**Post-Doctoral Fellows (3)**
- Dr. Grazieli Carosio, 2014–2015
- Dr. Alexander Bihlo, 2014–2015
- Dr. Thomas Humphries, 2011–2013

  *Optimization Problems in the development of Energy Technologies*

**PhD Students (2)**
- Khaled Mohammad, 2010–present

  *Numerical Solution of Time Dependent PDEs using Moving Method of Lines and Multirate Approaches*
- Xiang Wang (Visiting PhD student Chinese Scholarship Council), 2014–2015

**MSc Students (9)**
- Benjamin Kary, 2014–present (with C. Farquharson, Earth Sciences, MUN)

  *Title: TBD*
- Abu Naser Sarker, 2013–present

  *Optimized Schwarz Methods for PDE Based Mesh Generation*
- Faysol Ahmed, 2013–present

  *Linearized Iterations for Parallel PDE Based Mesh Generation*
- Patrick Belliveau, 2012–2014 (with C. Farquharson, Earth Sciences, MUN)

  *Parallelization of the 2.5D Inversion Program ArjunAir*
- Siva Prasad, 2011–2013

  *Towards a Tidal and Storm Surge Model for coastal Newfoundland and Labrador*
- Alexander Howse, 2011–2013

  *Domain Decomposition Algorithms for Mesh Generation*
- Shaun Hiller, 2011–2012

  *Efficient Computation of Simulated Transmission Electron Microscope Images*
- Khaled Mohammad, 2009–2010

  *Multirate Rosenbrock Methods for Stiff Systems of Ordinary Differential Equations with Matlab*
- Yuheng Wu (with H. Chipman @Acadia), 2006–2008

  *Industrial Risk Classification Using Credibility Theory and Hierachical Clustering*

**Honours Students (15 distinct)**

- Devin Grant, 2014–2015
  *Coarse corrections for $r$–refined meshes generated by domain decomposition*
- Andrew Rose, 2014–2015
  *Domain decomposition for implicitly smoothed meshes*
- Brendan Cooke, Fall 2013 (Discontinued)
- Nathan King, NSERC USRA, 2012
  *Local and Global Error Control for Blowup problems*
- Andrew Butler, 2012
  *Efficient Optimization of the Likelihood Function in Gaussian Process Modelling*
- Alexander Howse, NSERC USRA, 2011
  *Domain Decomposition Methods for Nonlinear Diffusion Equations and Mesh Equidistribution in 2D*
- Alexander Howse, NSERC USRA, 2010
  *Domain Decomposition Methods for Differential and Integral Equations*
- Amber Corkum, NSERC USRA, (with R. Karsten @Acadia), 2010
  *The Ability of Particle Swarm Optimization to Optimally Place Tidal Turbines in the Bay of Fundy*
- Amanda Swan, NSERC USRA (with R. Karsten @Acadia), 2010
  *A Model of Power Output for Tidal Turbines*
- Matthew Rideout, NSERC USRA, 2008–2009
  *An Update Strategy for Numerically Solving Boundary Value Problems*
- Megan Lickley, NSERC USRA, (with R. Karsten @Acadia), 2008–2009
  *Determining the Potential for Tidal Power in the Bay of Fundy and Optimizing Turbine Placement*
- Shannon Kennedy, NSERC USRA, 2007–2008
  *Perturbing Tridiagonal $M$–matrices while Maintaining Inverse Non–Negativity*
- Dayang Wang, 2006–2007
  *Parallel Programming with MPI*
- Braden Dulong, NSERC USRA (with M. Robertson Physics @Acadia), 2006–2007
  *Determining Efficient Numerical Methods for Transmission Electron Microscope Image Simulation*
- Colin Turner, NSERC USRA (with H. Teismann @Acadia), 2005–2006
  *An Investigation of Blow–up Times for the Maxwell–Debye System and like Equations*
- Yifan Yang, 2005–2006
  *Energy Conserving Methods for Ordinary Differential Equations*

**Research Assistants (5)**

- Amber Corkum, 2009–2010
- Amanda Swan, 2009–2010
- Donald Patterson, 2008–2009
- Justine MacMillan, 2008–2009
- Shannon Kennedy, 2006–2007

RESEARCH PRESENTATIONS (50)

*See next section for a list of student presentations*

## Invited Lectures (35)

An Accelerated Domain Decomposition method for Time Dependent Problems, SIAM CSE, Salt Lake City, Utah, March 14–18, 2015.

An Overview of some DD methods for PDE based mesh generation, University of Geneva, February 17, 2015.

Recent Developments in Parallel PDE based Mesh Generation, CAIMS 2014, Saskatoon, Saskatchewan, June 25, 2014.

Optimized RIDC - DD methods for time dependent PDEs, DD22, Lugano, Switzerland, September 20, 2013.

A probabilistic domain decomposition method for equidistributing meshes, DD22, Lugano, Switzerland, September 17, 2013.

(Towards) a multicore adaptive space time method for PDEs, ACMMS 2013, Waterloo, Ontario, Canada, August 29, 2013.

Parallel in space (and time) algorithms for PDEs, CAIMS 2013, Quebec, Quebec, June 16–20, 2013.

A Parallel Space-Time Approach for the Numerical Solution of Partial Differential Equations, CMS Winter Meeting, Montreal QC, December 9, 2012.

An Optimized Schwarz Method for the Generation of Equidistributed Grids, $21^{st}$ International Conference on Domain Decomposition Methods, Inria, Rennes, France, June 29, 2012.

A RIDC–DD Space-Time Algorithm for Time Dependent Partial Differential Equations, $21^{st}$ International Conference on Domain Decomposition Methods, Inria, Rennes, France, June 27, 2012.

Mesh Generation via Domain Decomposition Methods and a new space–time parallel approach for PDEs, December 7, 2011, Geneva, Switzerland.

Applications of Domain Decomposition Methods to Mesh Generation and Space–Time Parallelism for PDEs, Michigan State University, October 20, 2011.

Applications of Domain Decomposition Methods to Mesh Generation and Space–Time Parallelism for PDEs, University of Kansas, October 12, 2011.

Equidistributing Grids via Domain Decomposition, $20^{th}$ International Conference on Domain Decomposition Methods, San Diego, CA, USA, February 7, 2011.

Domain Decomposition for Time Dependent Problems, CAIMS (Canadian Applied and Industrial Mathematics Society) Conference 2010, St. John's, Newfoundland, July 18, 2010.

Special Session on Spectral Methods in the Analysis of Differential Equations, 2010 CMS Summer Meeting, University of New Brunswick, June 4-6 2010. (Unable to attend)

Moving Meshes, Domain Decomposition and other initiatives, Department of Mathematics and Statistics, Memorial University of Newfoundland, Dynamical Systems Seminar, December 4, 2009.

Recent Advances in Schwarz Waveform Moving Mesh Methods, $19^{th}$ International Conference on

Domain Decomposition Methods, Zhangjiajie, China, August 17, 2009.

Adaptive Space–Time Methods for Differential Equations, CAIMS 2009, London, Ontario, June 12, 2009.

Adaptive Space–Time Methods for Differential Equations, CMS/CSHPM 2009, St. John's, NL, June 7, 2009.

Multirate Moving Mesh Methods, Computational Science and Engineering Seminar Series, McGill Univeristy, February 8th, 2008.

Schwarz Waveform Moving Mesh Methods, Department of Mathematics and Statistics, Memorial University of Newfoundland, January 18th, 2008.

Schwarz Waveform Moving Mesh Methods, Department of Earth Sciences, Memorial University of Newfoundland, August 14, 2007.

Schwarz Waveform Moving Mesh Methods, Computational PDE Symposium, CAIMS*SCMAI 2007, BANFF Centre, Alberta, May 21, 2007.

The Story of two Schwarz Waveform Moving Mesh Methods, AARMS Session on Mathematical Modeling and Simulation, APICS Mathematics and Computer Science Conference, Sydney, N.S., October 14, 2006

Towards a 2D/3D Schwarz Waveform Moving Mesh Solver, $17^{th}$ International Conference on Domain Decomposition Methods, St. Wolfgang/Strobl, Austria, July 3-7, 2006.

Towards a Schwarz Waveform Moving Mesh Method, Bluenose Numerical Analysis Day, St. Francis Xavier University, Antigonish, Nova Scotia, June 23, 2006.

Perturbed M–matrices and the Persistence of Positivity, Department of Mathematics and Statistics, Dalhousie University, May 26, 2006.

Persistently Positive Inverses of Diagonally Perturbed M–matrices, Department of Mathematics and Statistics, Memorial University of Newfoundland, February 24, 2006.

New Solution Strategies for Moving Mesh Partial Differential Equation Methods., Bluenose Numerical Analysis Day, Acadia University, May 28, 2004.

McGill Computational Science and Engineering Seminar Series, April 8, 2004.

Applied Mathematics Colloquium, University of Western Ontario, March 16, 2004.

Mathematics and Statistics Seminar, Wilfred Laurier University, February 12, 2004.

Applied Mathematics Seminar, University of Waterloo, October 2003.

Scicom Colloquium, School of Computer Science, University of Waterloo, May 2002.

## Contributed Talks (16)

Thomas Humphries, Ronald Haynes and Lesley James. Simultaneous and Sequential Approaches to Optimizing Well Placement and Control. 2013 Optimization Days/OPDE, Montreal, Quebec, Canada. May 6-8, 2013.

Computing Matrix Inverses — another look, Computational and Applied Mathematics Seminar, Memorial University of Newfoundland, March 21, 2012.

Domain Decomposition approaches for grid generation via the Equidistribution Principle, The 2011 Bluenose Computational and Applied Math Day, Saint Mary's University, Halifax, Nova Scotia, June 17, 2011.

Reflections on Negativity, Positivity and other Moods- a Matrix Theoretic Approach, Department of Mathematics and Statistics Seminar, Acadia University, Wolfville, Nova, November 21, 2008.

Inverse Positivity of Perturbed Tridiagonal $M$–Matrices, Bluenose Numerical Analysis Day, June 13, 2008, Dalhousie University, Halifax, Nova Scotia.

Jacobi–Based Moving Mesh Methods, AARMS/ACE-NET/MITACS HPC Workshop, Acadia University, July 14, 2007.

Persistently Positive Inverses of Diagonally Perturbed M–matrices, Department of Mathematics and Statistics, Acadia University, March 24, 2006.

Persistently Positive Inverses of Diagonally Perturbed M–matrices, Canadian Mathematics Society Winter Meeting, Victoria B.C., December 12, 2005.

An Introduction to LaTeX. Graduate Student Seminar, Acadia University, October 28, 2004.

Front Dynamics in PEM Fuel Cells., Industrial Mathematics Symposia, Canadian Mathematics Society Winter Meeting, 2001.

Numerical Analysis of a Toy Model of Phase Change. PIMS Computational Fuel Cell Dynamics Workshop, 2001.

Preconditioning spectral methods for first–order equations. Copper Mountain Conference on Iterative Methods, 2000.

Invariant Manifolds: Theory and Computation. Canadian Mathematics Society Summer Meeting, 1999.

On the Computation of Blow–up Solutions of Differential Equations. Canadian Undergraduate Mathematics Conference, 1996.

Dynamics of a Discrete Quintic Map. Canadian Undergraduate Mathematics Conference, 1995.

Latent Chaos: The complicated Behaviour of a Quintic Map. Atlantic Provinces Council of the Sciences Mathematics Conference, 1994.

STUDENT PRESENTATIONS

P. Belliveau, Parallelizing the Geophysical Inversion Program ArjunAir: A Hybrid Distributed/Shared Memory Approach, February 20, 2014.

T. Humphries, Approaches for joint optimization of oil well placement and control. Applied Math and Computation Seminar, Oregon State University, January 2014.

P. Belliveau, Parallelizing the 2.5D electromagnetic inversion program ArjunAir, November 22, 2013.

T. Humphries. Simulation and Optimization. 2013 Blundon Seminar, Memorial University, May 2013.

Thomas Humphries, Ronald Haynes and Lesley James, Simultaneous and Sequential Approaches to Optimizing Well Placement and Control. *2013 Optimization Days/OPDE*, Montreal, Quebec, Canada. May 6-8, 2013. (Presentation).

T. Humphries, R. Haynes and L. James, Simultaneous optimization of well placement and control using a hybrid global-local strategy. *13th European Conference on the Mathematics of Oil Recovery*, Biarritz, France, September 2012. (Presentation/Conference Paper).

T. Humphries, R. Haynes and L. James, Simultaneous optimization of well placement and control using a hybrid global-local strategy. *Canadian Applied and Industrial Mathematics Society Annual Meeting*, Toronto, Canada, June 2012. (Presentation).

T. Humphries. Simultaneous optimization of well placement and control using a hybrid global-local strategy. Computational and Applied Mathematics Seminar, Memorial University, April 2012.

Nathan King, Error control algorithms used for initial value problems with blow-up solutions, October 2, 2012.

Andrew Butler, Efficient Optimization Techniques for Performance Maximization of a Gaussian Process Model, October 2, 2012.

Amanda Swan, Modeling Power Output for Tidal Turbines, Bluenose Computational and Applied Mathematics Day, June 17, 2011.

Alexander Howse, Classical Schwarz Domain Decomposition with Non-Separated Boundary Conditions, Bluenose Computational and Applied Mathematics Day, June 17, 2011.

Howse, A.J.M., Applications of Domain Decomposition to the Mesh Equidistribution Problem, AMAT 419B Honours Presentation, Memorial University of Newfoundland, St. John's, Newfoundland, April 8, 2011.

Howse, A.J.M., New Applications of Domain Decomposition Methods, Summer Undergraduate Research Forum 2010, Memorial University of Newfoundland, St. John's, Newfoundland, September 30, 2010.

Amber Corkum and Amanda Swan, Optimization of Tidal Turbine Power, Poster Presentation, CAIMS 2010, St. John's, NL.

Amber Corkum and Amanda Swan, Optimization of Tidal Turbine Power, Poster Presentation, Nova Scotial Energy Research and Development Forum 2010.

Amber Corkum, Optimization Strategies for Tidal Turbine Power, APICS, Dalhousie University, October 2009.

Amanda Swan, Optimizing Power Potential in the Bay of Fundy, APICS, Dalhousie University,

October 2009.

Justine McMillan & Megan Lickley, Modelling the World's Highest Tides, Bluenose Numerical Analysis Day, Saint Mary's University, July 27, 2007.

Shannon Kennedy, Finding bounds on Perturbations of an M-matrix to Maintain Inverse Positivity, Canadian Undergraduate Mathematics Conference, Simon Fraser University, July 19, 2007.

Shannon Kennedy, Perturbations of $M$–matrices, APICS Mathematics and Computer Science Conference, Sydney, N.S., October 14, 2006

Braden Dulong, Efficient Numerical Methods for the Simulation of Transmission Electron Microscope Images, APICS Mathematics and Computer Science Conference, Sydney, N.S., October 14, 2006

Colin Turner, A Numerical and Theoretical Study of Blow–up for a System of Ordinary Differential Equations using the Sundman Transformation, Bluenose Numerical Analysis Day, St. Francis Xavier University, Antigonish, Nova Scotia, June 23, 2006.

Shannon Kennedy, Finding Numerical Evidence for the Bound on a Perturbation of an $M$–Matrix, Bluenose Numerical Analysis Day, St. Francis Xavier University, Antigonish, Nova Scotia, June 23, 2006.

Colin Turner, A Numerical Investigation of Blowup of Solutions to the Maxwell–Debye System, 29th Annual APICS Mathematics, Statistics and Computer Science Meeting, October 22, 2005.

# Teaching

TEACHING EXPERIENCE

**Memorial University**, St. John's, NL (8 distinct courses)

- *2014–2015* MATH 3132 Numerical Analysis, MATH 1001 Calculus II
- *2013–2014* MATH 3132 Numerical Analysis, MATH 1001 Calculus II, MATH 6201 Numerical Methods for Time Dependent PDEs
- *2012–2013* MATH 3132 Numerical Analysis, MATH 3260 Ordinary Differential Equations I (2 Sections)
- *2011-2012* MATH 3132 Numerical Analysis, MATH 4162 Numerical Methods for Differential Equations, MATH 6210 Numerical Methods for Differential Equations
- *2010-2011* MATH 6210 Numerical Methods for Differential Equations, MATH 4160 Partial Differential Equations, MATH 3132 Numerical Analysis, CS 6739 Nonlinear Optimization
- *2009-2010* AMATH 4162 Numerical Methods for Partial Differential Equations, MATH 6210 Numerical Methods for Differential Equations

**Acadia University**, Wolfville, Nova Scotia (7 distinct)

- *2008-2009* Calculus I (Differential), Numerical Methods, Calculus II (Integral), Advanced Numerical Methods (Graduate), Differential Equations I
- *2007-2008* Calculus I (Differential), Numerical Methods, Calculus IV (Vector), Advanced Numerical Methods
- *2006-2007* Calculus I (Differential), Calculus II (Integral), Calculus IV (Vector), Numerical Methods

- *2005-2006* Calculus I (Differential), Calculus II (Integral), Calculus IV (Vector), Numerical Methods, Advanced Numerical Methods
- *2004-2005* Numerical Methods, Calculus II (Integral), Calculus IV (Vector)

**Simon Fraser University**, Burnaby, British Columbia (2 courses)

- *2000-2001* MACM 316 Numerical Analysis
- *1999-2000* MATH 100 Precalculus

# Academic Service

THESIS COMMITTEES

- Scott Cranford (MSc), Earth Sciences, Memorial University, 2014, Internal Examiner.
- Dlamini (MSc), University of Johannesburg, 2012, External Examiner.
- Xiao Yu (PhD), Memorial University, 2012, Supervisory Committee
- Aghil Khangha (PhD), Memorial University, Supervisory Committee, 2012.
- Yi Zhang (MSc), Memorial University, 2012, Internal Examiner.
- Cao, Jie (PhD), Faculty of Engineering and Applied Science, Memorial University of Newfoundland, 2012.
- Ali Souri Laki (Phd), Faculty of Engineering and Applied Science, Memorial University of Newfoundland, 2012.
- Zahangir Hossain (MSc), Memorial University, 2011, Internal Examiner.
  *Towards the development of a multi–scale model for thermally driven circulation*
- Sadegheh Haghshenas (PhD), Memorial University, 2011, Supervisory Committee.
- Yuxiang Zhang (PhD), Memorial University, 2011, Examination Committee.
- Fan Bai (MSc), Memorial Univerisity, 2011, Internal Examinar
  *Collocation Methods for Weakly Singular Volterra Integral Equations with Vanishing Delays*
- Liangjie He (MSc), Memorial University, 2010, Internal Examiner
  *A Travel–time Engine for Seismic Petroleum Applications Using Evolving Methods*
- Ling Lin (MSc), Saint Mary's University, 2009
  *High Order Collocation Software for the Numerical Solution of Fourth Order Parabolic PDEs*
- Brian Johansen (MSc), Memorial University, 2008
  *Numerical Investigations of the Korteweg-de Vries (KdV) Equation*
- Rania Ghanan (MSc), Dalhousie University, 2007
  *A Suite of Matlab Functions for the Solution of Linear Systems Arising from Collocation with B–Splines and with Monomial Splines*
- Josh Gould (MSc), Acadia University, 2007
  *Age–Structured Population Models for Species of Pest Mites*

## Other Academic Service

- NSERC Discovery Grant Reviewer, 2013.
- Organizing Committee, AARMS Summer School, 2011, Memorial University of Newfoundland
- CFI Grant Reviewer, 2010.
- NSERC Discovery Grant Reviewer, 2009

## Journal Referee Duties

- *Transactions on Mathematics Software*,Association for Computing Machinery
- *Mathematics of Computation*, American Mathematics Society
- *Applied Mathematics Letters*, Elsevier Publishing
- *SIAM Journal of Scientific Computing*, SIAM
- *SIAM Journal of Matrix Analysis and Applications*, SIAM
- *SIAM Journal of Numerical Analysis*, SIAM
- *Atlantic Electronic Journal of Mathematics*
- *Numerical Mathematics: Theory, Methods, and Applications*
- *Applied Mathematics and Computation*
- *Linear Algebra and its Applications*
- *Numerical Algorithms*
- *Springer Lecture Notes Computational Science and Engineering*
- *Computing*
- *IMA Journal of Numerical Analysis*
- *Electronic Transactions on Numerical Analysis*

## Conference & Workshop Organization

- AARMS Workshop on Domain Decomposition Methods for PDEs, Halifax, NS, August 2015 (with H. Brunner and Paul Muir)
- *Minisymposium on Parallel–in–time Methods*, SIAM CSE 2015, Salt Lake City, Utah
- *AARMS-CRM Workshop on Adaptive Methods for PDEs*, St. John's, NL, August 17-22, 2014 (with H. Brunner and Paul Muir)
- *Scientific and High Performance Computing Theme - 8 minisymposia*, CAIMS 2014, June, 2014 (with S. Ruuth and A. Fortin).
- *First Canadian Symposium in Numerical Analysis and Scientific Computing (CSNASC)*, CAIMS 2013, June 16-20, 2013 – co-organizer (with J. Urquiza, R. Spiteri, R. Russell).
- Scientific Committee, CAIMS 2013, June 16–20, 2013, Quebec City, Quebec, Canada
- *Spatial Error Estimation and Grid Refinement Techniques for the Numerical Solution of PDEs*, Minisymposium Organizer, Scicade 2011, Toronto, On, July 11–15.
- *The Eleventh Annual Bluenose Numerical Analysis Day*, Saint Mary's University, Halifax, Nova Scotia, June 17, 2011 (with P. Muir (SMU))
- 2011 AARMS Summer School Organizing Committee
- CAIMS–SCMAI 2010 Scientific Program Committee, St. John's, NL
- *Scientific Computing and Numerical Analysis*, Invited Minisymposium Organizer, CAIMS–SCMAI 2010, St. John's, NL
- *Parallelizing your Differential Equation Solver*, Contributed Session Organizer, CAIMS-SCMAI 2010, St. John's, NL

- APICS 2009 Special Session and Scientific Computing and Applied Mathematics, APICS, Dalhousie University, Halifax NS, October 24, 2009.
- *The Tenth Annual Bluenose Numerical Analysis Day*, Acadia University, Wolfville, Nova Scotia, July 10, 2009 (with R. Karsten (Acadia), P. Keast (DAL), P. Muir (SMU))
- *The Ninth Annual Bluenose Numerical Analysis Day*, Acadia University, Wolfville, Nova Scotia, June 13, 2008 (with R. Karsten (Acadia), P. Keast (DAL), P. Muir (SMU))
- *The Eight Annual Bluenose Numerical Analysis Day*, Acadia University, Wolfville, Nova Scotia, July 27, 2007 (with R. Karsten (Acadia), P. Keast (DAL), P. Muir (SMU))
- *AARMS–ACENET HPC Workshop and Conference*, July 9–14, 2007, (with H. Chipman & R. Karsten, Acadia)
- *APICS—AARMS* Workshop on Mathematical Modelling and Simulation, Sydney, Nova Scotia, October 13–15 2006 (with G. Chen, UCB)
- *The Seventh Annual Bluenose Numerical Analysis Day*, St. Francis Xavier University, Nova Scotia, June 23, 2006 (with P. Keast (DAL), P. Muir (SMU))
- *The Sixth Annual Bluenose Numerical Analysis Day*, Cape Breton University, Sydney, Nova Scotia, June 10, 2005 (with P. Keast (DAL), P. Muir (SMU))

PROFESSIONAL MEMBERSHIPS

- Canadian Applied and Industrial Mathematics Society (CAIMS), since 2000
- Society for Industrial and Applied Mathematics (SIAM), since 2004

SERVICE

## NATIONAL

**ACEnet Fellowship Committee**
- Member, 2014–present

**Canadian Applied and Industrial Math Society (CAIMS) Board of Directors**
- Member-at-large, 2013–2016

**Canadian Applied and Industrial Math Society (CAIMS) Membership Committee**
- Chair, 2013–2015

**Canadian Mathematics Society (CMS) Board of Directors**
- Director Atlantic, 2011–present

**The Atlantic Computational Excellence Network (ACEnet) Research Directorate**
- Member, 2012–present

## MEMORIAL UNIVERSITY OF NEWFOUNDLAND

**University Committees**
- Dean of Science Review Committee, 2013.
- Senate Committee on Educational Technology, September 1, 2012–August 31, 2015.
- University Senate Committee on Academic Appeals, September 2010–2011.
- Board of Study for the MSc in Computational Science Interdisciplinary Program, October 2009 – present.

**Department Service**

- Promotion and Tenure Committee, 2015–2016.
- Blundon Competition Co-Designer and Co-ordinator, 2014.
- Hiring Committee, Winter 2014.
- Graduate Studies Committee, 2013–2015.
- Blundon Seminar Co-organizer, 2013.
- Blundon Competition, Co–designer, 2013.
- Canadian Open Mathematics Challenge Newfoundland and Labrador Marking Co-ordinator, 2012.
- Webpage Committee, 2012–2014.
- Department Strategic Planning Committee, 2012.
- Blundon Competition, Co–designer, 2012.
- Hiring Committee, Statistics , Fall 2011.
- Annual Blundon Seminar Committee, Problems Session Co–ordinator, 2011.
- Hiring Committee, 3 Year Contractual Position, Fall 2010.
- Hiring Committee, 2 Statistics Positions, Fall 2010.
- Chair, PhD Intermediate Review Examination for Mariathas Hubert, September 3, 2010
- Chair, PhD Intermediate Review Examination for Vineetha Warriyar, September 2, 2010
- Invited Speaker, *Root–finding, Optimization, and other (numerical) Pursuits*, Department of Mathematics and Statistics Annual Blundon Seminar, May 20, 2010
- Undegraduate Studies Committee, 2010–2012
- Computing Committee, 2010–2012
- High School Competitions Committee, 2010–2011

**Other University Service**

- Workshop, *Matlab and Root–Finding*, Shad Valley, St. John's, NL, July 3, 2013.
- Workshop, *Root Finding and Discrete Population Dynamics using Matlab* , Shad Valley, St. John's, NL, July, 2012.
- Workshop, *An introduction to Matlab, Population Dynamics and Root–Finding*, Shad Valley, St. John's, NL, July 5, 2011.
- High School Interviewing Program Volunteer, Torbay, Spring 2010.

## ACADIA UNIVERSITY

**University Committees**

- NSERC USRA Adjudication Committee, 2009
- NSERC PGS/CGS Adjudication Committee, 2008
- AUFA University Appointments Committee, 2008-2009
- Acadia Centre for Mathematical Modelling and Computation Board of Directors, 2007-2010
- Faculty Working Group for Student Recruitment, 2007–2009
- Faculty of Pure and Applied Sciences Student Recruitment Committee, 2007–2009
- Senate Graduate Studies Committee, 2007–2009
  - Special working group to investigate part–time graduate studies, 2008–2009
- Faculty of Pure and Applied Science Nominating Committee, 2006–2009

  - Chair 2008–2009
- Acadia Advantage Software Stream Committee, 2007–2008
- Senate Curriculum Committee, 2006–2007
- Research Funds Allocation Committee, 2005–2007

**Department Service**

- Acting Head, Department of Mathematics and Statistics, April 25 - May 1, 2009
- Graduate Program Coordinator, Department of Mathematics & Statistics, 2007–2009
- Coordinator and Editor, Department of Mathematics and Statistics Recruiting Newsletter, 2007–2009
- Calculus Co-ordinator, 2006–2007
- Computer, Co–op, Problem Solving Committees, & Student Society Liaison Committee 2006-2007
- Computer, Co–op, Recruiting, & Problem Solving Committees 2004–2006

## Other Activities

- Facilitator, 2012 COMC Marking Team, Newfoundland and Labrador, 2012.
- Coordinator, *2nd Annual Acadia Undergraduate Mathematics Competition* (with F. Mendivil) , 2009.
- Acadia University Residence Faculty Mentor, Eaton House, 2008–09.
- Developer and Coordinator, *1st Annual Acadia Undergraduate Mathematics Competition* (with F. Mendivil), 2008.
- Marker, *2007 Maritime Mathematics Competition*,
- Presenter, *Annapolis Valley High School Math League Session*, February 2007.
- Marker, *2006 Maritime Mathematics Competition*,
- Problem Contributor, *2005 Maritime Mathematics Competition*,
- BC Advanced Systems Institute (ASI) Graduate Advisory Committee member, 1999–2001.
- Mentor, *IAM-CSC-PIMS Senior Undergraduate Math Modeling Workshop*, February 17–18, 2001 SFU/UBC.
- Invited Speaker, *Solving Polynomial Equations*, International Mathematical Olympiad Candidate Camp, Simon Fraser University, 2001.
- Co–organizer of the 1999 CMS summer meeting graduate session, St. John's, NL.
- Treasurer of Mathematics Graduate Society, Simon Fraser University, 1998–2000.