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PROFILE

In August 2006 I joined the Department of Mathematics & Statistics at the University of Guelph with the rank of Assistant Professor of Mathematics. Prior to this I was a Postdoctoral Research Associate at Florida State University working under Prof. Max Gunzburger. I was awarded the PhD in Applied Mathematics, within the Numerical Analysis Group, at the University of Durham, England, in 2003, under the supervision of Dr. James Blowey. My research involves the mathematical and numerical analysis of nonlinear reaction-diffusion equations in biology. I publish in top-quality peer reviewed journals of applied analysis, numerical analysis, and mathematical biology. In addition to my research accomplishments I have qualified teacher status in the UK and teach at introductory, advanced undergraduate and graduate levels at the University of Guelph.

KEY KNOWLEDGE AREAS

General	numerical solution of nonlinear partial differential equations; mathematical analysis; scientific computing; mathematical biology/ecology
Specific	rigorous development and application of finite element/difference methods; error bounds; global existence and uniqueness results; reaction-diffusion systems; spatially extended predator-prey models; metapopulation dynamics; Turing patterns; optimal control theory; MATLAB

RESEARCH GRANTS HELD

2008 – 2013	Natural Sciences and Engineering Research Council of Canada (NSERC) Individual Discovery Grant entitled ‘Computation, Analysis, and Control of Biological Pattern Formation’. \$13,000 per year awarded over five years.
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PUBLICATIONS

1. **Garvie M.R.**[§], and Maini P.K., and Trenchea C. (2010), ‘An efficient and robust numerical algorithm for estimating parameters in Turing systems’, *Journal of Computational Physics*, Vol. 229, pp. 7058-7071 [ISI Impact Factor 2.345]
2. Schwalb A.N., and **Garvie M.R.**, and Ackerman J.D.[§] (2010), ‘Dispersion of freshwater mussel larvae in a lowland river’, *Limnology & Oceanography*, Vol. 55, No. 2, pp. 628-638 [ISI Impact Factor 3.385]
3. **Garvie M.R.**[§], and Trenchea C. (2010), ‘Spatiotemporal dynamics of two generic predator-prey models’, *Journal of Biological Dynamics*, Vol. 4, No. 6, pp. 559-570 [ISI Impact Factor: not yet available]
4. **Garvie M.R.**[§], and Golinski M. (2010), ‘Metapopulation Dynamics for Spatially-Extended Predator-Prey Interactions’, *Ecological Complexity*, Vol. 7, No. 2, pp. 55-59 [ISI Impact Factor 1.886]

5. **Garvie M.R.**, and Trenchea C. (2007), ‘Optimal control of a nutrient - phytoplankton - zooplankton - fish system’, *SIAM Journal On Control and Optimization*, Vol. 46, No. 3, pp. 775-791 [ISI Impact Factor 1.297]
6. **Garvie M.R.**[§] (2007), ‘Finite difference schemes for reaction-diffusion equations modeling predator-prey interactions in MATLAB’, *Bulletin of Mathematical Biology*, Vol. 69 No. 03, pp. 931-956 [ISI Impact Factor 1.859]
7. **Garvie M.R.**[§], and Trenchea C. (2007), ‘Finite element approximations of spatially extended predator-prey interactions with the Holling type II functional response’, *Numerische Mathematik*, Vol. 107, pp. 641-667 [ISI Impact Factor 1.388]
8. **Garvie M.R.**, and Trenchea C. (2007), ‘Biomanipulation of food-webs in eutrophic lakes’, *Proceedings of the 46th IEEE Conference on Decision and Control*, pp. 3460-3465, New Orleans, Louisiana, USA
9. **Garvie M.R.**[§], and Blowey J.F. (2005), ‘A reaction-diffusion system of $\lambda - \omega$ type. Part II: numerical analysis’, *European Journal of Applied Mathematics*, Vol. 16 No. 05, pp. 621-646 [ISI Impact Factor 1.480]
10. Blowey J.F., and **Garvie M.R.**[§] (2005), ‘A reaction-diffusion system of $\lambda - \omega$ type. Part I: mathematical analysis’, *European Journal of Applied Mathematics*, Vol. 16 No. 01, pp. 1-19 [ISI Impact Factor 1.480]
11. **Garvie M.R.**[§] and Trenchea C., ‘The identification of space-time distributed parameters in reaction-diffusion systems’, submitted to *Inverse Problems* [ISI Impact Factor 2.124]
12. **Garvie M.R.**[§] and Trenchea C., ‘A second-order, three level finite element approximation of an experimental substrate-inhibition model’, submitted to *SIAM Journal on Numerical Analysis* [ISI Impact Factor 1.661]
13. **Garvie M.R.**[§] and Burkardt J., ‘Finite Element simulation of predator-prey dynamics in arbitrary shaped 2D habitats using MATLAB’, in preparation.
14. **Garvie M.R.**[§] and Banks L., ‘A note on the numerical suppression of chaos in oscillatory reaction-diffusion equations’, in preparation.

(N.B. Applicants name is shown in **bold**, while corresponding authors are marked with a §.)

EDUCATION

- 1999 – 2003 **PhD in Applied Mathematics**
 University of Durham, Durham, UK.
 Thesis: ‘Analysis of a reaction-diffusion system of $\lambda - \omega$ type’.
 Adviser: Dr. James F. Blowey (J.F.Blowey@durham.ac.uk).
- 1997 – 1998 **MSc in The Numerical Solution of Differential Equations**
 University of Reading, Reading, UK.
 Thesis: ‘Cell-to-cell Mapping Algorithms to Efficiently Plot Basins of Attraction in Dynamical Systems.’
- 1992 – 1993 **Postgraduate Certificate in Education (sec. level)**
 Keele University, Keele, UK.
 Primary subject: mathematics.

- 1989 – 1991 **MSc in Ecology**
The University of Wales, Bangor, UK.
Thesis: ‘Studies of the Woolly Hair Moss (*Racomitrium lanuginosum*) in Snowdonia National Park.’
- 1986 – 1989 **BSc (Honors) in Mathematics**
The University of Sussex, Falmer, UK.

EMPLOYMENT

- Aug 2006 – **Assistant Professor (tenure-track)**, Department of Mathematics & Statistics, University of Guelph, Canada. Duties include all aspects of teaching, research and service. supervising graduate students, 1 PhD student + 1 MSc student (two more graduate students join my group in the Fall).
- 2003 – 2006 **Postdoctoral Research Associate**, School of Computational Science, Florida State University, USA. Duties: Three-year postdoctoral research position under Prof. Max Gunzburger (<http://www.csit.fsu.edu/~gunzburg/>).
- 1999 – 2003 **Teaching Assistant**, University of Durham, Durham, UK.
Duties: Running weekly second year numerical analysis tutorials, MATLAB practicals and grading.
- 1998 – 1999 **Mathematics Instructor**, Arizona State University, Tempe, USA.
Duties: Full responsibility for lecturing in Brief Calculus, Financial Mathematics and Finite Mathematics. I also taught a short course on MATLAB to a group of engineering students.
- 1995 – 1997 **Mathematics Teacher**, Peter Symonds’ College, Winchester, UK.
Duties: Pure mathematics and statistics taught to Community College level. Personal tutor for 22 students.

MEETINGS ORGANIZED

- July 2011 Co-organized with Herb Kunze (University of Guelph) at the Laurier Centennial Conference (AMMCS - 2011), Waterloo, Canada, the minisymposium Applied Analysis and Inverse Problems I & II.
- Aug 2011 Co-organized with Julie Horrocks (University of Guelph) the BioM&S Symposium at the University of Guelph, Canada. Successful in receiving \$3000 support from the Fields Institute.
- Mar 2009 Co-organized with Catalin Trenchea (University of Pittsburgh) at the SIAM Conference on Computational Science and Engineering, the minisymposium - MS149 “Distributed Parameter Identification Problems”, Miami, USA

CONFERENCES/MEETINGS ATTENDED, WITH PRESENTATIONS

- July 2011 “A new algorithm for estimating parameters in reaction-diffusion systems that display pattern formation”, **Laurier Centennial Conference, AMMCS - 2011**, Waterloo, Canada
- July 2010 Attended the **SIAM Annual Meeting & Conference on Life Sciences**, Pittsburgh, USA

- Aug 2009 “Towards an image driven methodology for parameter identification in Turing systems”, **Minisymposium on Inverse Problems**, University of Guelph
- Mar 2009 “Image driven parameter identification”, **SIAM Conference on Computational Science and Engineering**, Miami, USA
- July 2008 “A second-order, three level finite element approximation of an experimental substrate-inhibition model”, **SIAM Annual Meeting**, San Diego, USA
- June 2007 “Parameter identification for reaction-diffusion equations modeling pattern formation”, **SIAM Conference on Control & Its Applications**, San Francisco, USA
- May 2007 “Fish, plankton and morphogenesis”, **Southern Ontario Numerical Analysis Day (SONAD) (invited talk)**, University of Ontario Institute of Technology, Oshawa
- Feb 2005 “Computational algorithms for spatially extended predator-prey systems”, **SIAM Conference on Computational Science & Engineering**, Orlando, USA
- March 2004 Attended the minisymposium **Emerging Methodologies and Applications in Numerical PDEs**, School of Computational Science, Florida State University, USA
- June 2003 Attended the **20th Biennial Conference on Numerical Analysis**, University of Dundee, Scotland, UK
- Sept 2002 Attended the **11th Scottish Computational Mathematics Symposium**, University of Strathclyde, Glasgow, Scotland, UK
- Sept 2002 Attended the EPSRC Summer School **Computational, Statistical and Mathematical Modeling in Biology**, University of Glasgow, Glasgow, Scotland, UK
- July 2002 Attended the LMS Symposium **Computational Methods for Wave Propagation in Direct Scattering**, University of Durham, Durham, UK
- July 2002 Attended the **X-th EPSRC Summer School in Numerical Analysis**, University of Durham, Durham, UK
- Sept 2000 Attended the **9th Scottish Computational Mathematics Symposium**, University of Strathclyde, Glasgow, Scotland, UK
- July 2000 Attended the **IX-th EPSRC Summer School in Numerical Analysis**, University of Durham, Durham, UK
- July 2000 Attended the Euro Summer School **Mathematical Aspects of Evolving Interfaces**, University of Madeira, Funchal, Portugal

RESEARCH SEMINARS

- Feb 2010 “A second-order, three level finite element approximation of a model for skin patterning”, Computational Math Colloquium Series (**invited talk**), University of Waterloo, Canada

- Mar 2009 “Image driven parameter identification in Turing models”, Biomathematics and Biostatistics Working Group Seminar, University of Guelph, Canada
- Oct 2008 “A second-order, three level finite element approximation of reaction-diffusion systems for patterning in nature”, Applied Analysis Seminar Series, University of Guelph, Canada.
- Nov 2007 “A Criticism’ of the Turing Mechanism for Patterning in Nature”, University of Guelph, Department of Mathematics & Statistics Colloquium, Canada
- May 2007 “Metapopulation dynamics for spatially-extended predator-prey interactions”, University of Guelph Workshop in Spatial Ecology, Canada
- Nov 2006 “Fish, plankton and morphogenesis”, Biomathematics and Biostatistics Working Group Seminar, University of Guelph, Canada
- Sept 2005 “Fish, plankton and chaos”, Colloquium, Department of Mathematics, Virginia Tech, USA
- May 2005 “Finite element analysis of reaction-diffusion systems modelling predator-prey interactions” (**invited talk**), Applied Mathematics Seminar, University of Dundee, Scotland, UK
- May 2005 “Computational algorithms for spatially extended predator-prey systems” (**invited talk**), Department of Mathematics Colloquium, Oregon State University, Oregon, USA
- Jan 2005 “Computational algorithms for spatially extended predator-prey systems”, University of Guelph, Department of Mathematics & Statistics Colloquium, Canada
- Sept 2004 “The numerical analysis of spatially extended predator-prey systems” (**invited talk**), Department of Mathematics Seminar, University of Pittsburgh, USA

ADDITIONAL EXPERIENCE

- Computing Matlab; Fortran 77/90; Mac OS X; Linux (Redhat); UNIX; Windows; $\text{\LaTeX} 2_{\epsilon}$; use of document camera systems to teach classes of up to 600 students.
- Recreational Math Mathematics involving art and nature, in particular: fractals; strange attractors; pentominoes; tiling; phyllotaxis; and symmetry patterns arising from polar inequalities.
- Memberships (i) Society for Industrial and Applied Mathematics (SIAM): since 2001
(ii) The Society for Mathematical Biology: since 2011
(iii) Canadian Applied and Industrial Mathematics Society (CAIMS): since 2011