

Michael J. Ward – CV

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Nationality	Canadian	Email	ward@math.ubc.ca

Education

1983–1988 Ph.D. Applied Mathematics, California Institute of Technology (Caltech). Advisor: D. S. Cohen. Awarded William Carey Prize for best doctoral dissertation in Applied Mathematics, 6/88.

1978–1983 B.Sc. Mathematics, University of British Columbia, Canada, (UBC), 6/83. First Class Honors. Awarded Lorraine Schwartz prize in Statistics UBC, 5/83.

Employment History

1993–date Professor of Mathematics at the University of British Columbia (UBC), Vancouver, Canada. Assist. Prof. 1993-1995, Assoc. Prof. 1995-1998, Full Prof. 1998 - date

6/2003–9/2008 Director of the Institute for Applied Mathematics, UBC.

9/1991–6/1993 Visiting Member, Courant Institute, New York University. Supervisor: Peter Lax

9/1988-9/1991 Szegő Assistant Professor, Stanford University. Supervisor: Joseph B. Keller.

6/1985-6/1993 Research Scientist, I.B.M. Thomas Watson Research Lab, New York. Summer research position in semiconductor device modeling. Supervisor: Farouk Odeh.

Honors and Awards

- Julian Cole Lectureship for 2022, awarded by SIAM.
- CAIMS Senior Research Prize for 2011. (The society's preeminent research award recognizes innovative and exceptional research contributions in Applied or Industrial Mathematics).
- Science Watch: Fast Breaking Papers Commentary, June 2011, based on Narrow Escape Problems (papers [89] and [90] in publication list) (A. Cheviakov and M. J. Ward).
- UBC Faculty of Science Killam Teaching Prize 2004. Honorable Mention in 1998.
- Christensen Fellow at St. Catherine's College, Oxford, Trinity term 1998.
- Steacie Fellowship for 1998-2000 awarded by NSERC. (Each year only six new such fellowships are awarded in Canada in Science and Engineering.)
- Coxeter-James Prize awarded by the Canadian Mathematical Society in 1998.
- Invited plenary speaker for ICIAM, Hamburg, July 1995. (Applied mathematics equivalent of ICM invited lecture).
- Co-winner of the 1995 Andre Aisenstadt prize for research in mathematics, awarded by the Centre de Recherches Mathematique (CRM), Canada.
- UBC Killam Research Prize in 1995 (\$10,000).
- I.B.M. Predoctoral Fellowship, 8/86 – 6/88.
- NSERC Postgraduate Scholarship (Canada), 8/83 – 8/87.

Research Interests

Applied partial differential equations, singular perturbations and asymptotic analysis, reaction-diffusion systems, interface dynamics and pattern forming systems, mathematical modeling, concentration and singularity behavior in PDE, eigenvalue asymptotics, mean first passage time, and Fekete point problems. Recently, I have developed a focus on some theoretical problems related to PDE modeling in math biology, such as persistence thresholds in ecology, quorum sensing and collective dynamics, and cell signalling.

Grants

My individual operating grants for my research program from the NSERC peer review process and the funding level is as follows: NSERC Discovery grant (1993-1996, 54K), NSERC Discovery grant (1996-2000, 105K), NSERC Discovery grant (2000-2004, 140K) NSERC Discovery grant (2005-2009, 160K) NSERC Discovery grant (2009-2016, 210K) NSERC Discovery grant (2016-2022, 276K). In Canada there is no university overhead on NSERC Discovery grants, and so all the funds can support graduate students, travel to conferences, and research collaborations.

Team grants for computing equipment are as follows: NSERC Equipment Grant (1992, 22K), (1994, 56K), (1995,23K). MITACS NCE team grant (with B. Wetton) (2001-2003,50K).

From 2015-2017, I received a PIMS Collaborative Research Group Grant (CRG) (200K) (together with T. Hillen, T. Kolokolnikov, S. Ruuth, and J. Wei) for a two-year thematic program in Applied PDE: Modeling, Analysis, and Applications. This gave partial support for various research workshops and PDF support. Additional funding has been received on a peer-review basis from PIMS and the Banff International Research Station (BIRS) to support various conferences and workshops (see my list of co-organized activities from PIMS and BIRS).

Editorships

- Co-Editor in Chief (with J. King, U. Nottingham and M. Burger, U. Munster) of the *European Journal of Applied Mathematics* (effective September 2000). Formerly, associate editor of this journal since June 1996.
- Editorial Board: *Discrete and Continuous Dynamical Systems, Series B*, November 2007 – date.
- Associate Editor: *Journal of Nonlinear Science*, June 2015 – date.
- Associate Editor: *Mathematics in Science and Industry* (Journal of CAIMS). September 2018–date.
- Associate Editor: *Nonlinearity*, January 2016 – January 2019.
- Associate Editor: *Methods and Applications of Analysis*, January 1995 – January 2001.
- Associate Board of Referees: *J. Eng. Math.*, April 1998 – January 2005.
- Editorial Board: *Canadian Math Bulletin*, January 2011 – December 2014.

Graduate Student and PDF Supervision

PDF Supervision

- Jens Rademacher (2004-2005) (Current position: Professor at U. Bremen, Germany).
- Wentao Sun (2005-2006) (Current position: Seismic imaging computational scientist in industry, Calgary).
- Alexei Cheviakov (2007-2008) (Current position: Full Prof. at U. Saskatchewan, Saskatoon).
- Yana Nec (2010-2012) (Current position: CRC II in Mathematics at Thomson River U., Kamloops).

- Sarah Hormozi (summer 2013-2014) (Current position: Asst. Prof., Ohio U., USA).
- Justin Tzou (2015-2017) (Current position: Lecturer at Macquarie U., Australia).
- Andreas Buttenshoen (2018-date) (Current position: Asst. Prof. U. Mass).
- Chunyi Gai (2021-date) (Current position: PDF at UBC).

Ph.D (Doctoral Student) Supervision

- Sven Wolf (co-advisor with J.B. Keller), Stanford, completed June 1992. I supervised the second half of his thesis at Stanford resulting in the article [20]. (current position: unknown).
- Michele Titcombe, UBC, completed April 1999. (Initial position: PDF U. Montreal. Current position: Champlain College, Montreal).
- Xiaodi Sun, UBC, completed November 1998. (Current position; Scientist at General Avionics, Seattle, Washington).
- David Iron, UBC, completed April 2001. (Initial position: PDF U. Amsterdam. Current position. Full Prof. Dalhousie U.).
- Theodore Kolokolnikov, UBC, completed November 2004. (Initial position: PDF U. Brussels. Current position: Full Prof. Dalhousie U.).
- Wan Chen, UBC, completed July 2009. (Initial position: PDF Oxford U.. Current position: researcher at Google in Seattle.)
- Allan Lindsay, UBC, completed July 2010. (Initial position: Hanno Rund Asst. Prof. U. Arizona. Current position: Assoc. Prof. U. Notre Dame).
- Ignacio Rozada, UBC, completed July 2012. (Initial position: Dynamical systems modeler in disease epidemics at the BCCFE. Current position: Computational Physicist at IQBIT).
- Simon Tse, UBC, completed March 2016. (Initial position: PDF Trinity Western U.. Current position, Asst. Prof. Trinity Western U.)
- Victor Brena-Medina, Bristol U., completed July 2014. (joint supervision with A. Champneys). (Initial and current position: Asst. Prof. at UNAM Moralia, Mexico).
- Iain Moyles, UBC, completed July 2015. (joint supervision with B. Wetton). (Initial position: PDF U. Limerick. Current position: Asst. Prof. York U.).
- Jia Guo, UBC, completed March 2016. (joint supervision with Y. X. Li, W. Nagata). (Initial position: PDF U. Minnesota. Current Position: Asst. Prof. UC Riverside).
- Frederic Paquin-Lefebvre, UBC, started March 2015, (joint supervision with W. Nagata).
- Daniel Gomez, UBC, started September 2016, (joint supervision with J. Wei).
- Sarafa Iyaniwura, UBC, completed August 2021, (joint supervision with C. MacDonald). (Initial position: PDF at Los Alamos with Alan Perelson).
- Tony Wong, UBC, completed August 2021, (joint supervision with C. MacDonald). (Initial position: PDF at Brown U. with Bjorn Sandstede.)
- Merlin Pelz UBC, started September 2020.
- Fanze Kang UBC, started September 2021, (joint supervision with Juncheng Wei).

MSc Student Supervision: Wesley Ridgway UBC (2020); Daniel Gomez, UBC (2014); Eamon Kavanagh, UBC, (2014); Monica Delgado, UBC, (2013); Yifan Chang, UBC, (2014); Venu Kurella, UBC, (2011); Samara Pillay, UBC, (2008); Lloyd Bridge, UBC, (2001); Doug Stafford, UBC, (1997); David Iron, UBC. (1997). I have also supervised or co-supervised NSERC summer interns (Philip Marr 2010, Nabil Fadai 2013, Tim Small 2015), and several undergraduate honors theses in applied mathematics.

Highlighted Invited Lectures

- Julian Cole lecture: *Strong Localized Perturbation Theory: Analysis of Localized Solutions to some Linear and Nonlinear Diffusive Systems*, July 2022.
- Invited lecture for the *Nonlinear Waves and Coherent Structures*, webinar series, held online in Sept. 2021. Title: *Localized Patterns for some Reaction-Diffusion Systems in 3-D*.
- Invited lecture for the Wilhelm Killing Kolloquium at Munster University, Germany, held online in June 2021. Title: *Topics in Localized Pattern Formation for Reaction-Diffusion Systems in 3-D*.
- Invited online lecture for the Tianyuan International Workshop on *Applied Dynamical Systems*, held in November 2020. Title: *Diffusion Induced Synchrony for a 2-D PDE-ODE Model of Cell-Bulk Coupling*.
- Invited online lecture in the session *Life Sciences - mathematical modeling and analysis* for the Pacific Rim Math Conference sponsored by the MSRI, U.C. Berkeley, in August 2020. Title: *Synchrony and Oscillatory Dynamics for a 2-D PDE-ODE Model of Diffusion-Sensing with Small Signaling Compartments*.
- Invited lecture given at the first PIMS-Heidelberg Workshop on *PDEs and Math Biology*, held at the U. Heidelberg, Germany, June 2019. Title: *Topics in Localized Pattern Formation*.
- Invited lecture given at the international workshop on *Emerging Areas in Reaction-Diffusion Systems*, held at the East China Normal University, Shanghai, China, April 2019. Title: *Localized Pattern Formation in 3-D*.
- Invited lecture given at the international workshop *Advanced Asymptotics of PDEs and Applications*, held at the De Giorgi Research Center, Pisa, Italy, September 2018. Title: *Mean First Passage Time and the Burg-Purcell Problem*.
- Plenary lecture for *Applied Analysis Days*, held at the U. Ottawa, sponsored by the Fields Institute, October 2018. Title: *Asymptotic Analysis of Reaction-Diffusion Models of Urban Crime*.
- Invited lecture at the Institute for Advanced Studies (IAS) workshop *Frontiers of Theory and Applications of Nonlinear Partial Differential Equations*, held at HKUST in Hong Kong, December 2017. Title: *Refined Linear Stability Theory for Localized Spot Patterns for Reaction-Diffusion Systems in R^2* .
- Invited keynote lecture at the workshop *Future of Singular Perturbations*, held at the Lorentz Center, Leiden U., Holland, July 2017. Title: *Spots, Traps and Patches: Asymptotic Analysis of Localized Patterns in Diffusive Systems*.
- Invited lecture at the workshop *Mathematics of Pattern Formation*, held at the Banach Center for the Polish Academy of Sciences, Bedelow, Poland, September 2016. Title: *Asymptotic Analysis of a 2-D Quorum-Sensing Model with Active Components Coupled with Bulk Diffusion*.
- Invited lecture at the workshop *Dynamics Days: Latin America and the Caribbean*, held in Puebla, Mexico, October 2016. Title: *Quorum Sensing PDE Models: A New Paradigm for the Synchronization of Dynamically Active Units*.
- Invited lecture at the CMO-BIRS Workshop *Coherent Structures in PDEs and their Applications*, held in Oaxaca, Mexico, June 2016. Title: *Asymptotic Analysis of Quorum-Sensing Behavior for a Coupled Cell Bulk-Diffusion Model in 2-D*.
- Invited lecture for Bluenose Conference *Applied and Computational Math Days*, held at St. Mary's University, Halifax, July 2015. Title: *Fekete Point Distributions and Slow Spot Dynamics*.
- Invited lecture for the international conference in Applied Mathematics (in honor of Prof. R. Wong), held at the City University of Hong Kong, December 2014. Title: *The Stability of Localized Spot Patterns for Reaction-Diffusion Systems*.
- Invited lecture for the PIMS Workshop *Kinetic Theory and Related Topics*, held at the U. Victoria, Canada, November 2014. Title: *Fekete Points, Eigenvalue Asymptotics, and Localized Patterns*.
- Invited lecture for the international conference *Symmetry Methods, Applications, and Related Fields*, held at UBC, May 2014. Title: *Optimization of the Persistence Threshold in the Diffusive Logistic Model in Ecology*.

- Invited lecture for the PIMS Workshop *Analysis of Partial Differential Equations and Related Models*, held at SFU, January 2014. Title: *Logarithmic Expansions and the Stability of Periodic Patterns of Localized Spots for Reaction-Diffusion Systems in \mathbb{R}^2* .
- Invited lecture for the IMA workshop *Interactions among Localized Patterns in Dissipative Systems*, held at the IMA, U. Minnesota, May 2013. Title: *Topics in Localized Patterns: Hot-Spot Patterns in Urban Crime and Localized Patterns on the Sphere*.
- Invited lecture for PIMS Hot Topic workshop *Computational Criminology*, held at SFU, September 2012. Title: *The Stability of Steady-State Hot-Spot Patterns for Reaction-Diffusion Models of Urban Crime*.
- Invited lecture at the BIRS workshop *Emergent Behavior in Multi-Particle Systems with Nonlocal Interactions*, held in Banff, Alberta, January 2012: Title: *Fekete Points, Narrow Escape, and the Asymptotics of the Mean First Passage Time*.
- CAIMS Research Prize lecture at the ICIAM 2011, held in Vancouver, July 2011; Title: *Localized Pattern Formation in Reaction-Diffusion Systems*.
- One of three principal invited lecturers for the international conference *Recent Advances in Nonlinear Partial Differential Equations*, (organizers; J. Wei and Z. Xin), sponsored by the Croucher Foundation Advanced Study Institute, held at the CUHK, Hong Kong, February 2011. Gave three 75 minute lectures at this meeting.
- Invited speaker for the international conference *Far-from Equilibrium Dynamics*, in honor of Prof. Nishiura, held at RIMS in Kyoto, Japan, January 2011. Title: *Self-Replicating Patterns in Reaction-Diffusion Systems*.
- CAIMS 2010 Plenary lecture, held in St. John's, Newfoundland, July 2010; Title: *Traps, Patches, Spots, and Stripes: Localized Solutions to Diffusive and Reaction-Diffusion Systems*.
- Invited lecture in the PIMS Distinguished lecture series, held at the U. Saskatchewan, November 2010. Title: *An Asymptotic Analysis of Localized Solutions to Some Diffusive and Reaction-Diffusion Systems*.
- One of two principal lecturers at the BIRS workshop *Multiscale Analysis of Self-Organization in Biology* (organizers; B. Perthame, T. Hillen), held in Banff, Alberta, July 2009. Gave three 45 minute lectures at this workshop. Title: *Traps, Patches, Spots, and Stripes: Localized Solutions to Diffusive and Reaction-Diffusion Systems*.
- Invited lecture (45 minutes) for the international conference *Asymptotic Analysis and Infinite Dimensional Dynamical Systems*, held at the City University of Hong Kong, Hong Kong, June 2009. Title: *An Asymptotic Analysis of Narrow Escape and Capture Problems for a Brownian Particle*.
- Invited plenary lecture for the international conference *Mathematical Methods and Modeling of Biophysical Phenomena*, sponsored by IMPA (Brazil) (organizers; J. Zubelli, B. Perthame), held in Rio De Janeiro, March 2009: Title: *Asymptotic Analysis of Diffusion on Surfaces with Localized Traps*.
- Invited lecture for the Chile-Japan workshop *Nonlinear Elliptic and Parabolic PDE*, (organizer; M. Del Pino), held in Santiago, Chile, October 2007. Title: *Self-Replication for Reaction-Diffusion Equations in Two-Dimensional Domains*.
- Invited lecture for the BIRS workshop *Reaction-Diffusion and Free Boundary Value Problems*, held in Banff, Alberta, March 2006. Title: *Eigenvalue Optimization, Spikes, and the Neumann Green's Function*.
- Invited lecture for the international conference *The Dynamics of Patterns*, (organizer; A. Doelman), held at the U. Groningen, Holland, April 2006. Title: *The Stability and Dynamics of 1-D Localized Pulses for Reaction-Diffusion Systems*.
- Invited lecture for the international conference *Limit Problems in Analysis*, (organizers; J. F. Williams, V. Van de Bouwe), held at Leiden U., May 2006. Title: *Spike Dynamics in 2-D and the Neumann Green's Function*.
- Invited lecture for the international conference *Pattern Formation in PDEs*, (organizers; J. Wei, Y. Nishiura), held at the CUHK, Hong Kong, December 2006. Title: *A Two-Dimensional Metastable Flame-Front and a Degenerate Spike Layer Problem*.

- Invited 45-minute lecture at the joint Japan-France international conference *Pattern Formation in Biology*, (organizers; Ken-Ichi Nakamura, M. Henry, M. Mimura), held at the U. of Tokyo, October 2005. Title: *The Stability of Stripes for Reaction-Diffusion Systems*.
- Invited 30 minute lecture in the international conference for the 60th Birthday of Prof. Roderick Wong, held at the City U. of Hong Kong, May 2004. Title: *Singular Perturbations, Carrier's Problem, and Metastable Flame-Front Dynamics*.
- Plenary invited speaker for the international conference *Differential Equations and Asymptotic Theory in Mathematical Physics*, (organizers; C. Hua and R. Wong), held at Wuhan U., China, October 2003. Gave five one-hour lectures titled *Singular Perturbations and Reaction-Diffusion Equations*.
- Invited one-hour lecture for the workshop *Patterns in Nonlinear PDE*, (organizers; W. Craig, C. Sulem, N. Ercolani), held at the Fields Institute in Toronto, November 2003. Title: *Instabilities of Spike Solutions for the One-Dimensional Gray-Scott Model*.
- Invited lecture at the BIRS workshop *The Dynamics of Localized Structures*, (organizers; A. Bernoff, P. Fife, T. Hillen, M. Ward, J. Wei), held at Banff, Alberta, August 2003. Title: *Dynamics and Instabilities of Spikes for the One-Dimensional Gray-Scott Model*.
- Invited one-hour address for the AMS Western Section Meeting, held at the U. Utah, in October 2002: Title: *The Dynamics of Localized Patterns in Reaction-Diffusion Systems*.
- Invited keynote one-hour lecture for the international conference *Differential Equations in Mathematical Biology*, (organizers; H. Chua, B. Sleeman), held at Wuhan U., China, in May 2001. Title: *Beyond Turing: The Stability and Dynamics of Localized Patterns*.
- Invited one-hour lecture for the workshop *Nonlinear Pattern Formation*, (organizers; D. Hilhorst, H. Matano), held at the U. Leiden, Holland, March 2001. Title: *The Existence and Stability of Symmetric and Asymmetric Spike Patterns for the Gierer-Meinhardt Model*.
- One-hour lecture for the Advanced Systems Institute, held at UBC, September 2000: Title: *Nonlinear Problems in Industrial Applied Mathematics*.
- Invited keynote one-hour speaker for the *Mount Baldy Conference in Differential Equations*, (organizer; A. Bernoff), held at Claremont, California, September 2000. Title: *The Dynamics of Localized Patterns*.
- Invited lecture for the IMACS conference *Nonlinear Evolution Equations*, (organizers; W. Craig, C. Sulem), held in Athens, Georgia, April 1999. Title: *Nonlinear Dynamics for the Gierer-Meinhardt Model*.
- Invited one-hour lecture for the international conference *Nonlinear Pattern Formation*, (organizer; N. Alikakos), held in Crete, Greece, June 1999. Title: *Nonlocal Reaction-Diffusion Problems and Metastability*.
- Plenary one-hour lecture for the international conference *Nonlinear Evolution Equations*, (organizers; M. Mimura, J. Wei), held at the Chinese University of Hong Kong, December 1999. Title: *The Dynamics of Spikes for Nonlocal Reaction-Diffusion Models*.
- Invited one-hour lecture for the workshop *Reaction Diffusion Equations*, (organizer; D. Hilhorst), held at the Université de Paris-Sud, Orsay, France, December 1999. Title: *The Dynamics of Spikes for Nonlocal Reaction-Diffusion Models*.
- Two invited one-hour lectures for the international conference *Singularities and Partial Differential Equations*, (organizer: H. Matano), held in Kyoto, Japan, November 1998. Title: *Dynamics of Localized Solutions of PDEs*.
- Invited one-hour lecture for the international conference *Exponential Asymptotics*, (organizers; R. O'Malley, R. Diener), held in Luminy, France, June 1998. Title: *Metastability for the Gierer-Meinhardt Model*.
- Invited lecture for the AMS short course series *Singular Perturbation Concepts of Differential Equations*, (organizers: R. O'Malley, J. Cronin), held in Baltimore, Maryland, January 1998. Title: *Asymptotic Analysis of Metastable Behavior in Differential Equations*.
- The CMS Coxeter-James lecture given at the Canadian Math Society (CMS), held at the U. Victoria, Canada, December 1997.

- Invited plenary lecture for the IMA workshop *Multiple-Time Scale Dynamical Systems*, (organizers; C.K.R.T. Jones, S. Wiggins), held at the IMA in Minneapolis, Minnesota, October, 1997. Title: *Metastability in Differential Equations*.
- Three Invited lectures for the IMA workshop *Multiple-Time Scale Dynamical Systems*, (organizers; C.K.R.T. Jones, S. Wiggins), held at the IMA in Minneapolis, Minnesota, October 1997. Titles: *Exponentially Ill-Conditioned Boundary Value Problems*, *Metastability for Reaction-Diffusion Equations*, *Pulse Dynamics*.
- Invited lecture for the international conference *Exponential Asymptotics*, (organizer; R. O'Malley), held in Luminy, France, June 1996. Title: *Exponential Asymptotics and Dynamic Metastability*.
- Invited plenary one hour lecture for the CAIMS 1996 Annual Meeting, held in Winnipeg, Canada, May 1996. Title: *Exponential Asymptotics and Dynamic Metastability*.
- Two invited one-hour lectures for the Centre de Recherches Mathematique (CRM) summer school *Boundaries, Interfaces, and Transitions*, (organizers; M. Delfour and J. Chadham), held in Banff, Alberta, June 1995. Title: *Dynamical Metastability and Singular Perturbations*.
- Invited plenary lecture for the International Congress of Industrial and Applied Mathematics (ICIAM), held in Hamburg, Germany, July 1995. Title: *Hybrid Asymptotic-Numerical Methods for Singular Perturbation Problems*.
- Invited lecture for the conference honoring Prof. Joseph Keller (organizers; J. Flaherty, J. Cole), held at RPI, Troy, New York, June 1993. Title: *On the Exponentially Slow Motion of a Viscous Shock*.
- Invited lecture for the IMA conference on *Mathematics of Semiconductor Device Modeling*, (organizer; A. Friedman), held at the U. Minnesota, July 1991. Title: *Asymptotic Methods in Semiconductor Device Modeling*.
- Invited lecture for the international NASECODE 6 Conference, (organizer; J. J. Miller), held in Dublin, Ireland, July 1989. Title: *Multiple Steady State Solutions in a Multi-Junction Semiconductor Device*.

Minisymposium Lectures

- CMS Winter Meeting, in Vancouver, December 2008, in the session *Asymptotic Analysis and Applications*. Title: *The Stability of Hotspot Patterns for a Continuum Model of Urban Crime and the Effect of Police Intervention*.
- SIAM Nonlinear Waves Meeting, in Irvine, CA, June 2018, in the session *Patterns and Localized Structures*. Title: *The Stability of Hotspots for a Three-Component Reaction-Diffusion Model of Urban Crime with Focused Police Patrol*.
- SIAM Pacific Northwest Chapter Meeting at Oregon State U., Corvallis, October 2017, in the session *Modeling and Analysis in the Life Sciences*. Title: *A Time-Delay in the Activator Kinetics Enhances the Stability of a Spike Solution to the Gierer-Meinhardt Model*.
- CAIMS Annual 2017 Meeting, in Halifax, July 2017, in the session *Dynamics of Pattern Forming Systems*. Title: *A Time-Delay in the Activator Kinetics Enhances the Stability of a Spike Solution to the Gierer-Meinhardt Model*.
- CAIMS Annual 2016 Meeting, in Edmonton, June 2016, in the session *PDEs in Math Biology and Social Interaction*. Title: *Synchronized Oscillatory Dynamics for a 1-D Model of Membrane Kinetics Coupled by Linear Bulk Diffusion*.
- Joint Mathematics Meeting, AMS Special Session, in Seattle, January 2016, in the session *Random and Complex Dynamics of RD Systems*. Title: *Slow Dynamics of Localized Spot Patterns for Reaction-Diffusion Systems on the Sphere*.
- SIAM PDE Conference, in Phoenix, Arizona, December 2015, in the session *Self-organization Phenomena in Elliptic and Parabolic Systems*. Title: *Asymptotic Analysis of a 2-D Model of Dynamically Active Compartments Coupled by Bulk Diffusion*.

- CAIMS 2015 Annual Meeting, in Waterloo, Ontario, June 2015, in the theme *Applied Analysis/Dynamical Systems*. Title: *The Dynamics of Localized Spot Patterns on the Sphere*.
- SIAM Snowbird Conference on Dynamical Systems, in Snowbird, Utah, May 2015, in the Featured Minisymposium *Localized Pattern Formation in Reaction-Diffusion Systems*. Title: *The Slow Dynamics of Localized Spot Patterns for Reaction-Diffusion Systems on the Sphere*.
- CAIMS 2014 Annual Meeting, in Saskatoon, June 2014, in the theme *Applied Analysis/Dynamical Systems*. Title: *The Stability of Periodic Spot Patterns*.
- SIAM PDE conference, in Orlando, Florida, December 2013, in the session *Dynamics of Multi-Dimensional Coherent Structures*. Title: *Logarithmic Expansions and the Stability of Periodic Patterns of Localized Spots for Reaction-Diffusion Systems*.
- SIAM Nonlinear Waves Meeting, in Seattle, Washington, December 2012, in the session *Diffusion-Driven Pattern Formation in Biological Model Systems*. Title: *Localized Hot-Spot Patterns of Urban Crime*.
- CAIMS 2012 Annual Meeting, at the Fields Institute, Toronto, June 2012, in the theme *Applied Analysis/Dynamical Systems*. Title: *The Stability of Hot-Spot Patterns of Urban Crime*.
- SIAM Life Sciences Meeting, in San Diego, CA, August 2012, in the session *Modeling Morphogenesis in Plants at the Cellular and Subcellular Level*. Title: *Nonlocal Eigenvalue Problems and the Stability of Localized Biological Patterns in Reaction-Diffusion Systems*.
- SIAM PDE Conference, in San Diego, CA, November 2011, in the session *Self-Organized Patterns and Concentration Behavior*. Title: *Concentration Behavior in a Biharmonic Nonlinear Eigenvalue Problem of MEMS*.
- ICIAM 2011, in Vancouver, July 2011, in the session *Mathematical Modeling in Cellular Biology* (co-organizers; D. Holcman, M. J. Ward). Title: *Asymptotics and Scaling Laws for Narrow Escape and Splitting Probabilities*.
- SIAM Snowbird Conference on Dynamical Systems, in Snowbird, Utah, May 2011, in the session *Dynamics of Spatially Extended Structures in Higher Order Systems*. Title *The Dynamics and Stability of Localized Spot Patterns for the Gray-Scott Model*.
- CAIMS Annual Meeting, in St. John's, Newfoundland, July 2010, in the theme *Applied Analysis*; Title: *Asymptotic Analysis of Biharmonic Nonlinear Eigenvalue Problems of MEMS*.
- SIAM Annual Meeting, in Denver, Colorado, July 2009, in the session *Contemporary Applications of Perturbation Methods*. Title: *Asymptotic Analysis of Narrow Escape Problems for Diffusion in Microdomains*.
- CMS/CSHPM meeting at Memorial University, St. John's, Newfoundland, June 2009, in the session *Reaction-Diffusion Systems and their Applications*. Title: *Diffusion on a Sphere with Localized Traps: Mean First Passage Time, Eigenvalue Asymptotics, and Fekete Points*.
- SIAM Snowbird Dynamical Systems Conference, in Snowbird, Utah, May 2009, in the session *Molecular Diffusion and Transport in Cells*. Title: *Asymptotics of Narrow Escape*.
- CMS-CAIMS-France 2008 Conference, in Montreal, Quebec, May 2008, in the session *Asymptotic Analysis of Localized Patterns in PDE*. Title: *Self-Replicating Spots for Reaction-Diffusion Systems in Two-Space Dimensions*.
- 7th AIMS International Conference on Dynamical Systems, Differential Equations, and Applications, in Arlington, Texas, May 2008, in the session *Localized Behavior of Elliptic Equations and Systems*. Title: *The Dynamics and Self-Replication of Spots for the Schnakenburg Model*.
- SIAM 2008 Nonlinear Waves Meeting, in Rome, Italy, July 2008, in the session *Self-Replication in Homogeneous Media*. Title: *Self-Replicating Patterns for Reaction-Diffusion Systems in Two-Space Dimensions*.
- SIAM Nonlinear Waves Meeting, in Seattle, Washington, September 2006, in the session *Patterns on Growing Domains*. Title: *The Dynamics of Pulses for the Gray-Scott Model*.

- CMS-SMM Conference, in Guanajuato, Mexico, September 2006, in the session *Localization in PDE*, (organizer: A. Minzoni, M. Ward). Title: *Eigenvalue Optimization, Spikes, and the Neumann Green's Function*.
- CMS Winter Meeting, in Victoria, Canada, December 2005, in the session *Nonlinear Analysis*. Title: *Eigenvalue Optimization, Spikes, and the Neumann Green's Function*.
- International conference *Free Boundaries 2005*, in Coimbra, Portugal, June 2005, in the session *Localized Patterns in PDE*. Title: *Asymptotic Analysis of Localized Patterns for the One-Dimensional Gray-Scott Model*.
- SIAM Snowbird Dynamical Systems Conference, in Snowbird, Utah, May 2005, in the session *Localized Pattern Formation*. Title: *The Stability and Dynamics of Spike Solutions to the Gierer-Meinhardt and Gray-Scott Systems: Competition and Oscillatory Instabilities*.
- ICIAM 2003, in Sydney, Australia, July 2003, in the session *Spike Dynamics*. Gave two 30 minute lectures titled: *Instabilities of Spikes for the Gray-Scott Model* and *The Dynamics of Pulses in Reaction-Diffusion Systems*.
- Canada-China 3 by 3 Conference in Mathematics, in Vancouver, September 2001, in the session *Industrial Mathematics*. Title: *The Dynamics of Hot-Spots for Microwave Heating Models*.
- SIAM 2000 Dynamical Systems Conference, in Maui, Hawaii, August 2000. Title: *Metastable Spike Solutions to a Reaction-Diffusion System*.
- Pacific Rim Conference in Mathematics, Hong Kong, January 1998, in the session *Pulsatile Solutions of Reaction-Diffusion Equations*, (organizer: M. Mimura). Title: *Metastability in the Gierer-Meinhart Model*.
- SIAM meeting on Mathematical Aspects of Material Science in Philadelphia, May 1997, in the session *Dynamics and Singular Perturbations in Phase Transitions*. Title: *The Dynamics of Slow Phase Separation Problems*.
- AMS Meeting in Corvallis, Oregon, April 1997, in the session *Singular Perturbation: Theory and Applications*. Title: *Metastability for Propagating Flame-Fronts*.
- Joint AMS-Mexican Math Society meeting in Guanajuato, Mexico, December 1995, in the session *Localization in PDE*. Title: *Slow Bubble Motion for a Phase Separation Model*.
- City U. of Hong Kong international symposium *Methods and Applications of Analysis*, in Hong Kong, December 1994. Title: *Summing Infinite Logarithmic Expansions for Problems in Singularly Perturbed Geometries*.

Lectures: Summer Schools and Mini-Courses

- One of five principal lectures for the summer school in Mathematical Biology to be held at Shanghai Jiao Tong University, Shanghai, China, in July 2019 (organizers; S. Jin, B. Perthame, J. Carillo). Title: *Localized Diffusion Problems in Biology: Modeling, Analysis, and Computation*, (will give four one-hour lectures).
- A principal lecturer for the AARMS Summer School at Dalhousie U., Halifax, July 2015. Title: *Topics in Reaction-Diffusion Systems: Theory and Applications*. (gave ten 50 minute lectures).
- One of four principal lecturers for the Fourth Winter School on Applied Mathematics, City U. of Hong Kong, December 2010 (organizer; R. Wong). Five two-hour lectures on *Singular Perturbations and Localization Behavior for Partial Differential Equation Models of Pattern Formation*. There is a 100-page online set of notes for this course on their website.
- One of six principal lecturers at the International Centre for Mechanical Sciences (CISM) in Udine, Italy, September 2009, for the workshop *Asymptotic Methods in Fluid Mechanics: Survey and Results*, (organizers; R. Klein, H. Steinruck). Gave four one-hour lectures. Title: *Asymptotic Methods for PDE Problems in Fluid Mechanics and Related Systems with Strong Localized Perturbations in Two-Dimensional Domains*.

- One of two principal lecturers at the BIRS workshop *Multiscale Analysis of Self-Organization in Biology*, (organizers; B. Perthame, T. Hillen), July 2009. Gave three 45 minute lectures at this workshop (videotaped by BIRS and available on their website). Title: *Traps, Patches, Spots, and Stripes: Localized Solutions to Diffusive and Reaction-Diffusion Systems*.

Conference and Minisymposium Organization

- Co-organized (with Ye Dong (ECNU), J. Wei (UBC), and T. Kolokolnikov (Dalhousie)) the week-long international workshop *Emerging Areas in Reaction-Diffusion Systems*, held at the East China Normal University in Shanghai, China, April 2019.
- Co-organized (with D. Holcman (ENS-Paris)) the week-long workshop *Advanced asymptotics of PDEs and applications*, held at the De Giorgi Center in Pisa, Italy, September 2018.
- Co-organized (with V. Bokhil (OSU), Y. Nec (Thompson-Rivers)) a minisymposium at the SIAM Pacific Northwest Conference held at Oregon State U., October 2017. Title: *Mathematical Modeling and Analysis in the Life Sciences*.
- Co-organized (with J. Wei (UBC) and T. Jin (HKUST)) the week-long IAS-PIMS conference *Frontiers of Theory and Applications of Nonlinear Partial Differential Equations*, held at HKUST, Hong Kong, December 2017.
- Co-organized (with T. Kolokolnikov (Dalhousie) and J. Evers (SFU)) a 12 speaker satellite workshop at CAIMS 2017, Halifax, July 2015, titled *Collective Dynamics and Synchronization*.
- Co-organized (with D. Iron (Dalhousie)) a minisymposium at the CAIMS 2016 annual meeting, held in Edmonton, Alberta, June 2016. Title: *PDEs in Math Biology and Social Interaction*.
- Co-organized (with R. Choksi (McGill) and J. Wei (UBC)), the PIMS workshop *Nonlocal Variational Problems and PDEs*, held at PIMS, UBC, June 2016.
- Co-organized (with T. Kolokolnikov (Dalhousie) and R. Carretero (SDSU)), the AARMS-PIMS workshop *Pattern Formation Problems*, held at Dalhousie U., Halifax, July, 2015.
- Co-editor of Special two special issues for the European J. Appl. Math in 2015. One titled the *Mathematics of Crime and Security*, and the second a 25th Anniversary edition for the founding of EJAM and the 75th birthday of Prof. J. Ockendon (FRS).
- Member of the Organizing Committee for the SIAM 2015 Snowbird Conference on Dynamical Systems, held in Snowbird, Utah, May 2015.
- Scientific Committee for the CAIMS 2012 annual meeting held at the Fields Institute in Toronto. Organized with L. Buono (UOIT) the *Applied Analysis/Dynamical Systems* theme at this meeting (16 invited speakers for this theme). I also co-organized with A. Oberman (McGill) and L. Buono (OIT) the same theme for the CAIMS 2014 annual meeting held in Saskatoon in June 2014. Organized with L. Buono and D. Pelinovsky (McMaster U.) the 24 speakers for the *Dynamical Systems* theme for the CAIMS 2017 Annual Meeting held in Halifax in July 2017.
- Co-wrote a successful PIMS-NSF workshop proposal on *Stability Theory*, with B. Sandstede, B. Deconinck, J. Carter and N. Kutz, that was held prior to the SIAM Nonlinear Waves Meeting in Seattle in June 2012. Approximately 40 students/postdocs attended this workshop.
- Co-organized (with D. Holcman (ECNS-Paris)) the minisymposium *Stochastic Methods in Cell Biology*, for the ICIAM 2011 in Vancouver, July 2011.
- Co-organized a BIRS 5-day workshop: *Localized Multi-Dimensional Patterns in Dissipative Systems: Theory, Modeling, and Experiments*, (co-organizers; B. Deconinck (U. Wash), A. Doelman (Leiden U.), E. Knobloch (UC Berkeley), Y. Nishiura (Hokkaido U.), B. Sandstede (Brown)), held in Banff, Alberta, July, 2011.
- Co-organized (with B. Kath (Northwestern) and T. Witelski (Duke)) the two-part minisymposium *Contemporary Applications of Perturbation Methods*, held at the SIAM Annual Meeting in Denver, Colorado, July 2009.

- Co-organized (with G. Bluman (UBC), J. King (Nottingham), P. Broadridge, (Canberra)), the PIMS international workshop, *Similarity*, held at UBC in August 2008, with 40 international participants. I was the coeditor of a triple special issue of the J. of Eng. Math, **66**(1-3), (2010), based on papers presented at our conference.
- Co-organized (with J. Wei, CUHK) the minisymposium *Localized Behavior of Elliptic equations and Systems*, for the 7th AIMS International Conference on Dynamical Systems, Differential Equations, and Applications, held in Arlington Texas, May 2008.
- Co-organized (with A. Minzoni (UNAM, Mexico)) the minsymposium *Localization in PDE*, for the first CMS-SMM meeting, held in Guanajuato, Mexico, September 2006.
- Co-organized (with J. Rademacher) the minisymposium *Localized Pattern Formation*, held at the SIAM Snowbird Dynamical Systems Meeting, Snowbird, Utah, May 2005.
- Co-organized (with A. Bernoff, P. Fife, T. Hillen, J. Wei) the BIRS workshop *Dynamics of Localized Patterns*, held in Banff, Alberta, August 2003.
- Co-organized (with J. Wei) the workshop *Analysis of Reaction-Diffusion Patterns*, held at the Chinese University of Hong Kong, May 2002.
- Co-organized (with H. Huang (York)) the PIMS workshop *Integral Equation Methods in Engineering*, held in Banff, Alberta, August 2000.
- Co-organized (with K. Promislow (SFU), M. Kropinski (SFU), A. Gupta (SFU)), the PIMS Mathematical Modeling workshop *Case Studies in Industrial Mathematics*, held at SFU, May 1998.

University Colloquia and Seminars

In more recent years, my focus has been to participate and organize various specialized minisymposia, workshops and conferences, rather than to give isolated colloquia at different universities. Previous university colloquia and seminars, which were more abundant in my early career, are as follows:

U. Minnesota (1988), UBC (1988, 1991–1993, 1996, 1998–2005, 2010–2012, 2014), Stanford (1988–1990, 1996, 1998), U. Washington (1989, 1991, 1993, 1994, 1998, 1999, 2003, 2005, 2009) RPI (1990, 1999), Claremont College (1991), UC Davis (1991, 1999), SMU (1991), NYU-Courant (1991, 1993, 1999, 2002, 2016), U. Alberta (1992, 2000, 2002, 2003, 2006), SFU (1992, 1993, 1999, 2000, 2002, 2004, 2006, 2015), Northwestern (1992, 1995, 2009), NJIT (1992, 2002), Colorado State (1992, 1993), U. Victoria (1993), Caltech (1993), U. Wisconsin (1995), UCLA (1995), Boston U. (1995), U. Delaware (1995, 1996), U. Montreal (1995), U. Utah (1995, 2015), UC Irvine (1995, 2000, 2010) U. Michigan (1996), Colorado School of Mines (1996), UC Boulder (1996), UC San Diego (1996), Oxford (1998, 1999, 2003, 2007), Imperial College (1998), Herriot-Watt (1998), U. Strathclyde (1998), U. Bath (1998), U. Nottingham (1998), Dublin City U. (1998), CUHK (1998, 1999, 2001, 2002, 2003, 2004), U. Western Ontario (1999), U. Toronto (1999), U. Waterloo (1999), Montana State (1999), City U. Hong Kong (2000), U. Arizona (2001, 2011), HKUST (2001), HK Baptist (2001), Beijing U. (2001), UBC Okanagan (2015).

Service (Selected)

In addition to the usual Mathematics department service load (hiring committees, curriculum reform, etc.) and external service (external evaluations for tenure and promotion, refereeing duties), some of the more notable service items are as follows:

- Chair of Graduate Studies, Math Department, UBC: 7/2018–date.
- Director for the Institute of Applied Math, UBC: 6/2003–9/2008.
- Member NSERC Discovery Grant Review Panel for Applied Mathematics, 9/2013–9/2016. **Panel Group Chair for Applied Mathematics**, 9/2015–9/2016. (In my role of chair, I oversaw the review process of all NSERC Discovery grants in Applied Math in Canada for the February 2016 competition).
- Member of the CRM (Centre Recherches Mathematiques, Montreal) Scientific Advisory Board from 1997–2001 and from 2018–2021.

- Member of a four-person evaluation panel for the CAIMS Senior Research Prize in Applied Mathematics in 2014 (appointed by the president of CAIMS).
- Member of a four-person evaluation panel for the CAIMS-PIMS Junior Research Prize Committee in Applied Mathematics from 2009–2012 (appointed by the president of CAIMS).
- Member of the Scientific Advisory Board of BIRS in 2010.
- Member of the MITACS Young Investigator Prize Adjudication Committee for 2010 (appointed by the president of MITACS).
- CAIMS Best Ph.D Thesis Committee chair for 2001.

University Teaching

During my PDF at Stanford, and for the past 26 years at UBC, I have taught a wide variety of undergraduate courses including Calculus I, II, Differential Equations, PDE, Vector Calculus, Linear Algebra, Complex Analysis, Green's Functions and Variational Principles, and Dynamical Systems. At the graduate level I have taught courses in Asymptotic Analysis, Perturbation Methods, Methods of Applied Mathematics, ODE/PDE Models in Math Biology, Applied PDE, Dynamical Systems, and Math Modeling/Industrial Mathematics.

I have experience coordinating large multi-section courses. In 2018 I was in charge of 1300 students, covering 9 sections, of first year integral Calculus. My teaching evaluation for this assignment was 4.7/5. I have won a Faculty of Science Killam teaching prize in 2004 (awarded to 6 faculty across the entire Faculty of Science). I have consistently received strong teaching evaluations from students and my peers. A complete list of courses taught and my teaching evaluations are available upon request.