BARTOSZ PROTAS

Professor of Mathematics
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Education:

- Ph.D. in Mechanics, Warsaw University of Technology, Poland (with distinction) and in Fluid Dynamics, Université Pierre et Marie Curie – PARIS VI, France (la mention *très honorable avec félicitations*), June 2000 ('cotutelle' degree awarded jointly by the two Universities)
- M.Sc. in Mechanical Engineering, Warsaw University of Technology (with distinction), July 1995; (major in Computational Fluid Dynamics)

Professional Experience:

- 07/2015 – present — Professor of Mathematics, McMaster University
- 07/2009 – 06/2015 — Associate Professor of Mathematics, McMaster University
- 08/2003 – 06/2009 — Assistant Professor of Mathematics, McMaster University
- 11/2000 – 08/2003 — Post–Doctoral Researcher, University of California, San Diego
- 09/1997 – 10/2000 — Ph.D. student at the Warsaw University of Technology and Université Pierre et Marie Curie, Paris
- 03/1996 – 08/1997 — Research and Teaching Assistant at the Warsaw University of Technology

Administrative Responsibilities:

- 07/2022 – 06/2023 — Acting Chair, Department of Mathematics & Statistics
- 07/2016 – 06/2021 — Associate Chair for Graduate Studies, Department of Mathematics & Statistics
- 07/2009 – 12/2019 — Director of McMaster's School of Computational Science and Engineering (an interdisciplinary graduate program)

Primary Research Interests:

- Theoretical and Computational Fluid Dynamics
- Applied and Industrial Mathematics
- Scientific Computing
- Optimization and Optimal Control
- Nonequilibrium Thermodynamics and Electrochemistry

Honours & Awards:

- Visiting Professorship at the University College Dublin (Dublin, Ireland), 2018 (3 weeks), 2019 (3 weeks), 2022 (1.5 week)

- JSPS Visiting Fellow at Kyoto University (Kyoto, Japan), 2017 (2 months)
- Visiting Professorship at Laboratoire de Mathématiques Raphaël Salem (Université de Rouen, France), 2017 (3 weeks)
- Visiting Professorship at Laboratoire de Mathématiques Raphaël Salem (Université de Rouen, France), 2015 (1 month)
- Visiting Professorship at the Department of Mathematics, Chinese University of Hong Kong, 2014 (2 weeks)
- Visiting Professorship at the Department of Mathematics, Kyoto University (Japan), 2014 (2 weeks)
- Visiting Professorship at Laboratoire de Mathématiques Raphaël Salem (Université de Rouen, France), 2013 (1 month)
- Invited lecture in the *Seminaire de Mathématiques Appliquées* at Collège de France with P.-L. Lions (Fields Medal, 1994) as the Chairman of the Scientific Committee, March 2012
- Visiting Professorship at Institute PPrime (Poitiers, France), 2012 (6 weeks)
- Visiting Professorship at the Warsaw University of Technology (Poland), 2011 (1 month)
- Visiting Professorship at Université Bordeaux I (France), 2009 (1 month)
- Early Researcher Award (ERA), 2008
- Visiting Position with the "Bridging the Gaps" program at the University of Sheffield, UK, 2007 (3 weeks)
- Visiting Professorship at Université Pierre et Marie Curie – PARIS VI (France), 2006 (1 month)
- Visiting Professorship at École Supérieure de Physique et de Chimie Industrielles in Paris (France), 2005 (1 month)
- Visiting Professorship at École Normale Supérieure in Paris (France), 2003–2004 (6 months)
- SHARCNET Chair in Scientific Computation, 2003–2005
- Polish Society for Theoretical and Applied Mechanics Award, 1998
- Foundation for Polish Science Fellowship, 1998

Post–doctoral and Graduate Supervision:

- Dr. Xinyu Zhao (post–doctoral fellow, 2021–present)
- Dr. Lindsey Daniels (post–doctoral fellow, 2020–2022)
  Assistant Professor (teaching stream) at the University of British Columbia (as of July 2022)
- Dr. Di Kang (post–doctoral fellow, 2018–2021)
- Dr. José Morales Escalante (post–doctoral fellow, 2018–2020)
  currently Assistant Professor at the University of Texas San Antonio
- Dr. William Ko (post–doctoral fellow, 2017–2018)
  currently with NumerixS Quant, Canada
- Dr. Dongfang Yun (post–doctoral fellow, 2015–2018)
  currently Lecturer at the Nanjing Institute of Technology, China
- Dr. Francesc Font (post–doctoral fellow, 2016–2017)
  currently Assistant Professor at the Universitat Politècnica de Catalunya

- Dr. Jamie Foster (post–doctoral fellow, 2014–2016)
  currently Reader at the University of Portsmouth, UK
- Dr. Adam Gully (post–doctoral fellow, 2012–2014)
  currently Director of Data Science at Progressive Leasing, USA
- Dr. Seshasai Srinivasan (post–doctoral fellow, 2012–2013)
  currently Assistant Professor with BTech Program at McMaster University
- Dr. Dali Zhang (post–doctoral fellow, 2011–2012)
- Dr. Agegnehu Atena (post–doctoral fellow, 2010–2011)
  currently Associate Professor at the Savannah State University, Savannah, USA
- Dr. Ramesh Yapalparvi (post–doctoral fellow, 2009–2011)
- Dr. Oleg Volkov (post–doctoral fellow, 2007–2009);
  currently Research Associate at Stanford University, USA
- Dr. Wenyuan Liao (post–doctoral fellow, 2005–2007);
  currently Professor of Mathematics at the University of Calgary
- Dr. Vladislav Bukshtynov (Ph.D. student 2008–2012; recipient of the 2012 Cecil Graham Dissertation Award of the Canadian Applied and Industrial Mathematics Society);
  currently Assistant Professor at Florida Institute of Technology, USA
- Dr. Jonathan Gustafsson (Ph.D. student 2007–2012, M.Sc. student 2006–2007);
  currently with Volvo Group, Sweden
- Diego Ayala (Ph.D. student 2010–2014; recipient of the 2014 Cecil Graham Dissertation Award of the Canadian Applied and Industrial Mathematics Society; M.Sc. student 2008–2010);
  currently with Spectrum Effect, Mexico
- Athinthra Krishnaswamy Sethurajan (Ph.D. student 2014–2019; M.Sc. student 2012–2014)
  currently Data Science Team Lead at Public Health Agency of Canada
- Pritpal Matharu (Ph.D. student, 2018–2022; M.Sc. student, 2016–2018; recipient of a fellowship from the Japanese Society for the Promotion of Science); currently post-doc at KTH, Sweden
- Sadia Masud (M.Sc. student, 2022–present)
- Elkin Ramirez (Ph.D. student, 2020–present; M.Sc. student, 2018–2020)
- Avesta Ahmadi (Ph.D. student, 2020–present; M.Sc. student, 2018–2020; MITACS Accelerate intern with Pulsenics Inc.)
- Sergei Melkoumian (Ph.D. student 2015–2016; M.Sc. student, 2014)
  currently with Altair, Canada
- Mark Baczkowski (M.Sc. student, 2017–2019; co-supervised)
- Alec Mitchell (M.Sc. student, 2018–2020)
  currently with Gamma Technologies, USA
- Adam Śliwiak (M.Sc. student, 2015–2017)
  currently Ph.D. student at the Massachusetts Institute of Technology, USA
- Mohammad Javanmard (M.Sc. student, 2016–2017)
- James Arias (M.Sc. student, 2013–2014)
  currently with Weaver Labs, UK

- Katya Niakhai (M.Sc. student, 2011–2013)
  currently with PointClickCare, Canada
- Xiaohui Peng (M.Sc. student, 2009–2011);
  currently Ontario Teachers' Pension Plan, Canada
- Xiaohui Li (M.Sc. student, 2006; transferred to the coursework program)
- Md. Shah Noor (M.Sc. student, 2004–2005)

Journal Editorship:

- 2021 – 2023 — Guest Editor (together with S. Llewellyn Smith and T. Sakajo) of the theme issue "Applied and Computational Complex Analysis in the Study of Nonlinear Phenomena" of *Physica D* (due to appear in mid 2023)
- 2020 – 2022 — Guest Editor (together with Ch. Doering, D. Goluskin and J.-L. Thiffeault) of the theme issue "Mathematical problems in physical fluid dynamics" of *Philosophical Transactions of the Royal Society A*, DOI: 10.1098/rsta.2021.0056
- 2014 – present — Member of Editorial Board (Associate Editor) of *Journal of Computational Science*
- 2009 – 2022 — Member of Editorial Board (Associate Editor) of *International Journal of Computer Mathematics — Series B*

Organization of Scientific Meetings:

- Workshop "Vortex Dynamics: the Crossroads of Mathematics, Physics and Applications" at the Institute for Advanced Study in Mathematics (IASM) in Hangzhou, China (planned for December 2023).
- Workshop "Complex Analysis: Recent Progress in Techniques, Applications and Computations" at the Isaac Newton Institute in Cambridge, UK (planned for July 2023).
- Thematic Program "Complex Analysis: Techniques, Applications and Computations" at the Isaac Newton Institute in Cambridge, UK, during September–December 2019.
- Workshop "Scientific Computing Across Scales: Extreme Events and Criticality in Fluid Mechanics" at the Fields Institute in Toronto, ON, in April 2019.
- *Southern Ontario Numerical Analysis Day (SONAD 2017)*, Hamilton, ON, May 19, 2017.
- *Winter Meeting of the Canadian Mathematical Society*, Niagara Falls, ON, December 2–5, 2016 [Scientific Co-Director].
- Thematic Program "Multiscale Scientific Computing: From Quantum Physics and Chemistry to Material Science and Fluid Mechanics" at the Fields Institute in Toronto (January–April 2016).
- Workshop "Modern Applications of Complex Variables: Modeling, Theory and Computation (15w5052)" at Banff International Research Station (BIRS), Banff, AB, in January 2015.
- *Canadian Symposium on Fluid Dynamics*: CSFD 2010 held in St. John's, NL, on July 17–20, 2010, and CSFD 2012 to be held in Toronto, ON, on June 24–28, 2012 [Scientific Committee].
- *Workshop on Computational Optimization, Modelling and Simulation*, a part of *International Conference on Computational Science*: held in Amsterdam, the Netherlands, on May 31–June 2, 2010 and to be held in Tsukuba, Japan on June 1–3, 2011 [Scientific Committee].
- *High Performance Computing and Simulation Symposia*: HPCS 2008 held in Ottawa, ON, on April 14–16, 2008, and HPCS 2009 held in San Diego, CA, on March 22–27, 2009 [Scientific Committee].

- *Second Mathematical Programming Society International Conference on Continuous Optimization* held in Hamilton, ON, on August 13-16, 2007 [Organizing Committee].

Membership:

- American Physical Society
- Society for Industrial and Applied Mathematics
- Canadian Applied and Industrial Mathematics Society

Research Funding:

Council / Agency	Role	Amount	Time
Compute Canada (computing time)	PI	$36,541	2022 — 2023
MITACS — Accelerate	PI	$30,000	2022 — 2023
Compute Canada (computing time)	PI	$32,913	2021 — 2022
NSERC — Discovery	PI	$43,000 (pa)	2020 — 2025
Compute Canada (computing time)	PI	$33,189	2020 — 2021
Compute Canada (computing time)	PI	$14,709	2019 — 2020
University College Dublin Seed Grant	Co-PI	€7,000	2018 — 2020
Compute Canada (computing time)	PI	$16,331	2018 — 2019
Compute Canada (computing time)	PI	$34,163	2017 — 2018
NSERC — Collaborative Research & Development	Co-PI	$45,250 (pa)	2016 — 2020
NSERC — Strategic Project Grant	Co-PI	$46,000 (pa)	2016 — 2018
Compute Canada (computing time)	PI	$19,600	2014 — 2015
NSERC — Discovery	PI	$34,000 (pa)	2014 — 2019
Automotive Partnership Canada (APC)	Co-PI	$81,428 (pa)	2012 — 2015
AUTO21	PI	$16,000 (pa)	2009 — 2011
NSERC — Discovery	PI	$16,000 (pa)	2009 — 2014
Going Global Fund	PI	$9,835 (total)	2008 — 2009
Early Researcher Award	PI	$150,000 (total)	2008 — 2013
SHARCNET Graduate Fellowship	PI	$13,000 (pa)	2008 — 2009
Ontario Centres of Excellence	PI	$31,050 (pa)	2007 — 2009
NSERC — Collaborative Research & Development	PI	$30,050 (pa)	2007 — 2010
General Motors of Canada	PI	$28,000 (pa)	2007 — 2009
NSERC — Research Tools & Instruments	Co–PI	$149,288 (total)	2006
McMaster Centre for Advanced Material & Manufacturing	PI	$16,000 (pa)	2005 — 2006
NSERC — Collaborative Research & Development	PI	$30,000 (pa)	2005 — 2006
General Motors of Canada	PI	$20,000 (pa)	2005 — 2006
NSERC — Discovery	PI	$12,000 (pa)	2004 — 2009

Courses & Modules Taught at McMaster (since 2004):

- Undergraduate: *Mathematical Physics II* (Winter 2020), *Numerical Methods for Differential Equations* (Winter 2005, Winter 2007), *Calculus for Business, Humanities and the Social Science* (Winter 2006, Winter 2013, Winter 2020), *Introduction to Modelling* (Fall 2006), *Numerical Interpolation and Approximation Theory* (Winter 2007), *Numerical Linear Algebra* (Winter 2008), *Engineering Mathematics I* (Fall 2008, Winter 2011), *Engineering Mathematics II* (Winter 2009), *Engineering Mathematics III* (Fall 2009), *Engineering Mathematics IV* (Winter 2010, Winter 2014, Winter 2015, Winter 2019), *Numerical Explorations* (Fall 2015, Winter 2017)

- Graduate: *Topics in Numerical Analysis* (Winter 2004, Fall 2004, Fall 2005, Fall 2012, Fall 2014, Fall 2016, Fall 2021), *Foundations of Computational Finite Element Methods* (Fall 2007), *Introduction to Particle Methods* (Fall 2007), *Applied Mathematics I* (Fall 2010, Fall 2015, Fall 2020), *Applied Mathematics II* (Winter 2021), *Mathematical and Computational Fluid Dynamics* (Fall 2013)

International Lecturing (Graduate Schools):

- Tutorial on the topic "Numerical solution of PDE-constrained optimization problems" presented during the Thematic Program *Mathematical aspects of turbulence: where do we stand?* at the Isaac Newton Institute, Cambridge, UK, January 26–27, 2022.
- Lectures on the topic "Numerical optimization of partial differential equations" at the Graduate School during *Rencontres Normandes sur les aspects théoriques et numériques des EDP* in Rouen, France, November 5–7, 2018.
- Lectures on the topic "Optimization and Control Problems in Fluid Mechanics" delivered during the *Winter School on Stochastic Analysis and Control of Fluid Flow* in Thiruvananthapuram, India, December 3–20, 2012.

Journal Articles — Review Papers

1. B. Protas, "Systematic Search For Extreme and Singular Behavior in Some Fundamental Models of Fluid Mechanics", *Philosophical Transactions of the Royal Society A* **380**, 20210035, 2022.

2. B. Protas, "Vortex Dynamics Models in Flow Control Problems", *Nonlinearity* **21**, R203–R250 (invited paper), 2008.

Journal Articles — Research Papers

3. A. Novruzi and B. Protas, "An accelerated Sobolev gradient method for unconstrained optimization problems based on variable inner products", *Journal of Computational and Applied Mathematics* **420**, 114833, 2023.

4. P. Matharu, T. Yoneda and B. Protas, "On Maximum Enstrophy Dissipation in 2D Navier-Stokes Flows in the Limit of Vanishing Viscosity", *Physica D* **441**, 133517, 2022.

5. E. Ramírez and B. Protas, "Singularity formation in the deterministic and stochastic fractional Burgers equation", *Physica D* **440**, 133432, 2022.

6. A. Ahmadi, J. M. Foster and B. Protas, "Data-driven optimal closures for mean-cluster models: Beyond the classical pair approximation" *Physical Review E* **106**, 025313, 2022.

7. D. Kang and B. Protas, "Searching for Singularities in Navier-Stokes Flows Based on the Ladyzhenskaya-Prodi-Serrin Conditions", *Journal of Nonlinear Science* **32**, 81, 2022.

8. P. Matharu and B. Protas, "Optimal Eddy Viscosity in Closure Models for 2D Turbulent Flows", *Physical Review Fluids* **7**, 044605, 2022.

9. D. Diaz-Arriba, B. Protas, G. Acher, F. Pons, L. David, "Application of a Variational Approach to the Computation of Forces around a Wing", *Experiments in Fluids* , **63**, 31, 2022.

10. J. Morales Escalante, S. Sahu, J. M. Foster and B. Protas, "On Uncertainty Quantification in the Parametrization of Newman-Type Models of Lithium-Ion Batteries", *Journal of The Electrochemical Society* **168** 110519, 2021.

11. B. Protas, S. G. Llewellyn Smith and T. Sakajo, "Finite rotating and translating vortex sheets", *Journal of Fluid Mechanics* **923**, A23, 2021.

12. B. Protas, "Stability of Confined Vortex Sheets", *Theoretical and Computational Fluid Dynamics* **35**, 109-118, 2021.

13. J. Morales Escalante, W. Ko, J. M. Foster, S. Krachkovskiy, G. Goward, and B. Protas, "Discerning models of phase transformations in porous graphite electrodes: insights from inverse modelling based on MRI measurements", *Electrochimica Acta* **349** , 136290, 2020.

14. D. Kang, D. Yun and B. Protas, "Maximum Amplification of Enstrophy in 3D Navier-Stokes Flows", *Journal of Fluid Mechanics* **893**, A22, 2020.

15. B. Protas and T. Sakajo, "Rotating Equilibria of Vortex Sheets", *Physica D* **403**, 132286, 2020.

16. P. Matharu and B. Protas, "Optimal Closures in a Simple Model for Turbulent Flows", *SIAM Journal on Scientific Computing* **42**, B250-B272, 2020.

17. N. Kevlahan, R. Khan and B. Protas, "Variational data assimilation for the shallow water equations", *Advances in Computational Mathematics* **45**, 3195–3216, 2019.

18. B. Protas, "Linear Stability of Inviscid Vortex Rings to Axisymmetric Perturbations", *Journal of Fluid Mechanics* **874**, 1115–1146, 2019.

19. A. K. Sethurajan, J. M. Foster, G. Richardson, S. A. Krachkovskiy, J. D. Bazak, G. R. Goward and B. Protas, "Incorporating Dendrite Growth into Continuum Models of Electrolytes: Insights from NMR Measurements and Inverse Modelling", *Journal of The Electrochemical Society* **166**, A1591–A1602, 2019.

20. A. K. Sethurajan, S. A. Krachkovskiy, G. R. Goward and B. Protas, "Bayesian Uncertainty Quantification in Inverse Modelling of Electrochemical Systems", *Journal of Computational Chemistry* **40**, 740–752, 2019.

21. B. Protas and T. Sakajo, "Harnessing the Kelvin-Helmholtz Instability: Feedback Stabilization of an Inviscid Vortex Sheet", *Journal of Fluid Mechanics* **852**, 146–177, 2018.

22. G. Richardson, J. M. Foster, A. K. Sethurajan, S. A. Krachkovskiy, I. C. Halalay, G. R. Goward and B. Protas, "The Effect of Ionic Aggregates on the Transport of Charged Species in Lithium Electrolyte Solutions", *Journal of The Electrochemical Society* **165**, H561–H567, 2018.

23. F. Font, B. Protas, G. Richardson and J. M. Foster, "Binder migration during drying of lithium-ion battery electrodes: Modelling and comparison to experiment", *Journal of Power Sources* **393**, 177–185, 2018.

24. I. Danaila and B. Protas, "Computation of Ground States of the Gross-Pitaevskii Functional via Riemannian Optimization", *SIAM Journal on Scientific Computing* **39**, B1102–B1129, 2017.

25. J. M. Foster, S. J. Chapman, G. Richardson and B. Protas, "A mathematical model for mechanically-induced deterioration of the binder in lithium-ion electrodes", *SIAM Journal on Applied Mathematics* **77**, 2172–2198, 2017.

26. D. Poças and B. Protas, "Transient Growth in Stochastic Burgers Flows", *Discrete and Continuous Dynamical Systems — B* **23**, 2371–2391, 2018.

27. D. Yun and B. Protas, "Maximum Rate of Growth of Enstrophy in Solutions of the Fractional Burgers Equation", *Journal of Nonlinear Science* **28**, 395-422, 2018.

28. R. Nelson, B. Protas and T. Sakajo, "Linear feedback stabilization of point vortex equilibria near a Kasper Wing", *Journal of Fluid Mechanics* **827** 121–154, 2017.

29. K. J. Harris, J. M. Foster, M. Z. Tessaro, M. Jiang, X. Yang, Y. Wu, B. Protas, and G. R. Goward, "Structure Solution of Metal-Oxide Li Battery Cathodes from Simulated Annealing and Lithium NMR Spectroscopy", *Chemistry of Materials* **29**, 5550–5557, 2017.

30. J. M. Foster, X. Huang, M. Jiang, S. J. Chapman, B. Protas and G. Richardson,, "Causes of binder damage in porous battery electrodes and strategies to prevent it", *Journal of Power Sources* **350**, 140–151, 2017.

31. D. Ayala and B. Protas, "Extreme vortex states and the growth of enstrophy in three-dimensional incompressible flows", *Journal of Fluid Mechanics* **818**, 772–806, 2017.

32. B. Protas and A. Elcrat, "Linear Stability of Hill's Vortex to Axisymmetric Perturbations", *Journal of Fluid Mechanics* **799**, 579–602, 2016.

33. S. Melkoumian and B. Protas, "Drift Due to Two Obstacles in Different Arrangements", *Theoretical and Computational Fluid Dynamics* **30**, 529–542, 2016.

34. H. Liu, J. M. Foster, A. Gully, S. Krachkovskiy, M. Jiang, Y. Wu, X. Yang, B. Protas, G. R. Goward, G. A. Botton, "Three-dimensional investigation of cycling-induced microstructural changes in lithium-ion battery cathodes using focused ion beam/scanning electron microscopy", *Journal of Power Sources* **306**, 300–308, 2016.

35. A. K. Sethurajan, S. Krachkovskiy, I. C. Halalay, G. R. Goward and B. Protas, "Accurate Characterization of Ion Transport Properties in Binary Symmetric Electrolytes Using In-Situ NMR Imaging and Inverse Modeling", *The Journal of Physical Chemistry — B* **119**, 12238–12248, 2015.

36. I. Danaila and B. Protas, "Optimal Reconstruction of Inviscid Vortices", *Proceedings of the Royal Society A* **471**, 20150323, 2015.

37. J. Foster, A. Gully, H. Liu, S. Krachkovskiy, Y. Wu, S. B. Schougaard, M. Jiang, G. Goward, G. A. Botton, B. Protas, "A Homogenization Study of the Effects of Cycling on the Electronic Conductivity of Commercial Lithium-ion Battery Cathodes", *The Journal of Physical Chemistry — C* **119**, 12199-12208, 2015.

38. J. Gustafsson and B. Protas, "Computation of Steady Incompressible Flows in Unbounded Domains", *Computers and Fluids* **112**, 94–107, 2015.

39. B. Protas, B. Noack, and J. Östh, "Optimal Nonlinear Eddy Viscosity in Galerkin Models of Turbulent Flows", *Journal of Fluid Mechanics* **766**, 337–367, 2015.

40. S. Melkoumian and B. Protas, "Wake Effects on Drift in Two-Dimensional Inviscid Incompressible Flows", *Physics of Fluids* **26**, 123601, 2014.

41. A. Gully, H. Liu, S. Srinivasan, A. K. Sethurajan, S. Schougaard, and B. Protas, "Effective Transport Properties of Porous Electrochemical Materials — A Homogenization Approach", *Journal of The Electrochemical Society*, **161** (focus issue "On Mathematical Modeling of Electrochemical Systems at Multiple Scales"), E3066–E3077 2014.

42. D. Ayala and B. Protas, "Maximum Palinstrophy Growth in 2D Incompressible Flows", *Journal of Fluid Mechanics* **742** 340–367, 2014.

43. D. Ayala and B. Protas, "Vortices, Maximum Growth and the Problem of Finite-Time Singularity Formation", *Fluid Dynamics Research*, (Special Issue for IUTAM Symposium on Vortex Dynamics), **46** 031404, 2014.

44. B. Protas, B. Noack, and M. Morzyński, "An Optimal Model Identification For Oscillatory Dynamics With a Stable Limit Cycle", *Journal of Nonlinear Science* **24**, 245-275, 2014.

45. X. Peng, K. Niakhai and B. Protas, "A Method for Geometry Optimization in a Simple Model of Two-Dimensional Heat Transfer", *SIAM Journal on Scientific Computing* **35**, B1105–B1131, 2013.

46. V. Bukshtynov and B. Protas, "Optimal Reconstruction of Material Properties in Complex Multiphysics Phenomena", *Journal of Computational Physics* **242**, 889–914, 2013.

47. A. Elcrat and B. Protas, "A Framework for Linear Stability Analysis of Finite-Area Vortices", *Proceedings of the Royal Society A*, **469**, 20120709, 2013.

48. R. Yapalparvi and B. Protas, "Computation of Effective Free Surfaces in Two Phase Flows", *Physics of Fluids* **24**, 087101, 2012.

49. J. Gustafsson and B. Protas, "On Oseen Flows for Large Reynolds Numbers", *Theoretical and Computational Fluid Dynamics* **27**, 665–680, 2013.

50. B. Protas, "Vortex Design Problem", *Journal of Computational and Applied Mathematics* **236**, 1926–1946, 2012.

51. J.C.-F. Wong and B. Protas, "Application of Scaled Nonlinear Conjugate–Gradient Algorithms To The Inverse Natural Convection Problem", *Optimization Methods and Software* **28**, 159–185, 2013.

52. B. Protas, "On Calculation of Hydrodynamic Forces for Steady Flows in Unbounded Domains", *Journal of Fluids and Structures* **27**, 1455–1460, 2011.

53. D. Ayala and B. Protas, "On Maximum Enstrophy Growth in a Hydrodynamic System", *Physica D* **240**, 1553–1563, 2011.

54. V. Bukshtynov, O. Volkov, and B. Protas, "On Optimal Reconstruction of Constitutive Relations", *Physica D* **240**, 1228–1244, 2011.

55. M. Farazmand, N. K. R. Kevlahan and B. Protas, "Controlling the dual cascade of two–dimensional turbulence", *Journal of Fluid Mechanics* **668**, 202–222, 2011.

56. J. Gustafsson and B. Protas, "Regularization of the Backward–in–Time Kuramoto–Sivashinsky Equation", *Journal of Computational and Applied Mathematics* **234**, 398–406, 2010.

57. F. Gallizio, A. Iollo, B. Protas, L. Zannetti, "On Continuation of Inviscid Vortex Patches", *Physica D* **239**, 190–201, 2010.

58. O. Volkov, B. Protas, W. Liao and D. Glander "Adjoint–Based Optimization of Thermo–Fluid Phenomena in Welding Processes" *Journal of Engineering Mathematics*, **65**, 201–220, 2009.

59. O. Volkov and B. Protas, "An inverse model for a free–boundary problem with a contact line: steady case", *Journal of Computational Physics* **228**, 4893–4910, 2009.

60. B. Protas "Adjoint–Based Optimization of PDE Systems with Alternative Gradients" *Journal of Computational Physics* **227**, 6490–6510, 2008.

61. B. Protas and W. Liao "Adjoint–Based Optimization of PDEs in Moving Domains" *Journal of Computational Physics* **227**, 2707–2723, 2008.

62. B. Protas, "On an Attempt to Simplify the Quartapelle–Napolitano Approach to Computation of Hydrodynamic Forces in Open Flows", *Journal of Fluids and Structures* **23**, 1207–1214, 2007.

63. B. Protas, "Center Manifold Analysis of a Point–Vortex Model of Vortex Shedding with Control", *Physica D* **228** (2), 179–187, 2007.

64. B. Protas, "Higher–order Föppl models of steady wake flows", *Physics of Fluids* **18**(11), 117109, 2006.

65. B. Protas, "Linear Feedback Stabilization of Laminar Vortex Shedding Based on a Point Vortex Model", *Physics of Fluids* **16**(12), 4473-4488, 2004.

66. T. R. Bewley and B. Protas, "Skin friction and pressure: the "footprints" of turbulence", *Physica D* **196**(1-2), 28-44, 2004.

67. B. Protas, T. R. Bewley and G. Hagen, "A comprehensive framework for the regularization of adjoint analysis in multiscale PDE systems", *Journal of Computational Physics* **195**(1), 49-89, 2004.

68. B. Protas and J. E. Wesfreid, "On the Relation Between the Global Modes and the Spectra of Drag and Lift in Periodic Wake Flows", *Comptes Rendus de l'Académie des Sciences IIb — Mécanique* **331**, 49-54, 2003.

69. B. Protas, "On the "Vorticity" Formulation of the Adjoint Equations and its Solution Using Vortex Method", *Journal of Turbulence* **3**, 048, 2002.

70. B. Protas, M. Farge and K. Schneider, "Geometrical alignment properties in Fourier and wavelet filtered forced two-dimensional turbulence", *Physical Review E* **66**, 046307, 2002.

71. B. Protas and A. Styczek, "Optimal Rotary Control of the Cylinder Wake in the Laminar Regime", *Physics of Fluids* **14**(7), 2073–2087, 2002.

72. B. Protas and J.-E. Wesfreid, "Drag Force in the Open-Loop Control of the Cylinder Wake in the Laminar Regime", *Physics of Fluids* **14**(2), 810–826, 2002.

73. B. Protas, A. Styczek, and A. Nowakowski, "An effective approach to computation of forces in viscous incompressible flows", *Journal of Computational Physics* **159**, 231–245, 2000.

74. B. Protas, A. Babiano, and N. K.-R. Kevlahan, "On geometrical alignment properties of two-dimensional forced turbulence", *Physica D* **128**, 169–179, 1999.

75. B. Protas, "Computational study of the wake control problem", *Journal of Theoretical and Applied Mechanics* **37**(1), 13–27, 1999.

76. E. Gaudin, B. Protas, S. Goujon-Durand, J. Wojciechowski, and J.-E. Wesfreid, "Spatial properties of velocity structure functions in turbulent wake flows", *Physical Review E* **57**(1), R9–R12, 1998.

77. B. Protas, S. Goujon–Durand, and J.-E. Wesfreid, "Scaling properties of two dimensional turbulence in wakes behind bluff bodies", *Physical Review E* **55**(4), 4165–4169, 1997.

Conference Proceedings

78. D. Diaz, B. Protas, F. Pons and L. B. David, "Application of the Variational Approach for the Computation of Forces around a Wing and Comparison with other Methods", *Proceedings of the 13th International Symposium on Particle Image Velocimetry*, Munich, Germany, July 22-24, 2019.

79. B. Protas, "From the Velocity and Vorticity Fields to Hydrodynamic Forces — A Survey of Mathematical and Computational Approaches", In L. David (Ed.) *Proceedings of the Workshop on Non-Intrusive Measurements for Unsteady Flows and Aerodynamics in Poitiers, France, October 27-29, 2015.*

80. D. Ayala and B. Protas, "On the Maximum Enstrophy Growth in Burgers Equation", *Journal of Physics: Conference Series* **318**, 022043, 2011.

81. B. Protas, "Nonlinear Preconditioning in Problems of Optimal Control for Fluid Systems", In L. Cortelezzi and I. Mezic (Eds.), "Analysis and Control of Mixing with an Application to Micro and Macro Flow Processes", CISM Courses and Lectures **510**, Springer, 2009.

82. B. Protas, "Vortex models for feedback stabilization of wake flows", In R. King (Ed.), *Active Flow Control (Notes on Numerical Fluid Mechanics and Multidisciplinary Design)*, 422–436, Springer, 2007.

83. B. Protas, "Reduced–Order Optimal Feedback Control of Transition in Bluff Body Wake Flows", In H. I. Andersson and P.-Å. Krogstad, Eds., *Advances in Turbulence X*, 45–48, CIMNE Barcelona, 2004.

84. B. Protas and T. Bewley, "Regularization opportunities in the adjoint analysis of multiscale systems", In I. P. Castro et al., Eds., *Advances in Turbulence IX*, 505–508, CIMNE Barcelona, 2002.

85. T. Bewley and B. Protas, "Skin friction and pressure: the "footprints" of turbulence", Proceedings of the *3rd Symposium on Smart Control of Turbulence*, Tokyo, 2002.

86. B. Protas, K. Schneider, and M. Farge, "Alignment properties in Fourier and wavelet filtered forced two-dimensional turbulence", In C. Dopazo et al., Eds., *Advances in Turbulence VIII*, 793–796, CIMNE Barcelona, 2000.

87. B. Protas and A. Styczek, "Flow in a 2D duct with moving boundaries — vortex blob approach", In H. Cottet, Y. Gagnon, A. Giovannini, and E. Meiburg, Eds., *Vortex Flows and Related Numerical Methods*, volume 7 of *European Series in Applied and Industrial Mathematics - Proceedings*, 349–358. EISAM, 1999.

88. B. Protas and A. Styczek, "Theoretical and computational study of the wake control problem", In G. E. A. Meier and P. R. Viswanath, Eds., *Mechanics of Passive and Active Flow Control - Proceedings of the IUTAM Symposium held in Göttingen, Germany, 7 - 11 September 1998*, volume 53 of *Fluid Mechanics and its Applications*, 237–242. Kluwer, 1999.

89. B. Protas and A. Babiano, "On geometrical alignment properties of two-dimensional forced turbulence", In Uriel Frisch, Ed., *Advances in Turbulence VII*, 433–436, Kluwer, 1998.

90. B. Protas, A. Nowakowski, and S. Goujon-Durand, "Influence of the obstacle geometry on the dynamical properties of the von Karman vortex street", *Zeitschrift zur Angewandte Mathematik und Mechanik* **78**, 675–676, 1998.

91. B. Protas and J.-E. Wesfreid, "Stretching of vorticity gradients in two-dimensional wake flow" In *Proceedings of the 11th Symposium on Turbulent Shear Flows*, number 10-1, Grenoble, 1997.

92. E. Gaudin, B. Protas, S. Goujon-Durand, J. Wojciechowski, and J.-E. Wesfreid, "On the spatial properties of turbulence in wake flows". In *Advances in Turbulence VI*, pages 275–276. Kluwer, 1996.

Preprints

93. D. Kang, B. Protas and M. D. Bustamante, "Alignments of Triad Phases in 1D Burgers and 3D Navier-Stokes Flows", (see `arXiv:2105.09425`), 2021.

Other

94. D. Goluskin, B. Protas and J.-L. Thiffeault, "Editorial: Mathematical problems in physical fluid dynamics: part I", *Philosophical Transactions of the Royal Society A* **380**, 20210056, 2022.

95. D. Goluskin, B. Protas and J.-L. Thiffeault, "Editorial: Mathematical problems in physical fluid dynamics: part II", *Philosophical Transactions of the Royal Society A* **380**, 20210057, 2022.

96. R. Yapalparvi, V. Bukshtynov, and B. Protas, "Optimization and Parameter Estimation in MIG Welding — Reconstruction of Material Properties and Computation of Effective Surfaces in Complex Multiphysics Systems", Report #5 for the Collaborative Project *Inverse Methods in Computational Modelling of Welding Processes*, 2012.

97. A. Atena, R. Yapalparvi, V. Bukshtynov, and B. Protas, "Optimization and Parameter Estimation in MIG Welding — Multi-Objective Framework and Modelling Mass Transfer with Effective Surfaces", Report #4 for the Collaborative Project *Inverse Methods in Computational Modelling of Welding Processes*, 2011.

98. A. Atena, R. Yapalparvi, V. Bukshtynov, O. Volkov, and B. Protas, "Optimization and Parameter Estimation in MIG Welding — Towards Multi-Objective Framework and Modelling Mass Transfer with Effective Surfaces", Report #3 for the Collaborative Project *Inverse Methods in Computational Modelling of Welding Processes*, 2010.

99. O. Volkov, R. Yapalparvi, V. Bukshtynov, B.'Protas, "Modelling, Optimization and Estimation of the Systems Involving Interaction with Plasma Column", Report #2 for the Collaborative Project *Inverse Methods in Computational Modelling of Welding Processes*, 2009.

100. O. Volkov, V. Bukshtynov, B. Protas, "A unified approach to solving free-boundary and inverse problems for a stationary weld pool, with some notes on the related problem of parameter estimation", Report #1 for the Collaborative Project *Inverse Methods in Computational Modelling of Welding Processes*, 2008.

101. W. Liao and B. Protas, "Optimization Methodology", Report #3 for the Collaborative Project *Computational Optimization of a Single-Sided Welding Processes — Theory, Methods, and Automotive Applications*, 2007.

102. W. Liao and B. Protas, "Improvements of the Simulation Methodology", Report #2 for the Collaborative Project *Computational Optimization of a Single-Sided Welding Processes — Theory, Methods, and Automotive Applications*, 2006.

103. W. Liao and B. Protas, "Statement of the Optimization Problem", Report #1 for the Collaborative Project *Computational Optimization of a Single-Sided Welding Processes — Theory, Methods, and Automotive Applications*, 2005.

104. B. Protas and P. Wald, "Parallel Implementation of Fast Multipole Algorithm for N-Body Problem", Warsaw University of Technology internal report, (1999).

Recent Invited Presentations

- *Winter Meeting of the Canadian Mathematical Society (session "Calculus of Variations and its Applications")*, Toronto, ON, December 2022.
- *24th Midwest Optimization Meeting*, The University of Waterloo, Waterloo, ON , October, 2022.
- *SIAM 2022 Annual Meeting (minisymposium "Recent Advances in Numerical Algorithms for Systems Modeled by PDEs")*, Pittsburgh, PA, July 2022.
- *CAIMS 2022 Annual Meeting (special session "Batteries: Modeling, simulation, & analysis"),* Okanagan, BC, June 2022 (virtual).
- *Department of Mathematics, the University of York*, York, UK, June 2022.
- *Workshop "Criticality and stochasticity in quasilinear fluid systems"*, American Institute of Mathematics, San Jose, CA, May 2022.
- *Workshop "Modelling and analysis of turbulent transport, mixing and scaling"*, Isaac Newton Institute, Cambridge, UK, March 2022 (virtual).
- *CAIMS 2021 Annual Meeting (special session "Mathematics of Batteries"),* Waterloo, ON, June 2021 (virtual).
- *Fluid Mechanics seminar, University of California San Diego,* San Diego, CA, February 2021 (virtual).
- *Workshop "Transport and Mixing in Complex and Turbulent Flows",* Institute for Pure and Applied Mathematics (IPAM), UCLA, Los Angeles, CA, January 2021 (virtual).
- *Workshop "Vortex Filaments", Fields Institute*, Toronto, ON, November 2020 (virtual).
- *Computational Mathematics Colloquium, the University of Waterloo*, Waterloo, ON, February, 2020.
- *Workshop "Modeling and Simulation for Quantum Condensation, Fluids and Information", Institute for Mathematical Sciences, National University of Singapore*, Singapore, November 2019.
- *Department of Aeronautics, Imperial College*, London, UK, November 2019.
- *School of Mathematics, the University of East Anglia*, Norwich, UK, October 2019.
- *School of Mathematics and Statistics, the University of Sheffield*, Sheffield, UK, October 2019.
- *9th International Congress on Industrial and Applied Mathematics (Minisymposium "Mathematical Advances in Batteries")*, Valencia, Spain, July 2019.
- *Department of Mathematics, Simon Fraser University*, Burnaby, BC, March, 2019.
- *Department of Mathematics and Statistics, University of Victoria*, Victoria, BC, February, 2019.
- *Scientific Computing, Applied and Industrial Mathematics (SCAIM) seminar, University of British Columbia*, Vancouver, BC, February, 2019.
- *90th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM)*, Vienna, Austria, February, 2019.
- *School of Mathematics & Statistics, University College Dublin*, Dublin, Ireland, December 2018.
- *Rencontres Normandes sur les aspects théoriques et numériques des EDP*, Rouen, France, November 2018.
- *23rd Polish Conference on Fluid Mechanics (invited plenary lecture)*, Zawiercie, Poland, September 2018.
- *The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications*, Taipei, Taiwan, July 2018.

- *School of Mathematics & Statistics, University College Dublin*, Dublin, Ireland, April 2018.
- *14th International Conference on Flow Dynamics*, Sendai, Japan, November 2017.
- *Faculty of Mathematics and Physics, Kanazawa University*, Kanazawa, Japan, October 2017.
- *Workshop "Advances in Mathematical Modelling and Numerical Simulation of Superfluids"*, Rouen, France, August 2017.
- *CAIMS Annual Meeting (special session "Nonlinear PDEs and their applications")*, Halifax, NS, July 2017.
- *CAIMS Annual Meeting (3rd Canadian Symposium in Numerical Analysis and Scientific Computing)*, Halifax, NS, July 2017.
- *Workshop "Applied and Computational Complex Analysis", International Centre for Mathematical Sciences*, Edinburgh, UK, May 2017.
- *Inverse Problems and Image Analysis Seminar, Fields Institute* Toronto, ON, October 2016.
- *3rd International Retreat on Vortex Dynamics and Vorticity Aerodynamics*, Beijing, China, August 2016.
- *Department of Mechanical Science and Bioengineering, Osaka University*, Osaka, Japan, August 2016.
- *11th AIMS Conference on Dynamical Systems, Differential Equations and Applications (special session "Vortex Dynamics and Geometry: Analysis, Computations and Applications")*, Orlando, FL, July 2016.
- *Workshop on New Challenges in Mathematicl Modeling and Numerical Simulation of Superfluids*, CIRM, Marseille, France, June 2016.
- *10th International Conference on Scientific Computing and Applications (ICSCA 2016)*, Toronto, ON, June 2016.
- *Laboratory of Fluid Mechanics and Instabilities, École polytechnique fédérale de Lausanne (EPFL)*, Lausanne, Switzerland, March 2016.
- *Workshop "Non-Intrusive Measurements for Unsteady Flows and Aerodynamics"* (keynote lecture), Université de Poitiers, France, October 2015.
- *General Motors Global R&D*, Warren, MI, September 2015.
- *Workshop "Recent developments in numerical analysis with special emphasis on complex analysis"*, The University of Tokyo, Tokyo, Japan, July 2015.
- *Laboratoire de Physique et Mecanique des Milieux Heterogenes, Ecole Superieure de Physique et de Chimie Industrielles*, Paris, France, June 2015.
- *Workshop "Basic issues of extreme events in turbulence"*, Wolfgang Pauli Institute, Vienna, Austria, May 2015.
- *Workshop "Applied and Computational Complex Analysis"*, Imperial College, London, UK, March 2015.
- *Winter Meeting of the Canadian Mathematical Society (session "Recent Advances in Variational Analysis and Linear Optimization")*, Hamilton, ON, December 2014.
- *Workshop "Mathematical Analysis of Turbulence" at the Institute for Pure and Applied Mathematics, UCLA*, Los Angeles, CA, September 2014.
- *10th AIMS Conference on Dynamical Systems, Differential Equations and Applications (special session "Evolution Equations and Inclusions with Applications to Control, Mathematical Modeling and Mechanics")*, Madrid, Spain, July 2014.
- *Department of Mathematics, Kyoto University*, Kyoto, Japan, May 2014.
- *Department of Mathematics & Statistics, University of Ottawa*, Ottawa, ON, September 2013.
- *2nd International Retreat on Vortex Dynamics and Vorticity Aerodynamics*, Shanghai, China, August 2013.

- *2013 SIAM Annual Meeting (minisymposium "Stochastic Analysis, Control and Computation of Fluid Dynamics and other Physical Phenomena")*, San Diego, CA, July 2013.
- *Laboratoire de Mathématiques Raphaël Salem, Université de Rouen*, France, June 2013.
- *Department of Mathematics, the Chinese University of Hong Kong*, Hong Kong, April 2013.
- *National Aerospace Laboratories (Theoretical and Computational Fluid Dynamics Group)*, Bangalore, India, December 2012.
- *IISER-ICTS Winter School On Stochastic Analysis And Control Of Fluid Flow*, School of Mathematics, Indian Institute of Science Education and Research, Thiruvananthapuram, India, December 2012.
- *Tata Institute of Fundamental Research – Centre for Applicable Mathematics*, Bangalore, India, December 2012.
- *Materials Research Society 2012 Fall Meeting (symposium "Advanced Multiscale Materials Simulation – Toward Inverse Materials Computation")*, Boston, MA, November 2012.
- *The 8th International Conference on Differential Equations and Dynamic Systems*, University of Waterloo, Waterloo, ON, August 2012.
- *Variational and Topological Methods:Theory, Applications, Numerical Simulations, and Open Problems*, Northern Arizona University, Flagstaff, AZ, June 2012.
- *Laboratoire de Meteorologie Dynamique, École Normale Supérieure*, Paris, France, April 2012.
- *Collège de France (seminar "Mathématiques Appliquées" chaired by P.-L. Lions)*, Paris, France, March 2012.
- *Department of Mechanical Engineering, The University of Sheffield*, Sheffield, UK, March 2012.
- *Institut de Mecanique des Fluides de Toulouse (seminar in the "Conf'luence" series)*, Toulouse, France, March 2012.
- *Institute PPrime, Université de Poitiers*, Poitiers, France, February 2012.
- *Institute of Fluid Mechanics and Heat Transfer, Vienna University of Technology*, Vienna, Austria, February 2012.
- *Institute of Fundamental Technological Research, Polish Academy of Sciences*, Warsaw, Poland, November 2011.
- *Faculty of Power and Aeronautical Engineering, Warsaw University of Technology*, Warsaw, Poland, October 2011.
- *SIAM Conference on Control and Its Applications*, Baltimore, MD, July 2011.
- *7th International Congress on Industrial and Applied Mathematics (Minisymposium "Theory, Numerical Analysis, and Applications of Sobolev Gradients")*, Vancouver, BC, July 2011.
- *Workshop Complex Fluids and Flows in Industry and Nature"*, University of British Columbia, Vancouver, BC, July 2011
- *Department of Mathematics & Statistics, University of Ottawa*, Ottawa, ON, February 2011
- *Department of Mathematics, the University of Michigan*, Ann Arbor, MI, January 2011.
- *19th Canadian Symposium on Fluid Mechanics*, St. John's, NL, July 2010.
- *Fifth European Conference on Computational Fluid Dynamics ECCOMAS CFD 2010*, Lisbon, Portugal, June 2010.
- *34th SIAM Southeastern-Atlantic Section Conference, Raleigh, NC, March 2010*
- *Department of Mathematics & Statistics, Wichita State University*, Wichita, KS, February 2010.
- *Faculty of Science, University of Ontario Institute of Technology*, Oshawa, ON, October 2009.

- *Departement des Mathématiques Appliquées, Université Bordeaux I*, Bordeaux, France, May 2009.
- *SIAM Meeting on Applied Dynamical Systems*, Snowbird, UT, May 2009.
- *Laboratoire d'Etudes Aérodynamiques, Université de Poitiers*, Poitiers, France, May 2009.
- *Winter Meeting of the Canadian Mathematical Society (session "Applied PDEs")*, Ottawa, ON, December 2008.
- *Advanced Optimization Laboratory*, McMaster University, Hamilton, ON, October 2008.
- *Industrial Physics Group, Commonwealth Scientific and Industrial Research Organisation*, Sydney, NSW, Australia, August 2008.
- *School of Mathematics, The University of Manchester*, Manchester, UK, May 2008
- *Industrial Optimization Seminar, Fields Institute* Toronto, ON, April 2008.
- *Department of Mathematics, Universidade Federal do Rio de Janeiro*, Rio de Janeiro, Brasil, December 2007
- *Department of Mathematics & Statistics, University of Ottawa*, Ottawa, ON, October 2007
- *Interdisciplinary Program "Bridging the Gaps"*, The University of Sheffield, Sheffield, UK, June 2007.
- *1st Conference on Active Flow Control*, Berlin, Germany, September 2006
- *17th Polish Conference on Fluid Mechanics (invited plenary lecture)*, Belchatow, Poland, September 2006
- *Workshop on the Navier–Stokes Equation and Turbulence*, Wolfgang Pauli Institute, Vienna, Austria, April 2006
- *Department of Applied Mathematics, The University of Waterloo*, Waterloo, ON, March 2006
- *SANDIA Workshop on Large–Scale Robust Optimization*, Santa Fe, NM, August 2005
- *AFOSR Workshop on Feedback Flow Control*, Jackson Hole, WY, July 2005
- *Workshop on Analysis and Control of Mixing with an Applications to Micro and Macro Flow Processes*, Udine, Italy, June 2005
- *Institute of Aeronautics & Applied Mechanics, Warsaw University of Technology*, Warsaw, Poland, March 2005
- *Department of Mathematics & Statistics, Wichita State University*, Wichita, KS, January 2005
- *Department of Mathematics & Statistics, University of Ottawa*, Ottawa, ON, November 2004
- *Institute for Applied and Interdisciplinary Mathematics, University of Toronto*, Toronto, ON, November 2004
- *Department of Computer Science, University of Toronto*, Toronto, ON, November 2004
- *Departement des Mathématiques Appliquées, Université Bordeaux I*, Bordeaux, France, June 2004.
- *Boundary Layer Wind Tunnel Laboratory, University of Western Ontario*, London, ON, January 2004.
- *Laboratoire de Physique et Mecanique des Milieux Heterogenes, École Supérieure de Physique et de Chimie Industrielles*, Paris, France, December 2003.
- *Laboratoire de Meteorologie Dynamique, École Normale Supérieure*, Paris, France, December 2003.
- *Laboratoire des Fluides et Acoustique, École Nationale Supérieure de Techniques Avancée*s, Palaiseau, France, December 2003.
- *Institute of Computational Science, Swiss Federal Institute of Technology*, Zurich, Switzerland, December 2003.
- *LadHyX, École Polytechnique*, Palaiseau, France, June 2003.
- *Institut de Mecanique des Fluides de Toulouse*, Toulouse, France, June 2003.

- *Department of Mathematics, University of Southern California*, Los Angeles, CA, April 2003.
- *United Technologies Research Center*, Hartford, CT, January 2001.
- *Hermann-Föttinger-Institut*, Berlin, Germany, October 2000.

Recent Conference Presentations

- *74th Annual Meeting of the APS Division of Fluid Dynamics,* Indianapolis, IN, November 2022.
- *18th Symposium on Fuel Cell and Battery Modeling and Experimental Validation,* Schloss Hochenkammer, Germany, March 2022.
- *73rd Annual Meeting of the APS Division of Fluid Dynamics,* Phoenix, AZ, November 2021.
- *17th Symposium on Fuel Cell and Battery Modeling and Experimental Validation,* Sion, Switzerland, April 2021 (virtual).
- *72nd Annual Meeting of the APS Division of Fluid Dynamics,* Chicago, IL, November 2020 (virtual).
- *2020 SIAM Annual Meeting (minisymposium "Vortex and vortex-body dynamics")*, Toronto, ON, July 2020 (virtual).
- *IUTAM Symposium on Vortex Dynamics in Science, Nature and Technology*, La Jolla, CA, June 2019.
- *16th Symposium on Fuel Cell and Battery Modeling and Experimental Validation*, Braunschweig, Germany, March 2019.
- *71th Annual Meeting of the APS Division of Fluid Dynamics*, Atlanta, GA, November 2018.
- *IUTAM Symposium on Recent Advances in Moving Boundary Problems in Mechanics*, Christchurch, New Zealand, February 2018.
- *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.
- *IUTAM Symposium on Dynamics and Topology of Vorticity and Vortices*, Carry-le-Rouet, France, June 2017.
- *14th Symposium for Fuel Cell and Battery Modeling and Experimental Validation*, Karlsruhe, Germany, March 2017.
- *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.
- *IUTAM Symposium on Helicity, structures and singularity in fluid and plasma dynamics*, Venice, Italy, April 2016.
- *13th Symposium for Fuel Cell and Battery Modeling and Experimental Validation*, Lausanne, Switzerland, March 2016.
- *68th Annual Meeting of the APS Division of Fluid Dynamics*, Boston, MA, November 2015.
- *8th International Congress on Industrial and Applied Mathematics (Minisymposium "Extreme Behavior in Flow Models: Analysis and Computations")*, Beijing, China, August 2015.
- *12th Symposium for Fuel Cell and Battery Modeling and Experimental Validation*, Freiburg, Germany, March 2015.
- *Workshop "Modern Applications of Complex Variables: Modeling, Theory and Computation"*, BIRS, Banff, AB, January 2015.
- *67th Annual Meeting of the APS Division of Fluid Dynamics*, San Francisco, CA, November 2014.
- *66th Annual Meeting of the APS Division of Fluid Dynamics*, Pittsburgh, PA, November 2013.
- *IUTAM Symposium on Vortex Dynamics: Formation, Structure and Function*, Fukuoka, Japan, March 2013.

- *65th Annual Meeting of the APS Division of Fluid Dynamics*, San Diego, CA, November 2012.
- *9th European Fluids Mechanics Conference*, Rome, Italy, September 2012
- *IUTAM Symposium on Topological Fluid Dynamics*, Isaac Newton Institute, Cambridge, UK, July 2012.
- *20th Canadian Symposium on Fluid Mechanics*, Toronto, ON, June 2012.
- *64nd Annual Meeting of the APS Division of Fluid Dynamics*, Baltimore, CA, November 2011.
- *13th European Turbulence Conference*, Warsaw, Poland, September 2011.
- *ECCOMAS Conference on CFD and Optimization*, Antalya, Turkey, May 2011.
- *63nd Annual Meeting of the APS Division of Fluid Dynamics*, Long Beach, CA, November 2010.
- *8th European Fluids Mechanics Conference*, Bad Reichenhal, Germany, September 2010.
- *International Conference on Inverse Problems*, Wuhan, China, April 2010.
- *62nd Annual Meeting of the APS Division of Fluid Dynamics*, Minneapolis, MN, November 2009.
- *10th Joint European Thermodynamics Conference*, Copenhagen, Denmark, June 2009.
- Conference on *Optimization with interfaces and free boundaries*, Regensburg, Germany, March, 2009
- *61th Annual Meeting of the APS Division of Fluid Dynamics*, San Antonio, TX, November 2008.
- *22nd International Congress of Theoretical and Applied Mechanics*, Adelaide, SA, Australia, August 2008.
- *18th Canadian Symposium on Fluid Mechanics*, Montreal, QC, June 2008.
- *Fifth Conference on Bluff Body Wakes and Vortex-Induced Vibrations* Costa do Sauípe, Bahia, Brazil, December 2007.
- 60^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Salt Lake City, UT, November 2007.
- *Second Mathematical Programming Society International Conference on Continuous Optimization*, Hamilton, Canada, August 2007.
- *6th International Congress on Industrial and Applied Mathematics*, Zurich, Switzerland, July 2007.
- *IUTAM Symposium on Unsteady Separated Flows and Their Control*, Corfu, Greece, June 2007.
- *Workshop on the Kinematic Simulation of Turbulence*, Sheffield, UK, June 2007.
- 59^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Tampa Bay, FL, November 2006.
- *6th European Fluid Mechanics Conference*, Stockholm, Sweden, June 2006.
- *17th Canadian Symposium on Fluid Mechanics*, Toronto, ON, June 2006.
- *CAIMS–MITACS 2006 Joint Annual Conference*, Toronto, ON, June 2006.
- 58^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Chicago, IL, November 2005.
- *SIAM Conference on Control and Its Applications*, New Orleans, LA, July 2005
- 57^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Seattle, WA, November 2004.
- *Mathematics Conference in Honor of John Neuberger's 70th Birthday*, Denton, TX, October 2004.
- *4th Annual McMaster Optimization Conference: Theory and Applications (MOPTA04)*, Hamilton, ON, July 2004.
- *10th European Turbulence Conference*, Trondheim, Norway, June 2004.
- *6th Workshop on Adjoint Applications in Dynamic Meteorology*, Acquafredda di Maratea, Italy, May 2004.

- *EUROMECH Colloquium #454 "Large Eddy Simulation, Coherent Vortex Simulation and Vortex Methods for Turbulent Flows"*, Marseille, France, April 2004.
- 56^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Rutherford, NJ, November 2003.
- *7th US National Congress on Computational Mechanics*, Albuquerque, NM, July 2003.
- *AMS–IMS–SIAM Summer Research Conference on Hydrodynamics Stability and Flow Control*, Snowbird, UT, July 2003.
- 55^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, Dallas, TX, November 2002.
- *AFOSR Dynamics and Control Workshop*, Pasadena, CA, August 2002.
- 9^{th} *European Turbulence Conference*, Southampton, UK, July 2002.
- *5th Workshop on Adjoint Applications in Dynamic Meteorology*, Mt. Bethel, PA, April 2002.
- 4^{th} *International Workshop on Vortex Flows and Related Numerical Methods*, Santa Barbara, CA, March 2002.
- 54^{th} *Annual Meeting of the APS Division of Fluid Dynamics*, San Diego, CA, November 2001.
- *SIAM Conference on Control and its Applications*, San Diego, CA, July 2001.
- *Southern California Nonlinear Control Workshop*, San Diego, CA, June 2001.
- 53^{rd} *Annual Meeting of the APS Division of Fluid Dynamics*, Washington D.C., November 2000.
- 8^{th} *European Turbulence Conference*, Barcelona, Spain, July 2000.
- *IUTAM Symposium on Bluff Body Wakes and Vortex-induced Vibration*, Marseille, France, June 2000.