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EDUCATION:

1988-1994: Ph.D. in Applied Mathematics, Department of Mathematics,
University of Maryland at College Park, College Park, Maryland.

1976-1982 : M.S., B.S. in Physical Chemistry and Metallurgy,
Moscow Institute of Steel and Alloys, Moscow, Russia.

EXPERIENCE:

2024-PRESENT – Director, Center for Applied Mathematics, University of St. Thomas, St. Paul, Minnesota.

2006-PRESENT - Associate Professor, Department of Mathematics, University of St. Thomas, St. Paul, Minnesota.

2000-2006 - Assistant Professor, Department of Mathematics, University of St. Thomas, St. Paul, Minnesota.

1998-2000 - Visiting Professor, Department of Mathematics, University of St. Thomas, St. Paul, Minnesota.

1996-1998 - Visiting Professor, Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania.

1996-1998 - Visiting Professor, Department of Mechanical Engineering, University of Pittsburgh, Pittsburgh, Pennsylvania.

1994-1996 - Postdoctoral Associate, Department of Mathematics, Carnegie Mellon University, Pittsburgh, Pennsylvania.

1988-1994 - Graduate (Research and Teaching) Assistant, Department of Mathematics, University of Maryland at College Park, College Park, Maryland.

1982-1987 - Junior Scientist, Piro-Metallurgy Laboratory, Center for Non-Ferrous Metals, Moscow, Russia.

PUBLICATIONS:

[1985] with M.A. Grinfeld, Stress-strain state in an elastic medium containing an inclusion of a new phase, Computational Seismology, v. 18, p. 91-96.

[1986] with R.I. Shabalina and V.A. Kukoev, Mechanism of zinc transfer in molten slag, Russian Metallurgy-USSR, vol. 2, p. 8-13.

[1994] Phase Boundaries in Anisotropic Elastic Materials, Doctoral Dissertation, University of Maryland, College Park.

[1995] with S.S. Antman, The shrink-fit problem for aeolotropic nonlinearly elastic bodies, J. of Elasticity, 37, p. 157-166.

[1995] with S.S. Antman, Coexistent phases in nonlinear thermoelasticity: radially symmetric equilibrium states of aeolotropic bodies, J. of Elasticity, 41, 107-136.

- [1997] with M.E. Gurtin, Configurational forces and the dynamics of planar cracks in three-dimensional bodies, *J. of Elasticity*, 48, 167--191.
- [1998] with P. Cermelli and M.E. Gurtin, A note on the thermomechanics of curvature flow in \mathbb{R}^3 and on surfaces in \mathbb{R}^3 , *Meccanica* 33 (1998), no. 6, 587--599.
- [1999] with I. Fonseca and J. Schaeffer, Oscillations in one-dimensional elasticity with surface energy, *Quart. Appl. Math.* 57 (1999), no. 3, 475--499.
- [1999] with I. Fonseca and Jack Schaeffer, Creation and propagation of oscillations in one-dimensional elasticity with surface energy. (English) Li, Ta-Tsien (ed.) et al., *Nonlinear evolution equations and their applications. Proceedings of the Luso-Chinese symposium*, Singapore: World Scientific. 72-80.
- [2002] with C. Shakiban, M. Hennessey, Characterizing Slope in Mechanical Assemblies via Differential Geometry, *Transactions of the ASME: Journal of Computing and Information Science in Engineering*, 2(3), 2002, pp. 150-159.
- [2004] with P.W.A. Dayananda and J. Kemper, A stochastic model for prostate-specific antigen levels. *Math. Biosci.* 190 (2004), no. 2, 113--126.
- [2006] with Dokken, D.P., Time averaging, hierarchy of the governing equations, and the balance of turbulent kinetic energy. In J. Cannon & B.K. Shivamoggi (Eds.), *Mathematical and Physical Theory of Turbulence* (pp. 155-164). Taylor & Francis Group, LLC (Catalog # DK3004).
- [2006] with P. Bělik, P.W. Dayananda and J. Kemper, A stochastic model for PSA levels: behavior of solutions and population statistics, *Journal of mathematical Biology*, 53, 437 – 463
- [2009] with P. Bělik, "Modeling the behavior of heat-shrinkable thin films", *J. of Elasticity*, 95, 57—77
- [2014] with P. Bělik, D.P. Dokken and K. Scholz, Fractal powers in Serrin's vortex solutions, *Asymptotic analysis* (Amsterdam : IOS-Press), Vol. 90, No. 1, p. 53-82.
- [2017] with P. Bělik, D.P. Dokken and K. Scholz, Applications of a Vortex Gas Models to Tornadogenesis and Maintenance, *OJFD*, Vol. 7, No. 4, p. 596-622.
- [2018] with P. Bělik, D. P. Dokken, K. Scholz, C. Potvin, Possible Implications of Self-Similarity for Tornadogenesis and Maintenance *AIMS Mathematics*, Vol. 3, No.3, 365-390.
- [2020] with P. Bělik, X. Su, D. P. Dokken, K. Scholz, On the Axisymmetric Steady Incompressible Beltrami Flows, *OJFD*, Vol. 10, No. 3, p. 208-238.
- [2022] with P. Bělik, D. P. Dokken, C. K. Potvin, K. Scholz, Vortex Gas Models for Tornadogenesis and Maintenance, *New Trends in Physical Science Research*, BP International, Vol. 2, Chapter 12, pages 137-157, Editor: Shi-Hai Dong, ISBN 978-93-5547-638-8, DOI: 10.9734/bpi/ntpsr/v2/2138B.
- [2023] with P. Bělik, E. Bibelnicks, R. Laskowski, A. Lukanen, D. P. Dokken, Equilibrium Energy and Entropy of Vortex Filaments in the Context of Tornadogenesis and Tornadic Flows, *OJFD*, Vol. 13, No. 2, June 2023.
- [2025] with P. Bělik, D. P. Dokken, Applications of Non-Equilibrium Thermodynamics And Statistical Mechanics of Vortex Gases in Tornado Theory, *OJFD*, Vol. 15, No. 3, September 2025.

AWARDS, GRANTS, SCHOLARSHIPS AND ASSISTANSHIPS:

[1985] Second Prize in The Competition of Young Scientists, Center for Non-Ferrous Metals, Moscow, Russia.

[1988-1994] Graduate Assistant, Department of Mathematics, University of Maryland, College Park

[1994 -1996] Postdoctoral Fellowship, Carnegie-Mellon University, Pittsburgh, PA

[1998] Faculty Partnership, University of St. Thomas, St Paul, MN

[2000] Faculty Partnership, University of St. Thomas, St Paul, MN

[2001] Faculty Partnership, University of St. Thomas, St Paul, MN

[2002] Research Assistance Grant, University of St. Thomas, St Paul, MN

[2007] Bush Grant, University of St. Thomas, St Paul, MN

[2022] Diversity Curriculum Grant, University of St. Thomas, St Paul, MN

NSF PROPOSALS AND AWARDS:

[2002] Mathematical Transformations and Their Applications – A Summer Research Experience at UST (co-PI jointly with P. Van Fleet, L Johnson, R. Turcajova)

[2004] Inverse problem of finding the temperature field for deformation of a thin film into a prescribed shape (co-PI jointly with P. Bělík)

[2008] CSUMS: A Computational Training and Interdisciplinary Research Program for Undergraduates in the Mathematical Sciences (co-PI jointly with P. Van Fleet, J. Kemper, A. Shemyakin, M. Stolarska, D.P. Dokken, K. Scholz)

[2009] CSUMS Grant **Awarded**, National Science Foundation, Washington, DC CSUMS: A Computational Training and Interdisciplinary Research Program for Undergraduates in the Mathematical Sciences (co-PI jointly with P. Van Fleet, J. Kemper, A. Shemyakin, M. Stolarska, D.P. Dokken, K. Scholz)

LECTURES, TALKS AND PRESENTATIONS:

5/84 Young scientists conference (Center for NON- Ferrous Metals, Moscow, Russia).

4/92 Theory of Freezing Waves, University of Maryland at College Park, College, Park, MD.

9/94 Phase Boundaries in Anisotropic Materials, Carnegie Mellon University, Pittsburgh, PA.

3/96 Three dimensional theory of dynamical fracture, Materials Dynamics Branch, Aberdeen Proving Ground, MD.

10/96 One-dimensional model of phase transition in elasticity, National Security Agency, Baltimore MD.

3/97 Configurational forces in fracture mechanics, University of Pittsburgh, PA.

4/97 A series of 3 lectures on Fracture Mechanics, Carnegie Mellon University, Pittsburgh, PA.

11/98, Black-Scholes Model in Financial Calculus, University of St. Thomas, St. Paul, MN

2/99, Evolution Equations in Fracture Mechanics, University of St. Thomas, St. Paul, MN

5/99, Nonlinear Oscillations in Elasticity with Surface Energy, University of Minnesota, Minneapolis, MN

11/99, Calculus of Variations, Series of 3 talks, University of St. Thomas, St. Paul, MN

3/00, Nonlinear PDE with surface energy, University of St. Thomas, St. Paul, MN

3/00, ARPS Theoretical Background, Series of 4 talks, University of St. Thomas, St. Paul, MN

4/00, Breakdown in strong convergence for a nonlinear wave equation, Midwest AMS meeting, Notre-Dame, IN

4/00, Nonlinear PDEs with surface energy, Southern AMS meeting, Lafayette, LA
 5/00, Configurational Forces in Mechanics, University of Minnesota, Minneapolis, MN
 7/00, Elevated Vortices, Series of 2 talks, University of St. Thomas, St. Paul, MN
 11/00, Theoretical Background of Dynamic Meteorology, Series of 4 talks,
 University of St. Thomas, St. Paul, MN
 04/01, Navier-Stokes Equations with inertial terms, UST Seminar on Dynamic Meteorology,
 Series of 5 talks, University of St. Thomas, St. Paul, MN
 4/01, Normally Hyperbolic Manifolds and Fluids, CAM Applied Math Seminar,
 University of St. Thomas, St. Paul, MN
 06-11/02, Vorticity and Turbulence, UST Seminar on Dynamic Meteorology,
 Series of 10 lectures, University of St. Thomas, St. Paul, MN
 02/26/03, Averaging Method in Computing the Turbulent Kinetic Energy.
 CAM Applied Math Seminar, University of St. Thomas, St. Paul, MN
 05/03, A Balance Equation for Turbulent Kinetic Energy in the Boundary Layer, Orlando, FL
 03/04 Tornado Mechanism, Math Club, University of St. Thomas, St. Paul, MN
 07/06 Tornados and Turbulent Kinetic Energy, Department of Mathematics, Aveiro University,
 Portugal.
 11/06 Predictability of tornados, UST Statistics Seminar, UST, St. Paul, MN
 03/07 Use of R language in Weather Modeling and Meteorological Statistics, UST Statistics
 Seminar, University of St. Thomas, St. Paul, MN
 03/07 Predictability of Tornados - Modeling and Statistics, SIAM Conference on Geosciences
 in Santa Fe, NM
 05/08 Delay in Spiking Neurons, Midwest Numerical Analysis Day in Minneapolis, MN
 05/08 (with P. Bělik), Mathematical Modeling of Heat-Shrinkable Thin Films, SIAM Meeting,
 Philadelphia, PA
 11/08 Talk to Math Club at UST "Why Mechanical Engineers have to major in Mathematics"
 03/09 (with P. Bělik), Modeling the Behavior of Heat-Shrinkable Thin Films, SIAM Meeting,
 Miami, FL
 02/10 Alternate powers in Serrin's Swirling Vortex Solutions
 (joint with D. P. Dokken and K. Scholz), IMA Workshop, University of Minnesota
 07/10 CSUMS presentation by students on Delay in axonal signal transmission, SIAM
 meeting, Pittsburgh, PA
 09/10 Delay in Modeling Spiking Neurons,
 Department of Mathematics Colloquium, Augsburg College, Minneapolis, MN
 11/10 Phenomenological versus Statistical Thermodynamics, the argument that has never been
 settled. Applied Probability and Statistics Seminar, University of St. Thomas, St Paul, MN
 04/12 Delay in Neuronal Spiking (joined with P. Bělik)
 SIAM Conference on Uncertainty Quantification, Raleigh, NC
 07/12 Investigations of Cai's Power Law for Strong Tornados (joint with P. Bělik, D. P.
 Dokken, K. Scholz), SIAM Annual Meeting, Minneapolis, MN
 07/12 Alternate Powers in Serrin's Swirling Vortex Solutions (joint with P. Bělik, D. P.
 Dokken, K. Scholz), SIAM Annual Meeting, Minneapolis, MN
 11/12 Slope of Vorticity Lines Derived from Numerical Models as a Tornado Predictor, Severe
 Local Storms Conference, Nashville, TN (joint with P. Bělik, D. P. Dokken, K. Scholz)
 01/13 Fractal Powers in Serrin's Swirling Vortex Solutions (joint with P. Bělik, D. P.
 Dokken, K. Scholz), 2013 Joint Mathematics Meeting, San Diego, CA

01/13 CSUMS presentation by students on Modeling Turbulence with Delay Equations, 2013 Joint Mathematics Meeting, San Diego, CA

03/13 Slope of Vorticity Lines Derived from Numerical Models as a Tornado Predictor, (joint with P. Bělík, D. P. Dokken, K. Scholz), Stochastic Modeling of the Oceans and Atmosphere, Minneapolis, MN

04/14 Fractal powers in Serrin's vortex solutions (joint with P. Bělík, D. P. Dokken, K. Scholz), University of Washington, Seattle, WA

08/14 Fractal Powers in Serrin's Swirling Vortex Solutions (joint with P. Bělík, D. P. Dokken, K. Scholz), GSSI, L'Aquila, Italy

11/14 Axisymmetric Solutions in the Models of Tornadogenesis (joint with P. Bělík, D. P. Dokken, K. Scholz), 27th Conference on Severe Local Storms, Madison, WI

03/15 Fractal Powers in Swirling Vortex Solutions (joint with P. Bělík, D. P. Dokken, K. Scholz), Wayne State University, Detroit, MI

08/15 Modeling Delay in Axon Circuit (joint with P. Bělík), MAA Mathfest 100, Washington, DC

12/15 Thermodynamic Equations in Tornado Theory (joint with P. Bělík, D. P. Dokken, K. Scholz), 114 Statistical Mechanics Conference, Celebration of David Ruelle and Yakov Sinai, Rutgers University, Piscataway, NJ

10/16 Thermodynamic Balance in Tornado Layer (joint with P. Bělík, D. P. Dokken, K. Scholz), Meeting #1123 of the Fall Central Sectional Meeting of the American Mathematical Society, Minneapolis, MN

03/19 Power Laws and Self-Similarity in Tornadogenesis (joint with P. Bělík, D. P. Dokken, K. Scholz), 2019 SIAM Conference on Mathematical & Computational Issues in the Geosciences, Houston, TX