

Lyudmyla L. Barannyk

Department of Mathematics

University of Idaho

Brink Hall 317

P.O. Box 441103

Moscow, ID 83844-1103

Phone: (973) 687-9668

Fax: (208) 885-5843

E-mail: barannyk@uidaho.edu

PERSONAL INFORMATION

Born: April 17, 1972, Poltava, Ukraine

Citizenship: Ukrainian

RESEARCH INTERESTS

Applied Mathematics, Scientific Computing, Mathematical Modeling, Asymptotic Methods, Boundary Integral Methods, Vortex Methods, Pseudo-Spectral Methods, Fluid Dynamics, Interfacial Instability, Partial Differential Equations, Grid-Free Numerical Methods, Plasma Simulations

EDUCATION

- 2000–2003: **PhD in Mathematical Sciences** – New Jersey Institute of Technology and Rutgers the State University of New Jersey
Thesis Title: “Fully Nonlinear Interfacial Waves in a Bounded Two-Fluid System”
Thesis Advisor: Demetrious Papageorgiou
- 1998–2000: **MS in Applied Mathematics** – New Jersey Institute of Technology
- 1994–1997: **Candidate Degree in Physical and Mathematical Sciences (PhD equiv.)** – Institute of Mathematics, National Academy of Sciences of Ukraine – Kyiv, Ukraine
Thesis Title: “Symmetry Reduction of Systems of Nonlinear Equations of Schrödinger and Hydrodynamic Types”
Thesis Advisors: Wilhelm I. Fushchych and Anatoly G. Nikitin
- 1990–1994: **Specialist (BS/MS) with Highest Honors in Mathematics, Mathematical Physics, Teaching in Mathematics and Computer Science** – Kharkiv National University, Ukraine
- 1989–1990: First year of the university program, Department of Mathematics – Uzhgorod State University, Ukraine

EMPLOYMENT

- 8/07–Present: Department of Mathematics, University of Idaho
Assistant Professor (tenure track)
Conduct research and teach two courses per semester
- 9/03–8/07: Department of Mathematics, University of Michigan – Ann Arbor
Assistant Professor (non-tenure track)
Conduct research and teach two courses per semester
- 5/03–8/03: Department of Mathematical Sciences, New Jersey Institute of Technology
Adjunct Lecturer, Teach one course per semester

- 9/98–5/03: Department of Mathematical Sciences, New Jersey Institute of Technology
Teaching Assistant: Teach one course per semester (Differential Equations). Supervise a formal tutorial for Pre-Calculus, Calculus I & II students by quizzing them weekly and encouraging them to work in groups to solve difficult problems. Conduct student tutoring on mathematics in the walk-in Math Learning Center
- 10/97 – 8/98: Institute of Mathematics, National Academy of Sciences of Ukraine – Kyiv, Ukraine
Assistant Professor, Department of Applied Research
Full time research in symmetry group methods
- 9/96 – 8/98: Editorial Board of the Journal "Dopovidi Natsional'noi Akademii Nauk Ukrainy"
("Proceedings of the National Academy of Sciences of Ukraine") – Kyiv, Ukraine
Technical Editor of the mathematical section of the journal
- 9/97–11/97: Secondary school N 29 – Poltava, Ukraine
Teacher of Computer Science

GRANTS AND SUPPORT

- 2006–2007: The Air Force Office of Scientific Research (FA9550-06-1-0529), *A Grid-Free Particle Method for Electrostatic Plasma Simulations*, PI: R. Krasny (50% of research appointment)
- 2005–2006: Air Force Research Lab – Edward's Air Force Base (F013829), *Hybrid Plasma Kinetics Modeling*, PI: A.J. Christlieb and Co-PI: R. Krasny (50% of research appointment)
- 2004: Rackham Faculty Research Fellowship, University of Michigan, *Evolution of Vortex Sheets in a Channel*, PI: L.L. Barannyk (\$7,000 summer support)

HONORS AND AWARDS

- 1998–2003: Department of Mathematical Sciences TA Fellowship (5 years of tuition and stipend)
New Jersey Institute of Technology
- 2003: Travel grant, Association for Women in Mathematics towards participation in a minisymposium on Applications in Biology and Fluids at the First Joint Meeting of CAIMS & SIAM 24th Annual Meeting, June 2003, Montreal, Quebec, Canada
- 2003: Exceptional Graduate Student Award from the College of Science and Liberal Arts
New Jersey Institute of Technology, May 2003
- 2002: Graduate Student Association Honorary Award
New Jersey Institute of Technology, December 2002
- 2000–2002: Graduate Student Association Student Achievement Awards (Travel grants)
Fall 2000, Fall 2001, Fall 2002 towards participation in the American Physical Society Annual Meetings of the Division of Fluid Dynamics of 2000, 2001 and 2002
- 2002: Dean of Students Leadership Award For Outstanding Leadership by a Graduate Student, May 2002 – New Jersey Institute of Technology
- 2002: Membership in Who's Who Among Students in American Universities & Colleges, May 2002

2001: Award of Excellence for Outstanding Leadership during the summer 2001 from the Department of Mathematical Sciences, Sept. 2001
New Jersey Institute of Technology

1990–1994: Honor stipend, Kharkiv State University – Kharkiv, Ukraine

MENTORSHIP ACTIVITY

Supervisor: for **Ying Ki Yim**, Engineering/Mathematics, Summer 2006 REU (Research Experience for Undergraduates) student
Project Title: *Virtual Cathode Simulation in 1D Using a Grid-Free Poisson Solver*

COMPUTER SKILLS

Fortran 90, Matlab, Maple, Mathematica, HTML, L^AT_EX

PAPERS IN PREPARATION AND PREPRINT

1. L.L. Barannyk, and R. Krasny. Singularity formation in vortex sheets in a channel. Comparison between long wave model and exact two-dimensional nonlinear problem (in preparation)
2. L.L. Barannyk and R. Krasny. Dynamics of vortex sheet in an inclined channel (in preparation)
3. L.L. Barannyk, R. Krasny and W. Choi. Evolution of solitary waves in a channel (in preparation)
4. B.E. Sondag, L.L. Barannyk, A.J. Christlieb, and R. Krasny. Regularized Particle Simulation of Plasma Beam Dynamics (in preparation)
5. P. Basarab-Horwath, L.L. Barannyk and W.I. Fushchych. Some exact solutions of a conformally invariant nonlinear Schrödinger equation. - Linköping, 1997. - 12p. - Preprint Linköping University, LiTH-MAT-R-97-11.

JOURNAL PUBLICATIONS

1. L.L. Barannyk and D.T. Papageorgiou. Fully nonlinear gravity-capillary solitary waves in a two-fluid system of finite depth. *J. Engrg. Math.* **42** (2002) 321–339.
2. L.L. Barannyk and L.F. Barannyk. On the classification of subalgebras of the Poincaré algebra $AP(2, n)$. (Ukrainian) *Dopov. Nats. Akad. Nauk Ukraïny* **8** (1998) 17–20.
3. L.L. Barannyk. Invariant solutions of a nonlinear system of differential equations for electromagnetic field. *J. Nonlin. Math. Phys.* **4**: 3–4 (1997) 482–491.
4. W.I. Fushchych and L.L. Barannyk. Symmetry reduction on subalgebras of the Poincaré algebra of a nonlinear system of differential equations of a vector field. (Ukrainian) *Dopov. Nats. Akad. Nauk Ukraïny* **8** (1997) 50–57.
5. L.L. Barannyk. Symmetry reduction for a system of nonlinear evolution equations. *J. Nonlinear Math. Phys.* **3**: 3–4 (1996) 447–452.

6. W.I. Fushchych and L.L. Barannyk. Symmetry reduction as a method for generating solutions of systems of linear differential equations. (Ukrainian) *Dopov. Nats. Akad. Nauk Ukrainy* **12** (1996) 44–49.
7. L.L. Barannyk. On symmetry reduction and exact solutions of the linear one-dimensional Schrödinger equation. (Ukrainian) *Dopov. Nats. Akad. Nauk Ukrainy* **9** (1996) 32–38.

PROCEEDINGS PAPERS

1. L.L. Barannyk, C.S. Bohun, M. Bolton, et al. Resistance Monitoring. *Proceedings of the Sixth PIMS Industrial Problem Solving Workshop*, University of British Columbia, (2002) 85–101.
2. L.L. Barannyk. Symmetry reduction of the Guerra-Pusterla equation by subalgebras of the central extension of the conformal algebra. *Pr. Inst. Mat. Nats. Akad. Nauk Ukr. Mat. Zastos.* **19** (1998) 20–31. Symmetry and analytic methods in mathematical physics: Kyiv (Ukrainian)
3. L.L. Barannyk. Symmetry reduction of a generalized complex Euler equation for a vector field. Proceedings of the 2nd International Conference "Symmetry in Nonlinear Mathematical Physics", July 7-13, Kyiv, 1997. *Symmetry in Nonlin. Math. Phys.* **2** (1997) 455–462.

TEACHING INTERESTS

Applied Mathematics, Scientific Computing, Partial and Ordinary Differential Equations, Asymptotic and Perturbation Methods

TEACHING

University of Michigan – Ann Arbor

- Spring 2007 (Math 454) Boundary Value Problems for Partial Differential Equations
- Winter 2007 (Math 471) Introduction to Numerical Methods
- Fall 2006 (Math 156) Applied Honors Calculus II
- Spring 2006 (Math 454) Boundary Value Problems for Partial Differential Equations
- Winter 2005 (Math 471) Introduction to Numerical Methods
- Fall 2005 (Math 471) Introduction to Numerical Methods
- Spring 2005 (Math 216) Differential Equations
- Winter 2005 (Math 471) Introduction to Numerical Methods
(Math 216) Differential Equations
- Fall 2004 (Math 471) Introduction to Numerical Methods
(Math 216) Differential Equations
- Winter 2004 (Math 216) Differential Equations (2 sections)
- Fall 2003 (Math 156) Applied Honors Calculus II (2 sections)

New Jersey Institute of Technology

Summer 2003 (Math 222) Differential Equations
Spring 2003 (Math 222) Differential Equations
Fall 2002 (Math 111) Calculus I
Spring 2002 (Math 111) Calculus I
Fall 2001 (Math 111) Calculus I

SERVICE

Reviewer for *IMA Journal of Applied Mathematics*
Archive of Applied Mechanics
International Journal of Computer Mathematics

10/02–Present Graduate Student Association President Emeritus, New Jersey Institute of Technology
04/01–10/02 President of the Graduate Student Association, New Jersey Institute of Technology
09/00–08/01 President and Vice President of the Mathematical Sciences Group, Graduate Student Mathematics Club, Department of Mathematics, New Jersey Institute of Technology

PROFESSIONAL ACTIVITIES

- Workshop:
- Spring 2002, The Fifth PIMS Graduate Mathematics Modelling Camp, May 18–23, Simon Fraser University, Burnaby, BC
 - The Sixth PIMS Industrial Problem Solving Workshop, May 27–31, University of British Columbia, Vancouver, BC, Canada
 - Spring 2001, The Seventeenth Annual Workshop on Mathematical Problems in Industry, June 4–8, 2001, Rensselaer Polytechnic Institute, Troy, NY

Member: Society for Industrial and Applied Mathematics, American Physical Society, American Mathematical Society, Association for Women in Mathematics

INVITED AND CONTRIBUTED TALKS/SEMINARS

Contributed *Evolution of Strongly Nonlinear Solitary Waves in a Channel*, L.L. Barannyk, W. Choi and R. Krasny, 59th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 19–21, 2006, Tampa, FL

Contributed *Dynamics of Density Stratified Vortex Sheets in an Channel*, L.L. Barannyk and R. Krasny, 2006 SIAM Annual Meeting, July 10–14, 2006, Boston, MA

Invited *A Study of Vortex Sheet Motion with Density Stratification in an Inclined Channel*, L.L. Barannyk and R. Krasny, Fluid Dynamics Seminar New Jersey Institute of Technology, February 13, 2006

Contributed *Simulations of Density-Stratified Kelvin-Helmholtz Instability in the Inclined Channel*, L.L. Barannyk and R. Krasny, 58th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 20–22, 2005, Chicago, IL

- Contributed *Numerical Simulations of Kelvin-Helmholtz Instability in Slightly Stratified Fluid in the Channel*, L.L. Barannyk and R. Krasny, The Second Conference on Frontiers in Applied and Computational Mathematics May 13–15, 2005, New Jersey Institute of Technology, Newark, NJ
- Contributed *Simulations of Density-Stratified Kelvin-Helmholtz Instability*, L.L. Barannyk and R. Krasny 2005 SIAM Annual Meeting, July 11–15, 2005, New Orleans, LA
- Contributed *Numerical Simulations of Kelvin-Helmholtz Instability in Slightly Stratified Fluid in the Channel*, L.L. Barannyk and R. Krasny, The First Conference on Frontiers in Applied and Computational Mathematics, May 21–22, 2004, New Jersey Institute of Technology, Newark, NJ
- Contributed *Singularity Formation in Vortex Sheets in a Channel*, L.L. Barannyk, R. Krasny and D.T. Papageorgiou, 57th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 21–23, 2004, Seattle, WA
- Contributed *Study of the Singularity Formation in Vortex Sheets in a Channel*, L.L. Barannyk and R. Krasny, 2004 SIAM Annual Meeting, July 12–16, 2004, Portland, OR
- Invited** *Fully Nonlinear Gravity-Capillary Interfacial Waves in a Two-Fluid System of Finite Depth*, L.L. Barannyk, University of Michigan, Ann Arbor, Differential Equations Seminar, Ann Arbor, Michigan, USA, October 1, 2003
- Contributed *Evolution of Vortex Sheets in a Channel*, L.L. Barannyk and R. Krasny, 56th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 23–25, 2003, East Rutherford, NJ
- Contributed *Fully Nonlinear Interfacial Waves in a Channel*, L.L. Barannyk and D.T. Papageorgiou, Association for Women in Mathematics Minisymposium on Applications in Biology and Fluids at the First Joint Meeting of CAIMS & SIAM, 24th Annual Meeting of CAIMS/SCMAI, June 16–20, 2003, Montreal, Quebec, Canada
- Contributed *Fully Nonlinear Interfacial Waves in a Bounded Two-Fluid System*, L.L. Barannyk, Graduate Research Seminar Series, Center for Applied Mathematics and Statistics, New Jersey Institute of Technology, Newark, NJ June 6, 2003
- Contributed *Three-Dimensional Fully Nonlinear Interfacial Long Waves in a Bounded Two-Fluid System*, L.L. Barannyk and D.T. Papageorgiou, 55th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 24–26, 2002, Dallas, TX
- Invited** *Effect of the Surface Tension on the Fully Nonlinear Capillary-Gravity Waves of Bounded Two-Fluid Systems*, L.L. Barannyk, The Mathematics-Physics-Technical Section of the Shevchenko Scientific Society, November 9, 2002, New York, NY
- Contributed *The Flow of an Evaporating Thin Film Liquid*, L.L. Barannyk, Graduate Research Seminar Series, Center for Applied Mathematics and Statistics, New Jersey Institute of Technology, June 16, 2002

- Contributed *The Flow of an Evaporating Thin Film Liquid*, L.L. Barannyk, The MITACS Third Annual General Meeting, May 23–25, University of British Columbia, Vancouver. Results are obtained during the "The Fifth PIMS Graduate Mathematics Modelling Camp", May 27–31, University of British Columbia, Vancouver, BC, Canada and presented at the Poster Session
- Contributed *Strongly Nonlinear Interfacial Waves of Two-Fluid System with the Surface Tension: Solitary and Traveling Waves*, L.L. Barannyk and D.T. Papageorgiou, 54th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, November 18–20, 2001, San Diego, CA
- Invited** *Some New Solitary Waves in Two-Fluid Flows and Their Connection to Elliptic Integrals*, L.L. Barannyk, Graduate Research Seminar Series, Center for Applied Mathematics and Statistics, New Jersey Institute of Technology, NJ, July 10, 2001
- Contributed *The Effect of Surface Tension on Strongly Nonlinear Interfacial Waves in a Channel*, L.L. Barannyk and D.T. Papageorgiou, 53rd Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Washington, DC, November 18–21, 2000
- Contributed *On an Algorithm for Classifying Subalgebras of the Poincaré Algebra $AP(2,n)$* , L.L. Barannyk and L.F. Barannyk, The International Congress of Mathematicians (ICM'98), Berlin, Germany, August 18–27, 1998
- Contributed *On Symmetry Reduction and Exact Solutions of a System of Nonlinear Differential Equations for Electromagnetic Field*, L.L. Barannyk, The Fifth All-Ukrainian Scientific Conference "New Approaches to Solving Differential Equations", Drohobych, Sept. 15–19, 1997
- Contributed *Symmetry Reduction of a Generalized Complex Euler Equation for a Vector Field*, L.L. Barannyk, The Second International Conference "Symmetry in Nonlinear Mathematical Physics", Institute of Mathematics, National Shevchenko University, Kyiv, Ukraine, July 7–13, 1997
- Contributed *Generation of Solutions to the Heat Equation by Using the Symmetry Reduction Method*, L.L. Barannyk, Acad. M. Kravchuk Fifth International Conference, Kyiv Polytechnic University, Kyiv, Ukraine, May 16–18, 1996, Poster Session
- Contributed *Symmetry Reduction for a System of Nonlinear Evolution Equations*, L.L. Barannyk, The First International Conference "Symmetry in Nonlinear Mathematical Physics", Kyiv, Ukraine, July 3–8, 1995, Poster Session
- Contributed *Symmetry Analysis of a System of Nonlinear Evolution Equations*, L.L. Barannyk, Acad. M. Kravchuk Fourth International Conference, Kyiv, Ukraine, May 11–12, 1995, Poster Session