

RESUMÉ

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Education:

- Ph.D. Theoretical Physics, Landau Institute for Theoretical Physics of the Russian Academy of Sciences, December 1997
- M.S. Physics, Moscow Institute of Physics and Technology, June 1994

Employment:

- 2012–Present** Professor, Department of Mathematics and Statistics, University of New Mexico
- 2006–Present** Associated Member, Landau Institute for Theoretical Physics
- 2004–Present** Visiting Scholar, Theoretical Division, Los Alamos National Laboratory
- 2006–2012** Associate Professor (tenured from 2009), Department of Mathematics and Statistics, University of New Mexico
- 2004–2006** Kenna Assistant Professor, Department of Mathematics, University of Notre Dame
- 2004–Spring** Visiting Assistant Professor, Department of Mathematics, University of Arizona
- 1999–2003** Postdoctoral Research Associate, Theoretical Division, Los Alamos National Laboratory
- 1998–1999** Visiting Researcher, Risø National Laboratory, Denmark
- 1998–2006** Research Staff, Landau Institute for Theoretical Physics

Professional Recognition:

- 2018** Awarded by the Honorary Title of the Professor of the Russian Academy of Sciences which is the associate membership in the Russian Academy of Sciences.
- 2008** Doctor of Science Degree in Physical and Mathematical Sciences, highest scientific degree in Russia, awarded for major scientific achievements beyond PhD by the Landau Institute of Theoretical Physics, Moscow, Russia on June 27, 2008. Members of award committee: A.F. Andreev (Vice-president of Russian Academy of Sciences), I.M. Khalatnikov (Member of the Russian Academy of Sciences), I.M. Krichever (Columbia University), E.A. Kuznetsov, (Member of the Russian Academy of Sciences), S.P. Novikov (Distinguished Professor at University of Maryland, Fields medal, Lobachevsky Medal, and Wolf Prize in Mathematics), Ya.G. Sinai (Princeton University, Abel Prize, Boltzmann Medal, Dannie Heineman Prize for Mathematical Physics, Dirac Medal, the Wolf Prize in Mathematics, Nemmers Prize, and the Henri Poincaré Prize, Member of the Russian Academy of Sciences), V.E. Zakharov (Regent Professor of the University of Arizona, Member of the Russian Academy of Sciences, Dirac Medal).

1996-1999 The Landau Scholar, Awarded by KFA, Forschungszentrum, Juelich, Germany.

Selected conferences and invited talks:

- 2019** International Conference “Analytic and numerical methods for solving problems of hydrodynamics, mathematical physics and biology” dedicated to the 100th anniversary of K.I. Babenko, Pushchino, Russia, August 26-29, 2019, plenary talk
Title: Babenko’s equation for Stokes wave and integrability of free surface dynamics
- 2019** VII International Conference “Frontiers of Nonlinear Physics”, Nizhny Novgorod, Russia, June 28-July 04, 2019, plenary talk
Title: Motion of complex singularities and integrability of surface dynamics
- 2019** International School for Advanced Studies (SISSA), Trieste, Italy, June 19, 2019, invited talk
Title: Motion of complex singularities and Hamiltonian integrability of surface dynamics
- 2019** Lebedev Institute of the Russian Academy of Sciences, May 28, 2019, invited talk
Title: Motion of complex singularities and integrability of free surface dynamics of ideal fluid and superfluid helium
- 2019** The Eleventh IMACS International Conference, The University of Georgia, Athens, Georgia, April 17-19, 2019, invited talk
Title: Non-Canonical Hamiltonian Structure and Integrability for 2D Fluid Surface Dynamics
- 2019** Florida International University, March 07, 2019, colloquium
Title: Dynamics of complex singularities and integrability of surface motion
- 2018** Conference “XXVII Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 17-18, 2018, invited talk
Title: New Integrals of Motion and Non-Canonical Hamiltonian Structure for 2D Hydrodynamics with Free Surface
- 2018** Institute of Space Research of the Russian Academy of Sciences, Dec 20, 2018, invited talk
Title: Filamentation of nonlinear Langmuir wave in the kinetic regime
- 2018** Princeton University, Nov 08, 2018, Analysis of fluids seminar, invited talk
Title: Dynamics of complex singularities and integrability of 2D surface motion
- 2018** Columbia University, New York, Oct 31, 2018, Applied Mathematics Colloquium
Title: Nonlinear waves and singularities in nonlinear optics, plasmas, hydrodynamics and biology
- 2018** Courant Institute of Mathematical Sciences, New York, Oct 25, 2018, Analysis seminar, invited talk
Title: Complex Poles, Branch Cuts and Integrability of 2D Surface Dynamics
- 2018** SIAM conference on Nonlinear Waves and Coherent Structures, Orange, California, USA, June 11-14, 2018
Title: Exact solutions and integrability for nonlinear development of Kelvin-Helmholtz instability for counterflow of superfluid and normal components of Helium II, invited talk
- 2018** Landau Institute, Chernogolovka, Russia, June 08, 2018, colloquium
Title: Dynamics of Poles in 2D Hydrodynamics with Free Surface: New Constants of Motion
- 2018** Moscow State University, Moscow, Russia, May 18, 2018, invited talk
Title: Self-focusing and collapses in nonlinear optical systems and plasmas

- 2018** University of Arizona, April 17, 2018, invited talk
Title: Nonlinear waves and singularities in nonlinear optics, plasmas, hydrodynamics and biology
- 2018** Department of Applied Mathematics, University of Colorado at Boulder, Jan 23, 2018, invited talk
Title: Dynamics of singularities and integrability in 2D hydrodynamics with free surface
- 2017** Landau Institute, Chernogolovka, Russia, Dec 22, 2017, colloquium
Title: Exact solutions for nonlinear development of Kelvin-Helmholtz instability for counterflow of superfluid and normal components of Helium II
- 2017** Conference “XXVI Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 18-19, 2017, invited talk
Title: Toward defeating diffraction and randomness for laser beam propagation in turbulent atmosphere
- 2017** Center for Nonlinear Studies, Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM, Nov 27, 2018, invited talk
Title: Dynamics of singularities and wavebreaking in 2D hydrodynamics with free surface
- 2017** Department of Mathematics, Statistics, and Computer Science University of Illinois at Chicago, Chicago, IL, Sep 18, 2017, invited talk
Title: Dynamics of singularities and wavebreaking in 2D hydrodynamics with a free surface
- 2017** Sixth International Conference “Turbulent Mixing and Beyond”, ICTP - International Centre for Theoretical Physics, Trieste, Italy, August 14-18, 2017, invited talk
Title: Dynamics of singularities, wavebreaking and turbulence in 2D hydrodynamics with free surface
- 2017** Conference “Landau Days 2017”, Chernogolovka, Russia, June 26-29, 2017
Title: Langmuir wave filamentation in the kinetic regime
- 2017** French-American Conference on Nonlinear Dispersive PDEs, Centre International de Rencontres Mathématiques (CIRM), Marseille, France, Jun 12-16, 2017, plenary (invited) talk
Title: Stokes wave and dynamics of complex singularities in 2D hydrodynamics with free surface
- 2017** University of Cambridge, UK, Jun 08, 2017, invited talk
Title: Dynamics of singularities and wavebreaking in 2D hydrodynamics with a free surface
- 2017** VIII-th International Conference “Soliton, Collapses and Turbulence”, Chernogolovka, Russia, May, 21-25, 2017
Title: Dynamics of singularities in 2D hydrodynamics with free surface through time dependent conformal maps
- 2017** Department of Mathematics, The George Washington University, Washington, DC, Apr 21, 2017, invited talk (colloquium)
Title: Dynamics of complex singularities and wavebreaking in 2D hydrodynamics with free surface
- 2017** The Tenth IMACS International Conference, The University of Georgia, Athens, Georgia, March 29-April 01, 2017, invited talk
Title: Dynamics of singularities in 2D free surface hydrodynamics
- 2017** Workshop “Making a Splash - Droplets, Jets and Other Singularities”, The Institute for Computational and Experimental Research in Mathematics (ICERM) at Brown

- University, Mar 20-24, 2017 within the program “Singularities and Waves In Incompressible Fluids”, Jan. 29 - May 4, 2017, invited talk
 Title: Dynamics of singularities and wavebreaking in 2D hydrodynamics with free surface
- 2017** 3 lectures on Mar 16-17, 2017 at The Institute for Computational and Experimental Research in Mathematics (ICERM) at Brown University, Mar 20-24, 2017 within the program “Singularities and Waves In Incompressible Fluids”, Jan. 29 - May 4, 2017
 Title: Conformal mapping and Hamiltonian methods for solving the Euler equations
- 2016** Conference “XXV Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 19-20, 2016, invited talk
 Title: Transverse instability and filamentation of Langmuir wave in the kinetic regime
- 2016** Princeton University, Nov 18, 2016, invited talk
 Title: Optical collapse and nonlinear laser beam combining
- 2016** Courant Institute of Mathematical Sciences, New York, Nov 15, 2016, Computational Biology colloquium
 Title: Regularization of collapse in the dynamics of biological cells: connecting microscopic and macroscopic scales
- 2016** Fields Institute for Research in Mathematical Sciences, University of Toronto, Canada, Nov 11, 2016, Applied Mathematics colloquium
 Title: Formation of the limiting Stokes waves
- 2016** University of Buffalo, New York, Nov 10, 2016, invited talk
 Title: Formation of limiting Stokes wave from non-limiting wave
- 2016** LABORATORY FOR LASER ENERGETICS, University of Rochester, Nov 09, 2016, invited talk
 Title: Collective Regimes of Stimulated Brillouin Scatter
- 2016** Massachusetts Institute of Technology, November 08, 2016, invited talk
 Title: Stokes wave, dynamics of singularities and wavebreaking in 2D hydrodynamics with free surface
- 2016** IMA workshop “Mathematical and Physical Models of Nonlinear Optics”, University of Minnesota, Oct 31-Nov 04, 2016, invited talk
 Title: Nonlinear laser beam combining from optical collapse
- 2016** 58th Annual Meeting of the APS Division of Plasma Physics, San Jose, California, October 31 - November 04, 2016
 Title: Electron plasma wave filamentation in the kinetic regime
- 2016** SIAM conference on Nonlinear Waves and Coherent Structures, Philadelphia, Pennsylvania, USA, August 08-11, 2016
 Title: Formation of Limiting Stokes Wave from Non-Limiting Stokes Wave: Merging of Square Root Branch Points from the Infinite Set of Sheets of Riemann Surface to Form $2/3$ Singularity of Limiting Wave
- 2016** VI International Conference “Frontiers of Nonlinear Physics”, Nizhny Novgorod, Russia, July 17-23, 2016
 Title: Formation of limiting Stokes wave from non-limiting Stokes wave: merging of square root branch points from the infinite set of sheets of Riemann surface to form $2/3$ singularity of limiting wave
- 2016** Workshop “Statistics of extreme and singular events in spatially extended systems”, Warwick Mathematics Institute, University of Warwick, UK, July 11-15, 2016, invited talk
 Title: Dynamics of singularities and wavebreaking in 2D hydrodynamics with free surface

- 2016** University of Edinburgh, UK, July 08, 2016, invited talk
Title: Formation of limiting Stokes wave from non-limiting Stokes wave: merging of square root branch points from the infinite set of sheets of Riemann surface to form $2/3$ power law singularity of limiting wave
- 2016** 43rd EPS Conference on Plasma Physics, Leuven, Belgium, July 04-08, 2016
Title: Langmuir wave filamentation in the kinetic regime
- 2016** The 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida, USA, July 01-05, 2016
Title: Nonlinear combining of multiple laser beams in multimode optical fiber
- 2016** The Fourth International Conference: Nonlinear Waves—Theory and Applications, Beijing, China, June 25-18, 2016
Title: Nonlinear combining of multiple laser beams in multimode optical fiber
- 2016** Conference “Landau Days 2016”, Chernogolovka, Russia, June 20-22, 2016
Title: Dynamics of singularities in 2D hydrodynamics with free surface
- 2016** Landau Institute, Chernogolovka, Russia, June 17, 2016, colloquium
Title: Closed equations for the jump along branch cut of Stokes wave
- 2016** Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland, May 20, 2016, invited talk
Title: Dynamics of singularities, wavebreaking and efficient simulations of 2D hydrodynamics with free surface
- 2016** ETH Zurich, Switzerland, May 19, 2016, invited talk
Title: Formation of the limiting Stokes waves
- 2016** University of Illinois at Urbana-Champaign, March 01, 2016, invited talk
Title: Formation of limiting Stokes wave from non-limiting Stokes wave: merging of square root branch points from the infinite set of sheets of Riemann surface to form $2/3$ singularity of limiting wave
- 2016** Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow, Russia, January 12, 2016, invited talk
Title: Compensation of Kerr nonlinearity and collapse of optical pulse in single mode optical fiber
- 2015** Conference “XXIV Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 21-22, 2015, invited talk
Title: How limiting Stokes wave appears from non-limiting Stokes wave: merging of square root branch points from the infinite set of sheets of Riemann surface to form $2/3$ singularity of limiting wave
- 2015** Southern Methodist University, November 09, 2015, invited talk
Title: Complex branch cuts of Stokes wave
- 2015** The Texas Analysis and Mathematical Physics Symposium, The University of Texas at Dallas, November 06-08, 2015, The University of Texas at Dallas
Title: How limiting Stokes wave appears from non-limiting Stokes wave: merging of square root branch points from the infinite set of sheets of Riemann surface to form $2/3$ singularity of limiting wave branch cuts of Stokes wave
- 2015** Conference “Nonlinear Optics (NLO) 2015”, Kauai, Hawaii, USA, July 26-31, 2015
Title: Nonlinear Combining of Laser Beam
- 2015** International Workshop “Nonlinear Photonics: Theory, Materials, Applications”, St. Petersburg State University, Russia, June 29-July 02, 2015, invited talk
Title: Nonlinear Combining of Laser Beam

- 2015** Conference “Landau Days 2015”, Chernogolovka, Russia, June 22-25, 2015
Title: Branch Cut Singularity of Stokes Wave
- 2015** Steklov Mathematical Institute, Moscow, Russia, June 17, 2015, invited talk
Title: Branch cuts of Stokes wave
- 2015** Landau Institute, Chernogolovka, Russia, June 05, 2015, colloquium
Title: Branch cuts of Stokes wave: numerical and analytical results
- 2015** AMS meeting, University of Nevada, Las Vegas, April 18-19, 2015, invited talk
Title: Branch Cut Singularity of Stokes Wave on Deep Water
- 2015** The Ninth IMACS International Conference, The University of Georgia, Athens, Georgia, April 1-4, 2015.
Title: Branch cut singularity of Stokes wave on deep water
- 2014** Conference “XXIII Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 22-23, 2014, invited talk
Title: Nonlinear combining of laser beams
- 2014** George Washington University, November 21, 2014, colloquium
Title: Finite time singularities, rogue waves and strong collapse turbulence
- 2014** SIAM conference on Nonlinear Waves and Coherent Structures, Churchill College, University of Cambridge, UK, August 11-14, 2014
Title: Branch Cut Singularity of Stokes Wave
- 2014** VII-th International Conference “Soliton, Collapses and Turbulence”, Chernogolovka, Russia, August, 04-08, 2014
Title: Branch Cut Singularity of Stokes Wave
- 2014** 23th International Laser Physics Workshop, July 14-18, 2014, Sofia, Bulgaria, invited talk
Title: Nonlinear combining of laser beams
- 2014** Conference “Landau Days 2014”, Chernogolovka, Russia, June 23-25, 2014
Title: Nonlinear combining of laser beams through critical collapse
- 2014** Skoltech colloquium, Skolkovo Institute of Science and Technology, Moscow, Russia, May 22, 2014, invited talk
Title: Finite time singularities, rogue waves and strong collapse turbulence
- 2014** AMS meeting, University of New Mexico, Apr 5-6, 2014, invited talk
Title: Collapse and laser beam combining
- 2013** Conference “XXII Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 23-24, 2013, invited talk
Title: Branch cut singularity of Stokes wave
- 2013** V International Conference “Frontiers of Nonlinear Physics”, Nizhny Novgorod, Russia, July 28 - August 02, 2013, invited talk
Title: Logarithmic scaling in the catastrophic self-focusing (collapse) of laser beam in Kerr media
- 2013** Advanced Workshop on Nonlinear Photonics, Disorder and Wave Turbulence, ICTP - International Centre for Theoretical Physics, Trieste, Italy, July 15-19, 2013, invited talk
Title: Logarithmic scaling of critical collapse and strong collapse turbulence
- 2013** Conference “Landau Days 2013”, Chernogolovka, Russia, June 24-27, 2013
Title: Water waves and analytical structure of Stokes waves
- 2013** International Conference on Coherent and Nonlinear Optics (ICONO)/Conference on Lasers, Applications, and Technologies (LAT) Moscow, Russia, June 18-22, 2013, invited talk
Title: Logarithmic scaling in the self-focusing of a laser beam in Kerr media,

- 2013** The Third International Conference: Nonlinear Waves—Theory and Applications, Beijing, China, June 12-15, 2013, invited talk
Title: Logarithmic scaling in the catastrophic self-focusing (collapse) of a laser beam in Kerr media
- 2013** Thematic Program on the Mathematics of Oceans, Fields Institute, University of Toronto, April 29-June 28, 2013, invited talk
Title: Logarithmic scaling of wave collapse
- 2013** AMS meeting, University of Colorado Boulder, Apr 13-14, 2013, invited talk
Title: Logarithmic scaling of critical collapse of Nonlinear Schrodinger equation
- 2013** Massachusetts Institute of Technology, April 01, 2013, invited talk
Title: Scaling of finite time singularities and strong collapse turbulence
- 2013** The eighth IMACS International Conference, The University of Georgia, Athens, Georgia, March 25-28, 2013
Title: Beyond log-log scaling of critical collapse of Nonlinear Schrodinger equation
- 2012** Conference “XXI Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 24-25, 2012, invited talk
- 2012** 2nd Conference on Localized Excitations in Nonlinear Complex Systems (LENCOS’12), Sevilla (Spain), July 9-12, 2012, invited talk
- 2012** Workshop “Patterns, turbulence and waves”, Warwick Mathematics Institute, University of Warwick, UK, July 09-10, 2012, invited talk
- 2012** IUTAM Symposium 2012: “Understanding Common Aspects of Extreme Events in Fluids”, University College Dublin, Ireland, July 02-06, 2012, invited talk
- 2012** 21th International Laser Physics Workshop, July 23-27, 2012, Calgary, Canada, 2 invited talks
- 2012** 3rd International Workshop on Laser-Matter Interaction, IGESA Center, Porquerolles, France, June 25-29, 2012, invited talk
- 2012** Sixth International Conference “Solitons, collapses and Turbulence”, June 5-8, 2012, Novosibirsk, Russia, invited talk
- 2012** AMS meeting, Washington DC, Apr 17-18, 2012, invited talk
- 2012** Brown University, March 15, 2012, invited talk
- 2011** Workshop on Recent Progress of Waves Processes in Nature, University of Arizona, Tucson, October 7-9, 2011, invited talk
- 2011** Third International Conference “Turbulent Mixing and Beyond”, ICTP - International Centre for Theoretical Physics, Trieste, Italy, August 21-28, 2011, invited talk
Title: Statistics of multiple filamentation of strong optical turbulence
- 2011** 20th International Laser Physics Workshop, Sarajevo, Bosnia and Herzegovina, July 11-15, 2011, invited talk
- 2011** Conference “Nonlinear Waves in Optics”, The University of Rouen, France, June 28 - July 01, 2011, invited talk
- 2011** 8th European Conference on Mathematical and Theoretical Biology, and Annual Meeting of The Society for Mathematical Biology, Krakow, Poland, June 28-July 02, 2011, invited talk
- 2011** The eighth IMACS International Conference, The University of Georgia, Athens, Georgia, April 04-07, 2011, invited talk
- 2011** Georgia Institute of Technology, April 04, 2011, invited talk

- 2011 University of California, Davis, Feb 14, 2011, invited talk
- 2011 Indiana University - Purdue University Indianapolis, Jan 26, 2011, invited talk
- 2011 University of Illinois at Urbana-Champaign, Jan 25, 2011, invited talk
- 2011 University of Cambridge, UK, Jan 14, 2011, invited talk
- 2010 Conference “XIX-th Session of the Nonlinear Dynamics Council of the Russian Academy of Sciences”, Moscow, Russia, December 20-21, 2010, invited talk
- 2010 2nd International Workshop on Laser-Matter Interaction, IGESA Center, Porquerolles, France 13-17 September 2010, invited talk
- 2010 Université Paris Sud, France, September 10, 2010, invited talk
- 2010 IV International Conference “Frontiers of Nonlinear Physics”, Nizhny Novgorod, Russia, July 13 - July 20, 2010, invited talk
- 2010 Moscow Institute of Physics and Technology, Russia, July 01, 2010, invited talk
- 2010 The 8th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Dresden, Germany, May 25-28, 2010, invited talk.
- 2010 Dresden University of Technology, Germany, May 27, 2010, invited talk
- 2010 University of Stuttgart, Germany, May 26, 2010, invited talk
- 2010 Conference “Frontiers in Nonlinear Waves”, University of Arizona, Tucson, AZ, March 26-29, 2010
- 2009 Arizona State University, November 7, 2009, invited talk
- 2009 The 7th International Conference of Numerical Analysis and Applied Mathematics, Crete, Greece, September 18-22, 2009.
- 2009 Fifth International Conference “Solitons, collapses and Turbulence”, August 2-7, 2009, Chernogolovka, Russia, invited talk
- 2009 International Conference on Mathematical Biology and Annual Meeting of the Society for Mathematical Biology July 27-30, 2009, University of British Columbia, Canada, invited talk
- 2009 Aston University, UK, July 07, 2009, invited talk
- 2009 Loughborough University, UK, July 06, 2009, invited talk
- 2009 Oxford University, July 03, 2009, invited talk
- 2009 University of Notre Dame, April 27, 2009, invited talk
- 2009 AMS meeting, Worcester, MA, Apr 25-26, 2009, invited talk
- 2009 Brown University, April 24, 2009, invited talk
- 2009 Southern Methodist University, April 13, 2009, colloquium
- 2009 The SIXTH IMACS International conference, Athens, Georgia, March 23-26, 2009, invited talk
- 2008 Workshop “Singular phenomena in nonlinear optics, hydrodynamics and plasmas”, Banff, Canada, October 24-26, 2008.
- 2008 SIAM conference on Nonlinear Waves and Coherent Structures, Rome, Italy
- 2007 University of Toronto, colloquium
- 2007 Southern Methodist University, colloquium
- 2006 Conference “Non-equilibrium Statistical Mechanics and turbulence”, University of Warwick (UK), 15-21 of July 2006, invited talk

- 2006 North Carolina State University, colloquium
- 2006 University of New Mexico, colloquium
- 2005 University of Chicago, invited talk
- 2005 University of Wisconsin-Madison, invited talk
- 2005 University of Houston, invited talk
- 2004 University of Illinois at Urbana-Champaign, invited talk
- 2004 Conference “Landau Days”(Chernogolovka, Russia)
- 2003 California Institute of Technology, invited talk
- 2003 The Third IMACS International conference, The University of Georgia, Athens, Georgia, April 07-10, 2003, invited talk
- 2003 Workshop “Advances in Raman-Based, High-Speed Photonics”, invited talk (Los Alamos, USA).
- 2002 Columbia University, invited talk
- 2002 “Nonlinear Optics Workshop”, invited talk (Brown University, USA).
- 2002 Conference “Arizona Days 2002”(Los Alamos, USA).
- 2002 Second Workshop “Soliton, Collapses and Turbulence”(Chernogolovka, Russia).
- 2001 Brown University, invited talk
- 2001 Rensselaer Polytechnic Institute, invited talk
- 2001 Bell Labs, invited talk
- 2001 Workshop “Statistical and Nonlinear Physics of Fiber Communications”, invited talk (Los Alamos, USA)
- 2001 Conference “Soliton Equations: Applications and Theory” (Colorado Springs, USA)
- 2001 Brown University, invited talk
- 2000 “Conference on Lasers and Electro-Optics” (CLEO) (San Francisco, USA)
- 2000 Workshop “Duke Days”, invited talk (Duke Univ., USA)
- 1999 “Seventh Topical Meeting on Photorefractive Materials, Effects, and Devices”, invited talk (Elsinore, Denmark)

Grants:

- 2018-2021 NSF DMS-1814619, Motion of complex singularities and integrability in surface dynamics. \$306,000. PI.
- 2014-2017 NSF DMS-1412140, Spontaneous formation of singularities through critical collapse. \$240,000. PI.
- 2010-2014 NSF/DOE Grant 1004118, Collaborative Research: Vlasov Multi-Dimensional Simulation of Langmuir Wave Collapse and Stimulated Raman Scatter in the Fluid-Kinetic Transition Regime. \$270,000. PI, lead institution.
- 2009-2012 NSF/DOE Grant 6834403, Instability and Transport of Laser Beam in Plasma. \$319,896. Co-PI, Subcontract from the New Mexico Consortium.
- 2008-2011 NSF DMS-0807131, Collaborative Research: Strong Turbulence from Singular Collapses in Nonlinear Schrödinger Type of Equations. \$108,385. PI, lead institution.
- 2007-2011 NSF DMS-0719895: Multiscale stochastic model of myxobacteria dynamic. \$199,999. Co-PI.

2002-2003 LDRD Reserve Grant for Homeland Defense of the Department of Energy, Secure communications in optical fiber links, \$90,000. Investigator.

2001-2004 LDRD Grant of the Department of Energy, Statistical Physics of Fiber Communications, \$300,000. Investigator.

1999-2001 LDRD Grant of the Department of Energy, New Perspectives in Mathematical Modeling of High Bit-Rate Fiber Optical Telecommunications, \$300,000. Investigator.

1997-1999 INTAS Grant 96-0954; Brussels, Belgium. EUR60,000. Team Leader.

Teaching:

2005-Present Taught a wide range of undergraduate and graduate mathematical courses

Doctoral advisement:

- Anastassiya Semenova, University of New Mexico, Expected date of degree 2020
- Denis Silantiev, University of New Mexico, PhD Aug 2017; currently postdoc at Courant Institute
- Sergey Dyachenko, University of New Mexico, PhD Aug 2014; currently JL Doob Research Assistant Professor, Department of mathematics, University of Illinois Urbana-Champaign
- Richard Gejji, University of Notre Dame (2008-2010, co-advisor with Mark Alber); currently at the Department of Defense
- Vladimir Novikov (summer student advisement at LANL, 2001); currently Lecturer in Mathematics, Department of Mathematical Sciences, Loughborough University

Postdoctoral advisement:

2008-Present: Natalia Vladimirova, University of New Mexico

2012-2013 Alexey Balakin, University of New Mexico; currently Senior Scientific Staff member at Institute of Applied Physics of the Russian Academy of Sciences, Nizhniy Novgorod, Russia

2006-2008: Nan Chen (co-advised with Mark Alber at the University of Notre Dame), currently the staff member at the Anderson Cancer Center, Houston.

Service and Memberships:

2008-Current Multiple NSF and DOE panels

2019 Organizer of 5 sessions at conference ICIAM 2019, Valencia, Spain, July 15-19, 2019.

2019 Organizer of the session 25 (7 sections, 20 speakers) "Nonlinear waves, singularities, vortices, and turbulence in hydrodynamics, physical, and biological system" at The Eleventh IMACS International Conference, The University of Georgia, Athens, Georgia, April 17-19, 2019.

2018 Organizer of 3 sessions at SIAM conference on Nonlinear Waves and Coherent Structures, Orange, California, USA, June 11-14, 2018

2017 Organizer of The VIIIth International Conference, "SOLITONS, COLLAPSES AND TURBULENCE: Achievements, Developments and Perspectives", Chernogolovka, Moscow region, Russia, May 21-25, 2017.

2017 Organizer of the session 18 "Waves, dynamics of singularities, and turbulence in hydrodynamics, physical, and biological systems" at The Tenth IMACS International Conference, The University of Georgia, Athens, Georgia, March 29 - April 01, 2017.

- 2016** Organizer of 4 sessions at SIAM conference on Nonlinear Waves and Coherent Structures, Philadelphia, Pennsylvania, USA, August 08-11, 2016
- 2016** Organizer of the special session SS45 "Nonlinear Waves and Singularities in Optical and Hydrodynamic Systems" SS45 at the 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, July 01-05, 2016.
- 2016** Organizer of the Minisymposium "Solitons, collapses and their applications in optics and hydrodynamics" at The Fourth International Conference: Nonlinear Waves—Theory and Applications, Beijing, June 25-28, 2016.
- 2015** Organizer of the session 17 "Waves, dynamics of singularities, and turbulence in hydrodynamics, physical, and biological systems" at The Ninth IMACS International Conference, The University of Georgia, Athens, Georgia, April 1-4, 2015.
- 2014** Organizer of 4 sessions at SIAM conference on Nonlinear Waves and Coherent Structures, Churchill College, University of Cambridge, UK, August 11-14, 2014.
- 2014** Organizer of The VIIth International Conference, "SOLITONS, COLLAPSES AND TURBULENCE: Achievements, Developments and Perspectives", Chernogolovka, Moscow region, Russia, August 4-8, 2014.
- 2014** Organizer of the Special Session on "Nonlinear Waves and Singularities in Water Waves, Optics and Plasmas", AMS meeting, Albuquerque, NM, USA, April 05-06, 2014.
- 2013** Organizer of the Session on "Nonlinear waves and singularities in optics, hydrodynamics, and plasmas: numerical and analytical approaches", The Eighth IMACS International Conference, The University of Georgia, Athens, Georgia, March 25-28, 2013.
- 2012** Organizer of the Special Session on "Analytical and Numerical Approaches in Nonlinear Systems: Collapses, Turbulence, Nonlinear Waves in Mathematics, Physics, and Biology", AMS meeting, Tucson, AZ, October 27-28, 2012.
- 2011** Organizer of the symposium "Nonlinear waves and singularities in optics, hydrodynamics and plasmas" at the 9th International Conference of Numerical Analysis and Applied Mathematics, Halkidiki, Greece, September 19-25, 2011.
- 2011** Organizer of 3 sessions at conference ICIAM 2011, Vancouver, Canada, July 18-22, 2011.
- 2010** Organizer of 4 sessions at SIAM conference on Nonlinear Waves and Coherent Structures, Philadelphia, Pennsylvania, August 16-19, 2010.
- 2010** Organizer of the conference "Frontiers in Nonlinear Waves", University of Arizona, Tucson, AZ, March 26-29, 2010.
- 2010** Organizer of the Special Session on Strongly-nonlinear Phenomena: Theory and Applications to Nonlinear Optics, Hydrodynamics, Bose-Einstein Condensation and Biology", AMS meeting, Albuquerque, NM, April 17-18, 2010.
- 2009** Organizer of symposium "Nonlinear waves and singularities in optics, hydrodynamics and plasmas" at the 7th International Conference of Numerical Analysis and Applied Mathematics, Crete, Greece, September 18-22, 2009.
- 2008** Organizer of workshop "Singular phenomena in nonlinear optics, hydrodynamics and plasmas", Banff, Canada, October 24-26, 2008.

- 2008** Organizer of 2 sessions at SIAM conference on Nonlinear Waves and Coherent Structures, Rome, Italy, July 21-24, 2008.
- 2008** Organizer of the workshop "LAAZ ASUNM Daze 2008", University of New Mexico, February 29 - March 01, 2008.
- 2007** Organizer of the Special Session on Nonlinear Waves in Optics, Hydrodynamics and Plasmas at AMS meeting, University of New Mexico, 13-14 October, 2007.
- 2007** Organizer and Co-Organizer of 4 minisymposia at the 6th International Congress on Industrial and Applied Mathematics (ICIAM 07), Zurich, Switzerland, 16-20 July, 2007.
- 2006** Organizer of the Special Session on Nonlinear Waves at AMS meeting, University of Notre Dame, 8-9 April 2006.
- 2002** Member of the Organizing committee, Second Workshop "Soliton, Collapses and Turbulence", Chernogolovka, Russia.

Referee: Applied Physics B - Lasers and Optics

Communications in Mathematical Physics
 Communications in Nonlinear Science and Numerical Simulation
 IMA Journal of Applied Mathematics
 Journal of Fluid Mechanics
 Journal of Nonlinear Science
 Journal of Physics A
 Journal of the Optical Society of America B
 Journal of Theoretical and Experimental Physics (JETP)
 JETP Letters
 New Journal of Physics
 Nonlinearity
 Optica
 Optics Communications
 Optics Express
 Optics Letters
 Physica A
 Physica D
 Physica Scripta
 Physical Review A
 Physical Review E
 Physical Review Letters
 Physics Letters A
 Physics of Plasmas
 Plasma Physics and Controlled Fusion
 Proceedings of the Royal Society A
 SIAM J. Applied Math
 Studies in Applied Mathematics

Research interests – Applied Mathematics and Nonlinear Science:

1. Laser Fusion. Propagation of intense beam in plasma. Plasma turbulence, stochastic partial differential equations.
2. Multiscale modeling of biological systems. Bacterial aggregation, chemotaxis, cell-cell interactions. Collapse of bacterial colonies. Stochastic Potts model of biological cell.

Matching microscale (intracellular) to macroscale (cell's density) level of description through mesoscale.

3. Dynamics of fluids with free surface. Surface waves. Well-posedness of surface wave equations. Exactly integrable interface dynamics. Stokes flow. Superfluids. Dynamics of interface between superfluid $^3\text{He-A}$ and superfluid $^3\text{He-B}$.
4. Wave collapse, blow-up, singularity formation and its application to plasma physics, hydrodynamics and nonlinear optics.
5. Pattern formation in nonlinear optics, hydrodynamics and biology.
6. High-bit-rate optical communication. Dispersion-managed optical fiber systems. Soliton propagation in optical systems. Pulse propagation in one-dimensional nonlinear media (optical fibers) with random birefringence and random dispersion.
7. Pseudospectral numerical methods. High performance parallel numerical computation of optical fiber systems. Multiscale modeling and simulations.
8. Collapse of Bose-Einstein condensate with long-range dipole-dipole interactions.
9. Nonlinear laser beam combining and collapses

LIST OF SCIENTIFIC PUBLICATIONS

Articles in Refereed Journals

1. P.M. Lushnikov and N.M. Zubarev, *Explosive development of quantum Kelvin-Helmholtz instability of the free surface of Helium II.*, Accepted to JETP (2019).
2. A. I. Dyachenko, S. A. Dyachenko, P. M. Lushnikov and V. E. Zakharov, *Dynamics of Poles in 2D Hydrodynamics with Free Surface: New Constants of Motion*, Accepted to Journal of Fluid Mechanics (2019). arXiv:1809.09584
3. A. I. Dyachenko, P. M. Lushnikov and V. E. Zakharov, *Non-Canonical Hamiltonian Structure and Poisson Bracket for 2D Hydrodynamics with Free Surface*, Journal of Fluid Mechanics, **869**, 526-552 (2019).
4. P.M. Lushnikov and N.M. Zubarev, *Exact solutions for nonlinear development of Kelvin-Helmholtz instability for counterflow of superfluid and normal components of Helium II.*, Phys. Rev. Lett. **120**, 204504 (2018).
5. P.M. Lushnikov and N. Vladimirova, *Toward defeating diffraction and randomness for laser beam propagation in turbulent atmosphere*, JETP Letters, **108**, 571-576 (2018).
6. L.G. Wright, Z.M. Ziegler, P.M. Lushnikov, Z. Zhu, M.A. Eftekhar, D.N. Christodoulides, and F.W. Wise, *Multimode Nonlinear Fiber Optics: Massively Parallel Numerical Solver, Tutorial, and Outlook*, IEEE Journal of Selected Topics in Quantum Electronics, **24**, 5100516 (2018).
7. P.M. Lushnikov, S.A. Dyachenko and D.A. Silantyev, *New conformal mapping for adaptive resolving of the complex singularities of Stokes wave*, Proc. Roy. Soc. A **473**, 20170198 (2017).
8. D.A. Silantyev, P.M. Lushnikov and H.A. Rose, *Langmuir wave filamentation in the kinetic regime. II. Weak and strong pumping of nonlinear electron plasma waves as the route to filamentation*, Phys. of Plasmas **24**, 042105 (2017).
9. D.A. Silantyev, P.M. Lushnikov and H.A. Rose, *Langmuir wave filamentation in the kinetic regime. I. Filamentation instability of Bernstein-Greene-Kruskal modes in multidimensional Vlasov simulations*, Phys. of Plasmas **24**, 042104 (2017).
10. P.M. Lushnikov. *Structure and location of branch points for Stokes wave on deep water*, Journal of Fluid Mechanics, **800**, 557-594 (2016).

11. S.A. Dyachenko, P.M. Lushnikov, and A.O. Korotkevich. *Branch cuts of Stokes wave on deep water. Part I: Numerical solution and Padé approximation*, Studies in Applied Mathematics, **137**, 419-472 (2016).
12. P.M. Lushnikov and N. Vladimirova. *Nonlinear combining of multiple laser beams in Kerr medium*, Optics Express **23**, 31120-31125 (2015).
13. A.O. Korotkevich, P.M. Lushnikov, and H.A. Rose, *Beyond the random phase approximation: Stimulated Brillouin backscatter for finite laser coherence times*. Physics of Plasmas, **22**, 012107 (2015).
14. P.M. Lushnikov and N. Vladimirova, *Nonlinear combining of laser beams*. Optics Letters **39**, 3429-3432 (2014).
15. P.M. Lushnikov, H.A. Rose, D.A. Silantyev, and N. Vladimirova, *Vlasov multi-dimensional model dispersion relation*, Phys. of Plasmas **21**, 072103 (2014).
16. S.I. Dejak, D. Egli, P.M. Lushnikov, and I.M. Sigal. *On blowup dynamics in the Keller-Segel model of chemotaxis*. St. Petersburg Mathematical Journal **25**, 547-574 (2014).
17. S.A. Dyachenko, P.M. Lushnikov, and A.O. Korotkevich. *The complex singularity of a Stokes wave*, JETP Letters **98**, 675-679 (2014).
18. S.A. Dyachenko, P.M. Lushnikov, and N. Vladimirova. *Logarithmic scaling of the collapse in the critical Keller-Segel equation*, Nonlinearity, **26**, 3011-3041 (2013).
19. P.M. Lushnikov, S.A. Dyachenko and N. Vladimirova. *Beyond leading-order logarithmic scaling in the catastrophic self-focusing of a laser beam in Kerr media*, Physical Review A, **88**, 013845 (2013).
20. S.I. Dejak, P.M. Lushnikov, Y.N. Ovchinnikov, and I.M. Sigal. *On Spectra of Linearized Operators for Keller-Segel Models of Chemotaxis*, Physica D **241**, 1245-1254 (2012).
21. P.M. Lushnikov, P. Šulc, and K.S. Turitsyn, *Non-Gaussianity in single-particle tracking: Use of kurtosis to learn the characteristics of a cage-type potential*, Physical Review E, **85**, 051905 (2012).
22. R. Gejji, P.M. Lushnikov, and M. Alber, *Macroscopic model of self-propelled bacteria swarming with regular reversals*, Physical Review E, **85**, 021903 (2012).
23. Y. Chung and P.M. Lushnikov, *Strong Collapse Turbulence in Quintic Nonlinear Schrödinger Equation*, Physical Review E, **84**, 036602 (2011).
24. A.O. Korotkevich, and P.M. Lushnikov, *Proof of concept implementation of the massively parallel algorithm for simulation of dispersion-managed WDM optical fiber systems*, Optics Letters, **36**, 1851-1853 (2011).
25. P.M. Lushnikov and N. Vladimirova. *Non-Gaussian Statistics of Multiple Filamentation*. Optics Letters, **35**, 1965-1967 (2010).
26. P.M. Lushnikov. *Collapse and stable self-trapping for Bose-Einstein condensates with $1/r^b$ type attractive interatomic interaction potential*. Physical Review A, **82**, 023615 (2010).
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29. M. Alber, N. Chen, P.M. Lushnikov, and S.A. Newman. *Continuous macroscopic limit of a discrete stochastic model for interaction of living cells*. Physical Review Letters, **99**, 168102 (2007).
30. I. Gabitov, R. Indik, P.M. Lushnikov, L. Mollenauer, and M. Shkarayev. *Twin Families of Bisolitons in Dispersion Managed Systems*. Optics Letters, **32**, 605-607 (2007).

31. P.M. Lushnikov and H.A. Rose. *How much laser power can propagate through fusion plasma?* Plasma Physics and Controlled Fusion, **48**, 1501-1513 (2006).
32. M. Alber, N. Chen, T. Glimm and P.M. Lushnikov. *Multiscale dynamics of biological cells with chemotactic interactions: from a discrete stochastic model to a continuous description.* Phys. Rev. E, **73**, 051901 (2006).
33. P.M. Lushnikov and V.E. Zakharov. *On optimal Canonical Variables in the Theory of Ideal Fluid with Free Surface.* Physica D, **203**, 9-29 (2005).
34. P.M. Lushnikov. *Diffusion of optical pulses in dispersion-shifted randomly birefringent optical fibers.* Optics Communications, **245**, 187-192 (2005).
35. P.M. Lushnikov and H.A. Rose. *Instability versus equilibrium propagation of laser beam in plasma.* Physical Review Letters, **92**, 255003 (2004).
36. P.M. Lushnikov. *Exactly Integrable Dynamics of Interface between Ideal Fluid and Light Viscous Fluid.* Physics Letters A, **329**, 49-54 (2004).
37. P.M. Lushnikov. *Oscillating tails of a dispersion-managed soliton.* J. of the Optical Society of America B, **21**, 1913-1918 (2004).
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39. P.M. Lushnikov. *Fully parallel algorithm for simulating wavelength-division-multiplexed optical fiber systems.* Optics Letters, **27**, 939-941 (2002).
40. M. Chertkov, I. Gabitov, P.M. Lushnikov, J. Moeser, Z. Toroczkai. *Pinning method of pulse confinement in optical fiber with random dispersion.*, J. of the Optical Society of America B, **19**, 2538-2550 (2002).
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45. P.M. Lushnikov. *On the boundary of the dispersion-managed soliton existence.* JETP Letters, **72**, 111-114 (2000).
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47. P.M. Lushnikov. *Light propagation in photorefractive crystals: from rings to hexagons.* Nature (Priroda Magazine of the Russian Academy of Science, in Russian), **999**(11), 29 (1998).
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1. M. Alber, N. Chen, T. Glimm, and P.M. Lushnikov. *Two-dimensional Multiscale Model of Cell Motion in a Chemotactic Field*. 53-76 In Single-Cell-Based Models in Biology and Medicine, Series: Mathematics and Biosciences in Interaction. Eds. A.R.A. Anderson, M.A.J. Chaplain, K.A. Rejniak. Birkhauser Verlag Basel/Switzerland (2007).

Books

1. E.A. Kuznetsov, P.M. Lushnikov and V.E. Zakharov. *Nonlinear Waves and Integrability: Basic Integrable and non-Integrable Equations*, 450 pages, In preparation for submission to AMS (2018).

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1. P.M. Lushnikov. *Branch cuts of Stokes wave on deep water. Part II: Structure and location of branch points in infinite set of sheets of Riemann surface*, arXiv:1509.03393 (2015).
2. S.A. Dyachenko, P.M. Lushnikov, and A.O. Korotkevich. *Branch cuts of Stokes wave on deep water. Part I: Numerical solution and Padé approximation*, arXiv:1507.02784 (2015).
3. A.O. Korotkevich, and P.M. Lushnikov. *Nonlinear Waves and Singularities in Optics, Hydrodynamics and Plasmas*. AIP Conf. Proc. **1389**, 684-685 (2011).
4. S.A. Dyachenko, P.M. Lushnikov and N. Vladimirova. *Logarithmic-type Scaling of the Collapse of Keller-Segel Equation*. AIP Conf. Proc. **1389**, 709-712 (2011).
5. A.O. Korotkevich, P.M. Lushnikov, and H.A. Rose, *Collective stimulated Brillouin scatter*, arXiv:1105.2094 (2011).
6. I.R. Gabitov, and P.M. Lushnikov. *Symposium: Nonlinear Waves and Singularities in Optics, Hydrodynamics and Plasmas*. AIP Conf. Proc. **1168**, 1217-1218 (2009).
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8. J.L. Kline, D.S. Montgomery, H.A. Rose, S.R. Goldman, D.H. Froula, J.S. Ross, R.M. Stevenson, P.M. Lushnikov. *Mitigation of stimulated Raman scattering in hohlraum plasmas*. Journal of Physics: Conf. Series. **112**, 022030 (2008).
9. P.M. Lushnikov, and H.A. Rose, *Collective stimulated Brillouin backscatter*, arXiv:0710.0634 (2007).
10. P.M. Lushnikov and H.A. Rose. *Practical Formula for Laser Intensity at Beam Spray Onset*. Nuclear Weapons Highlights 2007, p. 70, Los Alamos National Laboratory (2007).
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12. P.M. Lushnikov. Center for Nonlinear Studies. Research Highlights (2001).
13. P.M. Lushnikov, and M. Saffman. *Collapse and generation of ultrashort optical pulses in a nonlinear optical cavity*. Quantum Electronics and Laser Science Conference (QELS 2000). Technical Digest. Postconference Edition. TOPS Vol.40, 7-12 May 2000, San Francisco, CA, USA.
14. P.M. Lushnikov, and A.V. Mamaev. *Hexagonal patterns in photorefractive crystals with feedback for scattered light*. Proceedings of "Seventh Topical Meeting on Photorefractive Materials, Effects, and Devices" (Elsinore, Denmark, 1999).

15. P.M. Lushnikov. *Dynamical criterion of a collapse in the nonlinear Schrödinger equation.* Bulletin of the Russian Academy of Sciences. Physics, **61**, suppl., no.1, pp.46-51 (1997).