

# Curriculum Vitae

## Lenya Ryzhik

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### Education

*Stanford University, Stanford, CA*  
Ph.D. in Mathematics – 1997  
*Moscow Institute of Physics and Technology, Moscow, Russia*  
1986-1992 – equivalent of B.S. in Mathematical Physics

### Experience

2009 – present, Professor, Department of Mathematics, Stanford University  
2006 – 2009, Professor, Department of Mathematics, University of Chicago  
2003 – 2006, Associate Professor, Department of Mathematics, University of Chicago  
2000 – 2003, Assistant Professor, Department of Mathematics, University of Chicago  
1997 – 2000, L.E. Dickson Instructor, Department of Mathematics, University of Chicago  
Fall 1997, Postdoctoral Fellow, Mathematical Sciences Research Institute

**Dissertation** “Waves and Transport, Multiple Scattering of Waves in Random Medium”

**Ph.D. Advisors** Joseph B. Keller and George C. Papanicolaou

**Research Interests** Analysis and applied mathematics: applications of mathematical methods to physically interesting systems, applied analysis and partial differential equations, stochastic systems.

### Grants and Fellowships

NSF grant DMS-9971742 “Radiative transport theory for waves”, 1999–2002.  
ONR grant “Time Reversal for Waves in Random Media”, 2001–2004,  
Alfred P. Sloan Research Fellowship 2002–2004  
NSF grant DMS-0203537 “Propagation of Fronts and Waves in Complex Media”, 2002–2005.  
DARPA-ONR grant N00014-04-1-0224 ”Time Reversal for Electromagnetic Waves in Random Media”, 2004-2008.  
NSF grant DMS-0604687 “The Kinetic Theory of Waves and Reactive-Diffusive Fronts”, 2006-2009.  
NSF FRG grant DMS-0854952 ”Collaborative Research: Stochastics and Dynamics: Asymptotic problems”, 2009-2012.

NSF grant DMS-0908507 "Collaborative Research: Waves and Fronts in Heterogeneous Media", 2009-2013.

AFOSR NSSEFF Fellowship, 2010-2015.

NSF grant DMS-1100754 "Proposal for a Five-Day Conference: Challenges for Nonlinear PDE and Analysis".

NSF grant "FRG: Collaborative Research: Singularities, mixing and long time behavior in nonlinear evolution", DMS-1158938, 2012-2015.

NSF grant DMS-1311903, "Waves, Particle Transport and Fronts in Heterogeneous Media"

BSF grant "Stochastic front propagation", 2015–2018.

NSF grant DMS-1613603 "Waves and fronts in heterogeneous media", 2016-2019.

ONR grant "Laser propagation in heterogeneous media and applications to off-axis reconstructions", 2017-2020.

NSF grant DMS-1910023 "Long time behavior for partial differential equations in random media", 2019-2022.

ONR grant N00014-22-1-2174 "Diffusion and learning models", 2022-2025.

NSF grant DMS-2205497 "Branching processes, random partial differential equations and applications", 2022-2025.

## Publications and preprints

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2. L. Ryzhik, G. Papanicolaou, J. Keller, Transport equations for elastic and other waves in random media, *Wave Motion*, **24**, 1996, 327-370.
3. G. Papanicolaou, L. Ryzhik, J. Keller, Stability of the P to S energy ratio in the diffusive regime, *Bulletin of the Seismological Society of America*, **86**, 1996, 1107-1115
4. L. Ryzhik, G. Papanicolaou, J. Keller, Transport equations for waves in a half space, *Communications in Partial Differential equations*, **22**, 1997, 1869-1910.
5. G. Papanicolaou, L. Ryzhik *Waves and transport*, IAS/Park City Mathematics Series, Vol. 5, L. Caffarelli and Weinan E, eds., AMS, 1998, pp. 305-382.
6. A. Fannjiang, L. Ryzhik and G. Papanicolaou, Evolution of trajectory correlations in steady random flows, *Recent Advances in Partial Differential Equations* (R.Spigler, S.Venakides, eds.), AMS, 1997, 105-131.
7. G. Bal, A. Fannjiang, G. Papanicolaou and L. Ryzhik, Radiative transport in a periodic structure, *Journal of Statistical Physics* **95** (1/2):479-494, 1999.
8. G. Bal, J.B. Keller, G. Papanicolaou and L. Ryzhik, Transport theory for acoustic waves with reflection and transmission at interfaces, *Wave Motion*, **30**, 1999, 303-327.
9. G. Bal, G. Papanicolaou and L. Ryzhik, Diffusive energy scattering from weakly random surfaces, *Journal of Mathematical Physics*, **40**, 1999, 4813-4827.
10. G. Bal, G. Papanicolaou and L. Ryzhik, Probabilistic theory of transport processes with polarization, *SIAM Journal of Applied Mathematics*, **60**, 2000, 1639 - 1666
11. G. Bal and L. Ryzhik, Diffusion approximation of radiative transfer problems with interfaces, *SIAM Journal of Applied Mathematics*, **60**, 2000, 1887-1912.
12. P. Constantin, A. Kiselev, A. Oberman and L. Ryzhik, Bulk burning rate in passive - reactive

- diffusion, *Archive for Rational Mechanics*, **154**, 2000, 53-91.
13. G. Bal, V. Freilikher, G. Papanicolaou and L. Ryzhik, Wave transport along surfaces with random impedance, *Phys. Rev. B*, **62**, 2000, 6228-6240.
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  15. A. Fannjiang and L. Ryzhik, Radiative Transfer of Sound Waves in a Random Flow: Turbulent Scattering and Mode-Coupling, *SIAM Journal of Applied Mathematics*, **61**, 2001, 1545-1577.
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  17. A. Kiselev and L. Ryzhik, An upper bound for the bulk burning rate for systems, *Nonlinearity*, **14**, 2001, 1297-1310.
  18. G. Bal and L. Ryzhik, Wave transport for a scalar model of the Love waves, *Wave Motion*, **36**, 2002, 49-66.
  19. G. Bal and L. Ryzhik, Time reversal for classical waves in random media, *Comptes rendus de l'Académie des sciences - Série I - Mathématique*, **333**, 2001, 1041-1046.
  20. G. Bal, G. Papanicolaou and L. Ryzhik, Radiative transport limit for the random Schrödinger equation, *Nonlinearity*, **15**, 2002, 513-529.
  21. G. Bal and L. Ryzhik, Time reversal and refocusing in random media, *SIAM Jour. Appl. Math.*, **63**, 2003, 1475-1498.
  22. G. Papanicolaou, K. Sølna and L. Ryzhik, The parabolic wave approximation and time reversal, *Matematica Contemporanea*, **23**, 2002, 139-159.
  23. G. Bal, G. Papanicolaou and L. Ryzhik, Self-averaging in time reversal for the parabolic wave equation, *Stochastics and Dynamics*, **2**, 2002, 507-531.
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  25. G. Papanicolaou, K. Sølna and L. Ryzhik, Statistical stability in time reversal, *SIAM Jour. Appl. Math.*, **64**, 2004, 1133-1155
  26. G. Bal, T. Komorowski and L. Ryzhik, Self-averaging of the Wigner transform in random media, *Communications in Mathematical Physics*, 2003, **242**, 81-135.
  27. P. Constantin, A. Kiselev and L. Ryzhik, Fronts in reactive convection: bounds, stability and instability, *Communications in Pure and Applied Mathematics*, **56**, 2003, 1781-1803.
  28. N. Vladimirova, P. Constantin, A. Kiselev, O. Ruchaiskiy and L. Ryzhik, Flame enhancement and quenching in fluid flows, *Combustion Theory and Modeling*, **7**, 2003, 487-508.
  29. G. Bal and L. Ryzhik, Time splitting for wave equations in random media, *Mathematical Modelling and Numerical Analysis (M2AN)*, **38**, 2004, 961-987.
  30. B. Perthame and L. Ryzhik, Exponential decay for the fragmentation or cell-division equation, *Journal of the Differential Equations*, **210**, 2005, 155-177.
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- tinuous Dynamical Systems A, **12**, 2005, 793-815.
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  36. H. Berestycki, P. Constantin and L. Ryzhik, Non-Planar Fronts in Boussinesq Reactive Flows, *Annales de l'Institut Henri Poincaré, C. Analyse non linéaire*, **23**, 2006, 407–437.
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  50. G. Papanicolaou, L. Ryzhik and K. Solna, Self-averaging from lateral diversity in the Itô-Schrödinger equation, *SIAM MMS*, **6**, 2007, 468–492.
  51. B. Perthame and L. Ryzhik, Moderate dispersion in scalar conservation laws, *Communications in Mathematical Sciences*, **5**, 2007, 473–484.
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61. T. Komorowski, Sz. Peszat and L. Ryzhik, Limit of fluctuations of solutions of Wigner Equation, *Communications in Mathematical Physics*, **292**, 2009, 479–510.
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69. A. Kiselev and L. Ryzhik, Biomixing by chemotaxis and enhancement of biological reactions, *Comm. PDEs*, **37**, 2012, 298–318.
70. T. Komorowski, A. Novikov and L. Ryzhik, Evolution of particle separation in slowly decorrelating velocity fields, *Comm. Math. Sci.*, **10**, 2012, 767–786.
71. M. Moscoso, A. Novikov, G. Papanicolaou and L. Ryzhik, A differential equations approach to  $l_1$ -minimization with applications to array imaging, *Inverse Problems*, **28**, 2012, 1050012012.
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74. G. Iyer, T. Komorowski, A. Novikov and L. Ryzhik, From homogenization to averaging in cellular flows, *Ann. Inst. H. Poincaré Anal. Non Linéaire* **31**, 2014, 957–983.

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80. L. Rossi and L. Ryzhik, Transition waves for a class of space-time dependent monostable equations, *Commun. Math. Sci.* **12**, 2014, 879–900.
81. T. Komorowski and L. Ryzhik, Long time energy transfer in the random Schrödinger equation, *Comm. Math. Phys.* **329**, 2014, 1131–1170.
82. I. Kukavica, M. Ignatova and L. Ryzhik, The Harnack inequality for second-order parabolic equations with divergence-free drifts of low regularity, *Comm. PDE* **41**, 2016, 208–226.
83. T. Komorowski, A. Novikov and L. Ryzhik, Homogenization driven by a fractional Brownian motion: the shear layer case, *Multiscale Model. Simul.* **12**, 2014, 440–457.
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86. G. Bal, O. Pinaud, L. Ryzhik and K. Solna, Precursors for waves in random media, *Wave Motion* **51**, 2014, 1237–1253.
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91. Y. Gu and L. Ryzhik, The random Schrödinger equation: slowly decorrelating time-dependent potentials, *Comm. Math. Sci.*, **15**, 2017, 359–378.
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100. T. Do, A. Kiselev, L. Ryzhik and C. Tan, Global regularity for the fractional Euler alignment system, *Arch. Ration. Mech. Anal.* **228**, 2018, 1–37.
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106. A. Dunlap, Y. Gu, L. Ryzhik and O. Zeitouni, The random heat equation in dimensions three and higher: the homogenization viewpoint, *Arch. Rat. Mech. Anal.*, **242**, 2021, 827–873.
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108. J. An and L. Ryzhik, Global well-posedness for the Euler alignment system with mildly singular interactions, *Nonlinearity*, **33**, 2020, 4670–4699.
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112. A. Dunlap, C. Graham and L. Ryzhik, Stationary solutions to the stochastic Burgers equation on the line, *Comm. Math. Phys.* **382**, 2021, 875–949.
113. G. Papanicolaou, L. Ryzhik and K. Velcheva, Traveling waves in a mean field learning model, *Nonlinearity*, **34**, 2021, 6799–6842.
114. A. Kiselev, F. Nazarov, L. Ryzhik and Y. Yao, Chemotaxis and reactions in biology, *Jour. Eur. Math. Soc.*, **25**, 2022, 2641–2696.
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