

# Robert Jenkins

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## Areas of specialization

Integrable Systems, Nonlinear Dispersive PDE, Random Matrix Theory,  
Orthogonal Polynomials and their relation to combinatorics and probability

## Employment

2014- Postdoctoral Research Associate, University of Arizona, Tucson  
2012-14 Researcher, International School for Advanced Studies (SISSA/ISAS), Trieste  
2009-12 Postdoc, University of Michigan, Ann Arbor  
2003-09 Research and Teaching Assistant, University of Arizona, Tucson

## Education

2003 BS in Mathematics, University of Arizona, *Summa Cum Laude*  
2009 PhD Program in Applied Mathematics, University of Arizona  
Thesis: Semiclassical asymptotics of the focusing nonlinear Schrödinger equation for square barrier initial data. Advisor: Ken McLaughlin

## Awards

VIGRE fellow 2003, 2007, 2008.

## Publications

1. Jenkins, R., Liu, J., Perry, P., Sulem, C., “Soliton resolution for the derivative non-linear Schrödinger equation”, 45 pages. (submitted to *Comm. Math. Phys.*) ARXIV:1710.03819.
2. Jenkins, R., Liu, J., Perry, P., Sulem, C., “Global well-posedness for the derivative non-linear Schrödinger equation”, 43 pages. (submitted to *Comm. in PDE*) ARXIV:1710.03810.
3. Jenkins, R., McLaughlin, K., “Behavior of the roots of the Taylor polynomials of the Riemann  $\xi$  function with growing degree”, 28 pages. (accepted by *Constr. Approx.*) ARXIV:1609.05965.
4. Borghese, M., Jenkins, R., McLaughlin, K., “Long time asymptotic behavior of the focusing nonlinear Schrödinger equation”, 38 pages. *Ann. Inst. H. Poincaré Anal. Non Linéaire*, (accepted, DOI: <https://doi.org/10.1016/j.anihpc.2017.08.006>).
5. Buckingham, R., Jenkins, R., Miller, P., “Semiclassical soliton ensembles for the three wave resonant interaction equations”, *Comm. Math. Phys.* **354** (2017), n.3, 1015-1100.
6. Cuccagna, S. and Jenkins, R., “On the asymptotic stability of N-soliton solutions of the defocusing nonlinear Schrödinger equation”, *Comm. Math. Phys.* **343** (2016), n.3, 921-969.
7. Jenkins, R., “Regularization of a sharp shock by the defocusing nonlinear Schrödinger equation”, *Nonlinearity* **28** (2015) n.7 2131-2180.
8. Jenkins, R. and McLaughlin, K., “The semiclassical limit of focusing NLS for a family of non-analytic initial data”, *CPAM* **67** (2014), n.2, 246-320.
9. Jenkins, R. and Baik, J., “Limiting distributions of maximal crossing and nestings of Poissonized random matchings”, *Ann. Probab.* **41** (2013), n.6, 4359-4406.
10. Jenkins, R., “Semiclassical asymptotics of the focusing nonlinear Schrödinger equation for square barrier initial data”, (Thesis)

### IN PREPARATION:

11. Jenkins, R., Tovbis, A., “Generation of multiphase waves from a barrier potential in the semiclassical limit of the focusing nonlinear Schrödinger equation”.
12. Buckingham, R., Jenkins, R., Miller, P., “Semiclassical soliton ensembles for the three wave resonant interaction equations: asymptotic behavior for small time”.
13. Buckingham, R., Jenkins, R., Miller, P., “Semiclassical soliton ensembles of the nonlinear Schrödinger equation approximating compactly supported initial data”.
14. Jenkins, R., McLaughlin, K., Pounder, K., “The inverse spectral problem for Jacobi matrices and applications to the finite Toda lattice”.
15. Jenkins, R., Pounder, K., “Interacting shock fronts in the Ablowitz-Ladik equations”.

## Invited talks

*Semiclassical soliton ensembles of the three wave resonant interaction equations.* Analysis/PDE seminar. Univ. of Toronto, Nov. 3, 2017.

*On the soliton resolution and asymptotic stability of multi-solitons of the derivative nonlinear Schrödinger equation.* Workshop on Inverse Scattering and Dispersive PDEs in One Space Dimension. Fields Institute, Toronto, August 9, 2017.

*Global Existence and Asymptotics for the Derivative Nonlinear Schrödinger Equation in One Dimension: Part II.* IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Athens, GA, March 31, 2017.

*Large time asymptotic behavior for the Derivative Nonlinear Schrödinger equation.* AMS Spring Southeastern Sectional Meeting, Charleston, SC, March 10, 2017.

*Semi-classical and large time limits of integrable PDE.* Analysis Seminar, Univ. of Arkansas, February 16, 2017.

*Emergent Phenomena in nonlinear waves.* Applied Mathematics Seminar, Univ. of Rhode Island, February 7, 2017.

*The soliton resolution conjecture for the focusing nonlinear Schrödinger equation.* Analysis and its Applications Seminar, Univ. of Arizona, September 20, 2016.

*Long time asymptotics of defocusing NLS and stability of N-soliton solutions.* SIAM Conference on Nonlinear Waves and Coherent Structures, Philadelphia, August 10, 2016.

*Generation of arbitrarily large N-phase wavetrains from barrier type data via the focusing NLS equation.* Analysis and PDE Seminar, Univ. of Central Florida, July 17, 2015.

*Long time behavior of solution of Gross-Pitaevskii with finite density initial data.* 13th International Symposium on Orthogonal Polynomials, Special Functions, and Applications, NIST, June 1, 2015.

*Regularization of sharp shocks by the defocusing NLS equation.* Dispersive Hydrodynamics Workshop, BIRS Banff, Canada May 18, 2015.

*Long-time asymptotics for Gross-Pitaevskii and asymptotic stability of N-soliton solutions.* IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Athens, GA March 31, 2015.

*Using the  $\bar{\partial}$  extension of the steepest descent method to study stability of solitons.* Conference on Scattering and Inverse Scattering in Multi-Dimensions, Univ. of Kentucky, May 18, 2014.

*Orthogonal Polynomials on the circle and interacting Ablowitz-Ladik shock waves.* Conference on Integrable Systems, Random Matrix Theory, and Combinatorics, Univ. of Arizona, October 23, 2013.

*Dispersive regularization of shocks via defocusing NLS.* Analysis and its Applications Seminar, Univ. of Arizona, April 31, 2013.

*Randomized Perfect Crossings and Matchings.* Integrable Systems Seminar, SISSA, April 3, 2013.

*Dispersive v. Dissipative Regularization of Shocks.* Applied and Interdisciplinary Mathematics seminar, Univ. of Michigan, October 7, 2011.

*Small dispersion limit of the focusing nonlinear Schrödinger equation for square barrier initial data.* AMS sectional meeting, Univ. of Kentucky, March 27, 2010.

*Semiclassical limit of the focusing NLS equation: a case study.* Workshop on Integrable Systems and Scientific Computing, ICTP, Trieste, Italy, June 23, 2009.

*Regularization of discontinuities via the focusing nonlinear Schrödinger evolution.* IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Athens, Georgia, March 23, 2009.

*Generation of odd phase waves from discontinuities in focusing NLS.* Workshop on Random Matrices, Related Topics and Applications, CRM, Montreal, Canada, August 27, 2008.

## Teaching and Advising

GRADUATE STUDENT WORKSHOPS: I have organized and run weekly research working groups on: 1) Orthogonal polynomials, and random matrix theory; 2) Integrable systems techniques for nonlinear PDE; 3) Numerical Methods for Riemann Hilbert problems.

GRADUATE STUDENT MENTORING: The workshops I've run have developed into joint research projects with students that generated published papers, and close mentorship of one student's dissertation project.

### INSTRUCTOR OF RECORD:

Arizona: Math 522/422 Advanced Applied Mathematics, Math 456 Applied PDE, Math 424 Theory of Complex Variables, Math 410/310 Applied Linear Algebra, Math 355 Analysis of Ordinary Differential Equations. Math 243 Discrete Mathematics, Math 129 Calculus II, Math 125 Calculus I, Math 120R Calculus Prep, Math 111 Plane Trigonometry, Math 110 College Algebra.

Michigan: Math 555 Intro to Complex Variables, Math 454 Boundary Value Problems for PDE, Math 404 Intermediate Differential Equations, Math 217 Linear Algebra, Math 216 Intro to Differential Equations Math 156 Applied Honors Calculus II

### TEACHING ASSISTANCE (ARIZONA):

Math 523 Graduate Real Analysis, PhD Qualifying Exam Review

## Outreach:

MATH MODELING PROJECTS: Mentored teams of undergraduates working on semester long modeling project for Math 485. Students researched their projects by reading current papers in the field, and learned to code in Matlab to test their hypotheses. Projects culminated in a written report and poster session.

NEW START SUMMER PROGRAM: Taught and advised first generation university students, also organized a Academic Conference where students learned to give talks in an academic setting.

SUMMER MATHEMATICS CAMP: councilor at a two week program for middle school students to work on exploratory problems in mathematics.

HIGH SCHOOL WORKSHOPS: Helped organize and run half day programs for local high school students. Activities included simple game theory and constructing planar tilings.

## Service to the profession

Member of the Undergraduate Education Committee, Mathematics Department, Univ. of Arizona, 2016-2018.

Organizing Committee for Special Session at AMS meeting, Charleston, SC. March 2017.

Organizer, Graduate Student Workshop, "Solitary waves in nonlinear dispersive PDE" as part of the Conference on Integrable Systems, Random Matrix Theory, and Combinatorics, October 2013.

Organizing Committee, Hamiltonian PDEs, Frobenius Manifolds, Deligne Mumford Moduli Spaces, SISSA, Trieste, Italy, September 2013.

Referee for Nonlinearity, IMRN, Physica D, Ann. Inst. H. Poincaré Anal. Non Linéaire, and SIAM Journal on Applied Mathematics, SIAM Journal on Mathematical Analysis