

Robert Jenkins

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Department of Mathematics
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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

- 2019- Assistant Professor, University of Central Florida, Orlando
- 2018-2019 Postdoc, Colorado State University, Fort Collins
- 2014-18 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 (Physics minor), 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., “Inverse Scattering for the derivative nonlinear Schrödinger equation with arbitrary spectral singularities”, *Anal. PDE* (accepted) ARXIV:1804.01506, 40 pages.
2. Jenkins, R., Liu, J., Perry, P., Sulem, C., “Global well-posedness for the derivative non-linear Schrödinger equation”, *Comm. in PDE* (accepted) ARXIV:1710.03810, 43 pages.
3. Jenkins, R., Liu, J., Perry, P., Sulem, C., “Soliton resolution for the derivative non-linear Schrödinger equation”, *Comm. Math. Phys.*, **363** (2018), n. 3, 1003-1049
4. Jenkins, R., McLaughlin, K., “Behavior of the roots of the Taylor polynomials of the Riemann ξ function with growing degree”, *Constr. Approx.*
DOI: <https://doi.org/10.1007/s00365-018-9417-7>, 29 pages.
5. Borghese, M., Jenkins, R., McLaughlin, K., “Long time asymptotic behavior of the focusing nonlinear Schrödinger equation”, *Ann. Inst. H. Poincaré Anal. Non Linéaire*, **35** (2018), n.4, 887-920.
6. 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.
7. 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.
8. Jenkins, R., “Regularization of a sharp shock by the defocusing nonlinear Schrödinger equation”, *Nonlinearity* **28** (2015) n.7 2131-2180.
9. 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.
10. Jenkins, R. and Baik, J., “Limiting distributions of maximal crossing and nestings of Poissonized random matchings”, *Ann. Probab.* **41** (2013), n.6, 4359-4406.
11. Jenkins, R., “Semiclassical asymptotics of the focusing nonlinear Schrödinger equation for square barrier initial data”, (Thesis)
IN PREPARATION:
12. Jenkins, R., Tovbis, A., “Generation of multiphase waves from a barrier potential in the semiclassical limit of the focusing nonlinear Schrödinger equation”.
13. Buckingham, R., Jenkins, R., Miller, P., “Semiclassical soliton ensembles for the three wave resonant interaction equations: asymptotic behavior for small time”.
14. Buckingham, R., Jenkins, R., Miller, P., “Semiclassical soliton ensembles of the nonlinear Schrödinger equation approximating compactly supported initial data”.
15. Jenkins, R., McLaughlin, K., Pounder, K., “The inverse spectral problem for Jacobi matrices and applications to the finite Toda lattice”.

Invited talks

Soliton resolution for dispersive nonlinear systems Mathematics Colloquium, University of Colorado Colorado Springs, Nov. 15, 2018.

Semiclassical soliton ensembles Nonlinear Waves seminar. Univ. of Colorado Boulder. Oct. 30, 2018.

Soliton Resolution for the Derivative nonlinear Schrödinger Equation AMS sectional meeting Univ. of Michigan, Ann Arbor, MI, Oct. 20 2018.

Long time behavior of the derivative nonlinear Schrödinger Equation Dynamics Days Europe. University of Loughborough, Sept. 7, 2018.

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 $\bar{\delta}$ 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

Since 2014 I have organized and run a weekly research working group in integrable systems. Themes varied with the interest and needs of the students. Topics have included: orthogonal polynomials, random matrix theory, integrable systems techniques for nonlinear PDE, the nonlinear steepest descent method, and numerical methods for Riemann Hilbert problems.

GRADUATE STUDENT MENTORING

When Prof. Ken McLaughlin left the University of Arizona in 2016 I took over, unofficially, the day-to-day advising and supervising role for two of his PhD students:

- Michael Borghese, PhD completed 2017.
- Kyle Pounder, PhD completed 2018.

COURSE COORDINATION

At Colorado State I coordinated Calculus I (Math 160) with approximately 600 students over 15 sections each semester.

INSTRUCTOR OF RECORD

At Arizona:

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

At Michigan:

Math 555 Intro to Complex Variables	Math 454 BVPs 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: Analysis, Applied Methods, and Numerical Analysis

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 incoming first generation university students in a summer program designed to increase retention. As part of program we organized a Academic Conference where students learned to give talks in an academic setting.

SUMMER MATHEMATICS CAMP: Councilor and teaching assistant 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. IHP C, Studies in Applied Math, SIAM Journal on Applied Mathematics, and SIAM Journal on Mathematical Analysis