

# Jason C. Murphy

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## Research Interests

Harmonic Analysis and Nonlinear Dispersive PDE

## Education

Ph.D. Mathematics, University of California Los Angeles (2014)

- Thesis: *Nonlinear Schrödinger equations at non-conserved critical regularity*
- Advisors: Rowan Killip and Monica Visan

M.A. Mathematics, University of California Los Angeles (2010)

B.S. Mathematics (Highest Honors), University of Texas at Austin (2009)

## Academic Positions

Assistant Professor, Missouri University of Science and Technology (Fall 2017 – present)

NSF Postdoctoral Fellow, University of California, Berkeley (Fall 2014 – Spring 2017)

- Sponsoring Scientist: Daniel Tataru

## Awards and Funding

Center for Advancing Faculty Excellence Professional Development Funds (2019; Missouri S&T)

Simons Collaboration Grant (2018–2023)

University of Missouri System Affordable & Open Educational Resources Initiative Award (2018–2019)

Center for Advancing Faculty Excellence Professional Development Funds (2018; Missouri S&T)

AMS-Simons Travel Grant (2017–2019)

NSF Postdoctoral Fellowship DMS-1400706 (2014–2017; UC Berkeley)

Robert Sorgenfrey Distinguished Teaching Award (2013; UCLA)

## Research Articles

Submitted for Publication

25. J. Murphy and K. Nakanishi, *Failure of scattering to solitary waves for long-range nonlinear Schrödinger equations*. arXiv:1906.01802
24. A. Arora, B. Dodson, and J. Murphy, *Scattering below the ground state for the 2d radial nonlinear Schrödinger equation*. arXiv:1906.00515
23. J. Murphy and Y. Zhang, *Numerical simulations for the energy-supercritical nonlinear wave equation*. arXiv:1905.10446
22. R. Killip, J. Murphy, and M. Visan, *Invariance of white noise for KdV on the line*. arXiv:1904.11910
21. B. Dodson, A. Lawrie, D. Mendelson, and J. Murphy, *Scattering for defocusing energy subcritical nonlinear wave equations*. arXiv:1810.03182
20. C. Miao, J. Murphy, and J. Zheng, *The energy-critical nonlinear wave equation with an inverse-square potential*. arXiv:1808.08571

### To Appear

19. S. Masaki, J. Murphy, and J. Segata, *Stability of small solitary waves for the 1d NLS with an attractive delta potential*. To appear in Anal. PDE.
18. S. Masaki, J. Murphy, and J. Segata, *Modified scattering for the 1d cubic NLS with a repulsive delta potential*. To appear in Int. Math. Res. Not. <https://doi.org/10.1093/imrn/rny011>

### Publications

17. R. Killip, J. Murphy, and M. Visan, *Almost sure scattering for the energy-critical NLS with radial data below  $H^1(\mathbb{R}^4)$* . Comm. Partial Differential Equations **44** (2019), no. 1, 51–71.
16. J. Murphy, *The nonlinear Schrödinger equation with an inverse-square potential*. Contemporary Mathematics, **725** (2019)
15. R. Killip, S. Masaki, J. Murphy, and M. Visan, *The radial mass-subcritical NLS in negative order Sobolev spaces*. Discrete Contin. Dyn. Syst. Series-A **39** (2019), no. 1, 553–583.
14. J. Murphy, *Random data final-state problem for the mass-subcritical NLS in  $L^2$* . Proc. Amer. Math. Soc. **147** (2019), no. 1, 339–350.
13. R. Killip, J. Murphy, and M. Visan, *The initial-value problem for the cubic-quintic NLS with non-vanishing boundary conditions*. SIAM J. Math. Anal. **50** (2018), no. 3, 2681–2739.
12. B. Dodson and J. Murphy, *A new proof of scattering below the ground state for the non-radial focusing NLS*. Math. Res. Lett. **25** (2018), no. 6, 1805–1825.
11. J. Lu, C. Miao, and J. Murphy, *Scattering in  $H^1$  for the intercritical NLS with an inverse-square potential*. J. Differential Equations **264** (2018), no. 5, 3174–3211.
10. R. Killip, S. Masaki, J. Murphy, and M. Visan, *Large data mass-subcritical NLS: critical weighted bounds imply scattering*. NoDEA Nonlinear Differential Equations Appl. **24** (2017), no. 4, 24:38.
9. B. Dodson and J. Murphy, *A new proof of scattering below the ground state for the 3d radial focusing cubic NLS*. Proc. Amer. Math. Soc. **145** (2017), no. 11, 4589–4867.

8. B. Dodson, C. Miao, J. Murphy, and J. Zheng, *The defocusing quintic NLS in four space dimensions*. Ann. Inst. H. Poincaré Anal. Non Linéaire **34** (2017), no. 3, 759–787.
7. R. Killip, J. Murphy, M. Visan, and J. Zheng, *The focusing cubic NLS with inverse square potential in three space dimensions*. Differential Integral Equations **30** (2017), no. 3–4, 161–206.
6. J. Murphy and F. Pusateri, *Almost global existence for cubic nonlinear Schrödinger equations in one space dimension*. Discrete Contin. Dyn. Syst. Series-A **37** (2017), 2077–2102.
5. R. Killip, J. Murphy, and M. Visan, *The final-state problem for the cubic-quintic NLS with non-vanishing boundary conditions*. Anal. PDE **9** (2016), no. 7, 1523–1574
4. J. Murphy, *The radial defocusing nonlinear Schrödinger equation in three space dimensions*. Comm. Partial Differential Equations **40** (2015), 265–308.
3. C. Miao, J. Murphy, and J. Zheng, *The defocusing energy-supercritical NLS in four space dimensions*. J. Funct. Anal. **267** (2014), 1662–1724.
2. J. Murphy, *The defocusing  $\dot{H}^{1/2}$ -critical NLS in high dimensions*. Discrete Contin. Dyn. Syst. Series-A. **34** (2014), 733–748.
1. J. Murphy, *Intercritical NLS: critical  $\dot{H}^s$ -bounds imply scattering*. SIAM J. Math. Anal. **46** (2014), 939–997.

## Other Writing

2. J. Murphy, *Subcritical scattering for defocusing NLS*. Expository article. Available online.
1. J. Murphy, *The nonlinear Schrödinger equation at non-conserved critical regularity*. PhD Thesis, UCLA (2014). Available online.

## Teaching Experience

### Missouri University of Science and Technology (Instructor)

- Fall 2019: Math 3108 - Linear Algebra; Math 5215 - Introduction to Real Analysis
- Summer 2019: Math 3304 - Elementary Differential Equations
- Spring 2019: Math 6462 - Harmonic Analysis
- Fall 2018: Math 3108A - Linear Algebra; Math 6461 - Harmonic Analysis
- Spring 2018: Math 5215 - Introduction to Real Analysis
- Fall 2017: Math 3108AB - Linear Algebra (two sections)

### University of California, Berkeley (Instructor)

- Spring 2017: Math 121B - Mathematical Tools for the Physical Sciences
- Fall 2016: Math 204 - Ordinary Differential Equations
- Spring 2015: Math 185 - Complex Analysis
- Fall 2014: Math 126 - Partial Differential Equations

### University of California Los Angeles (Teaching Assistant)

- Spring 2014: Math 33B - Differential Equations; Math 131C - Topics in Analysis
- Winter 2014: Math 31A - Differential and Integral Calculus; Math 33B - Differential Equations
- Fall 2013: Math 131AH - Honors Analysis; Math 266A - Applied Ordinary Differential Equations
- Spring 2013: Math 32B - Calculus of Several Variables
- Winter 2013: Math 33B - Differential Equations; Math 115A - Linear Algebra
- Fall 2012: Math 33B - Differential Equations

- Spring 2011: Math 131A - Analysis
- Winter 2011: Math 131A - Analysis
- Fall 2010: Math 31B - Integration and Infinite Series
- Spring 2010: Math 32A - Calculus of Several Variables
- Winter 2010: Math 31B - Integration and Infinite Series
- Fall 2009: Math 31A - Differential and Integral Calculus

## Workshop and Conference Talks

- Workshop on Harmonic Analysis and Nonlinear Partial Differential Equations, Research Institute for Mathematical Sciences, Kyoto University, Summer 2019
- Workshop on Recent Developments in Nonlinear Waves, University of Illinois Chicago, Fall 2018
- 4th Annual Meeting of the SIAM Central States Section, Session on Partial Differential Equations: Analysis, Modeling, and Applications, University of Oklahoma, Fall 2018
- Workshop on Hyperbolic and Dispersive Equations, Beijing International Center for Mathematical Research, Peking University, Summer 2018
- 12th AIMS Conference Series on Dynamical Systems and Differential Equations, Special Session on Recent Progress in Nonlinear Dispersive PDE, Summer 2018
- 12th AIMS Conference Series on Dynamical Systems and Differential Equations, Special Session on Nonlinear Evolution Equations, Summer 2018
- AMS Sectional Meeting, Northeastern University, Special Session on the Analysis of Dispersive Equations, Spring 2018
- Joint Mathematics Meeting, Atlanta, Georgia, AMS Special Session on Spectral Calculus and Quasilinear Partial Differential Equations, Spring 2017
- Joint Mathematics Meeting, Atlanta, Georgia, AMS Special Session on Recent Progress on Nonlinear Dispersive and Wave Equations, Spring 2017
- AMS Sectional Meeting, North Carolina State University, Special Session on Harmonic Analysis and Dispersive PDE, Fall 2016
- AMS Sectional Meeting, San Francisco State University, Special Session on Hamiltonian PDE, Fall 2014
- Hausdorff Trimester Program in Harmonic Analysis and PDE, Closing Workshop, Summer 2014
- Joint International Meeting of the AMS and the Romanian Mathematical Society, Special Session on Nonlinear Evolution Equations, Summer 2013

## Invited Seminar and Colloquium Talks

- University of Michigan, Differential Equations Seminar, Spring 2019
- University of Kentucky, Analysis and PDE Seminar, Spring 2019
- Beijing Normal University, PDE Seminar, Summer 2018
- Institute for Applied Physics and Computational Mathematics, Beijing, China, Summer 2018
- Osaka University, Seminar of Differential Equations, Summer 2018
- Fujian Normal University, Summer 2018
- Georgia Tech, PDE Seminar, Spring 2018
- University of Minnesota, PDE Seminar, Spring 2018
- Washington University in St. Louis, Analysis Seminar, Spring 2018
- University of Illinois Urbana-Champaign, Harmonic Analysis and Differential Equations Seminar, Fall 2017
- University of Missouri Columbia, Differential Equations Seminar, Fall 2017
- Institute for Applied Physics and Computational Mathematics, Beijing, China, Summer 2017
- Korea Institute for Advanced Study, CMC Seminar, Summer 2017
- Osaka University, Seminar of Differential Equations, Summer 2017
- George Washington University, Applied Mathematics Seminar, Spring 2017

- San Jose State University, Colloquium, Spring 2017
- Missouri University of Science and Technology, Colloquium, Spring 2017
- University of Iowa PDE Seminar, Spring 2016
- Institute for Applied Physics and Computational Mathematics, Beijing, China, Spring 2016
- MSRI Postdoc Symposium, MSRI, Fall 2015
- UC Davis PDE and Applied Math Seminar, Fall 2015
- Institute for Applied Physics and Computational Mathematics, Beijing, China, Summer 2015
- University of Chicago Calderón–Zygmund Seminar, Spring 2014
- University of Minnesota PDE Seminar, Fall 2013
- Berkeley Analysis/PDE Seminar, Fall 2013

## Academic Service and Synergistic Activities

- Journal Referee: *American Journal of Mathematics*; *Applied Mathematics Letters*; *Archive for Rational Mechanics and Analysis*; *Communications in Partial Differential Equations*; *Discrete and Continuous Dynamical Systems*; *International Mathematics Research Notices*; *Journal of the Australian Mathematical Society*; *Journal of Differential Equations*; *Journal of Evolution Equations*; *Journal of Functional Analysis*; *Mathematics Research Letters*; *Nonlinearity*; *Nonlinear Analysis: Real World Applications*; *Proceedings of the American Mathematical Society*; *Proceedings of the Royal Society of Edinburgh, Section A*; *SIAM Journal on Mathematical Analysis*; *Transactions of the American Mathematical Society*; *Zeitschrift für angewandte Mathematik und Physik*.
- Reviewer for AMS MathSciNet (MR AuthorID 1034475)
- Undergraduate Reading Courses Supervised:
  - Spring 2018 - Global Attractors for ODE Models (Missouri S&T; co-supervised with J. Singler)
  - Fall 2015 - Mathematics of Machine Learning (UC Berkeley)
  - Spring 2015 - Mathematics of Signal Processing (UC Berkeley)
- Undergraduate Research Supervised:
  - Missouri S&T, OURE Fellows Program, 2018–2019 academic year, *Derivation, analysis, and computation of nonlinear Schrödinger equations* with N. Parris.
- Organization of Seminars and Conference Sessions:
  - Co-organizer, ‘Recent progress in nonlinear dispersive PDE’, Special session in the 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications; Taipei, Taiwan, July 5–9, 2018
  - Co-organizer, Analysis & PDE Seminar, UC Berkeley, Fall 2014–Spring 2015
- Committees and other department service:
  - Department curriculum committee (Missouri S&T, August 2018 – August 2020)
  - Colloquium chair (Missouri S&T, August 2018 – present)
- Talks for Undergraduates:
  - Missouri University of Science and Technology (Kappa Mu Epsilon), Spring 2018
  - University of Missouri Columbia, Fall 2017
  - University of Illinois Urbana Champaign (MATRIX club), Fall 2017
- Academic Excellence Workshop Facilitator, UCLA Center for Excellence in Engineering and Diversity, Fall 2010–Winter 2011.
- Mentor, National Alliance for Doctoral Studies in the Mathematical Sciences
- Project NExT Fellow (Missouri Section)

## Extended Scientific Visits

- Institute for Applied Physics and Computational Mathematics, Beijing, China. July 2015, April 2016, July 2017, July 2018
- Research Member at MSRI, Berkeley, CA. August–December 2015
- Hausdorff Research Institute for Mathematics, Bonn, Germany. July 2014

## Conference and Workshop Participation

- Workshop on Hyperbolic and Dispersive Equations, Beijing International Center for Mathematical Research, Peking University, Summer 2018
- 12th AIMS Conference Series on Dynamical Systems and Differential Equations, Taipei, Taiwan, Summer 2018
- RIMS Workshop on Harmonic Analysis and Nonlinear Partial Differential Equations, Kyoto University, Summer 2018
- Rivière–Fabes Symposium on Analysis & PDE, University of Minnesota, Spring 2018
- AMS Sectional Meeting, Northeastern University, Spring 2018
- Workshop on Inverse Scattering and Dispersive PDEs in One Space Dimension, Fields Institute, Toronto, Summer 2017
- RIMS Workshop on Harmonic Analysis and Nonlinear Partial Differential Equations, Kyoto, Japan, Summer 2017
- Workshop: Nonlinear Waves and Dispersive Equations (as *US Junior Oberwolfach Fellow*), Oberwolfach, Germany, Summer 2017
- Joint Mathematics Meeting, Atlanta, Georgia, Winter 2017
- AMS Sectional Meeting, North Carolina State University, Fall 2016
- Mathematical and Physical Models of Nonlinear Optics, Institute for Mathematics and its Applications, University of Minnesota, Fall 2016
- Analysis, PDEs, and Geometry: a conference in honor of Sergiu Klainerman, Princeton University, Spring 2016
- New challenges in PDE: deterministic dynamics and randomness in high and infinite dimensional systems, MSRI, Fall 2015
- Introductory Workshop: Randomness and long time dynamics in nonlinear evolution differential Equations, MSRI, Fall 2015
- AMS Sectional Meeting, San Francisco State University, Fall 2014
- Hausdorff Trimester Program in Harmonic Analysis and Partial Differential Equations, Summer 2014
- Dynamics in Geometric Dispersive Equations, 5-day workshop, Banff International Research Station, Spring 2014
- Rivière–Fabes Symposium on Analysis & PDE, University of Minnesota, Spring 2014
- Introductory Workshop: Mathematical General Relativity, MSRI, Fall 2013
- Meeting: Nonlinear Waves and Dispersive Equations (as *US Junior Oberwolfach Fellow*), Oberwolfach, Germany, Summer 2013
- Joint International Meeting of the AMS and the Romanian Mathematical Society, Alba Iulia, Romania, Summer 2013
- NSF-CBMS Regional Research Conference in the Mathematical Sciences, Kansas State University, Summer 2013
- Rivière–Fabes Symposium on Analysis & PDE, University of Minnesota, Spring 2013
- Southern California Analysis & PDE (SCAPDE) meeting, UCLA, Winter 2013
- Seminar on Dispersive Equations, Oberwolfach, Germany, Fall 2012
- Evolution equations of physics, fluids, and geometry: asymptotics and singularities, 5-day workshop, Banff International Research Station, Summer 2012
- Evolution Equations: a Workshop in Honor of Terence Tao, Northwestern University, Spring 2012
- Rivière–Fabes Symposium on Analysis & PDE, University of Minnesota, Spring 2012
- Southern California Analysis & PDE (SCAPDE) meeting, UCLA, Fall 2010

## Professional Memberships

- Member, American Mathematical Society

## Undergraduate Awards

- Dean's Honored Graduate (2009; UT Austin)
- Mathematics Departmental Honors (2009; UT Austin)
- College of Natural Sciences Book Award (2009; UT Austin)
- Dedman Merit Scholarship (2009; UT Austin)
- Carmelina Cutro Albino Memorial Endowed Presidential Scholarship (2008; UT Austin)