

# Curriculum Vitae

Jeremy L. Marzuola

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## PERSONAL INFORMATION:

Address:

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University of North Carolina, Chapel Hill  
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## EDUCATION:

**University of California, Berkeley:** Ph.D. granted May 2007, under the supervision of Professor Daniel Tataru.

**Thesis Title:** *A stable class of perturbations for a minimal mass soliton of a saturated NLS equation in three dimensions.*

**University of Oklahoma:** 2002, Mathematics. B.A. Summa cum laude. Minor in Physics.

**Senior thesis:** *On the number of small atoms in numerical semigroups*, directed by Professor Andy Miller.

## PROFESSIONAL EXPERIENCE:

**University of North Carolina, Chapel Hill:** Professor of Mathematics 2021-Present.

**University of North Carolina, Chapel Hill:** Associate Professor of Mathematics 2016-2021.

**University of North Carolina, Chapel Hill:** Assistant Professor of Mathematics 2010-2016.

**Columbia University - Applied Mathematics Department:** NSF Postdoctoral Fellow 2007-2008, 2009-2010.

**Universität Bonn - Mathematics Institute:** Hausdorff Center Visiting Postdoctoral Fellow 2008-2009.

## HONORS:

**MSRI Research Member:** Participant in special program on Microlocal Analysis from October-December, 2019.

**Invited Long Term Visitor:** ENS Cachan, Fall 2019.

**AIM SQuaRE on spectral theory of quantum graphs with Greg Berkolaiko, Yaiza Canzani and Graham Cox:** 2018-2020.

**Speaker at Midwestern PDE Seminar:** University of Illinois at Chicago, September 14-17, 2017.

**Invited Long Term Visitor:** Université Orleans, Summer 2016.

**MSRI Research Member:** Participant in special program on New Challenges in PDE: Deterministic Dynamics and Randomness in High and Infinite Dimensional Systems from August 17-December 18, 2015.

**Hausdorff Institute Trimester Participant:** Participant in special program on harmonic analysis and partial differential equations from May 21-June 21, 2014.

**Guest Lecturer:** Delivering a course at Karlsruhe Institute of Technology on Nonlinear Waves: Analysis and Numerics from May 15-June 30, 2013.

**Junior Leave/IBM Junior Faculty Development Award:** University of North Carolina development grant of \$7,500 for calendar year 2012. On leave Fall 2012.

**Guest Lecturer:** Delivering a course at Universität Bielefeld on Nonlinear Waves: Analysis and Numerics from May 28-July 15, 2012.

**Mathématiques en Pays de la Loire:** Visiting Researcher to the University of Nantes, June 13-20, 2011.

**Visiting Academic Universität Bonn:** May 11-June 12, 2011.

**Visiting Academic Privileges at the Courant Institute:** Spring and Summer 2010.

**Visiting Member of the Institut Henri Poincaré:** Attended the Trimester on Analysis Program from June 13-27, 2009.

**Hausdorff Center Postdoctoral Fellowship:** Academic year 2008-2009 to work with Professor Herbert Koch at the Universität Bonn.

**Mathématiques en Pays de la Loire:** Visiting Researcher to the University of Nantes, December 1-5, 2008.

**General Member of MSRI:** Summer 2007 workshop on Nonlinear Partial Differential Equations.

**NSF Mathematical Sciences Postdoctoral Research Fellowship:** Awarded February 2007. Award granted to work with Professor Michael Weinstein of Columbia University.

**Associate Member of MSRI:** Fall 2005.

**Letzeiser Gold Award Winner - Outstanding Graduate:** 2002

**Phi Beta Kappa:** 2002

**Research Experiences for Undergraduates (REU) in Physics:** 2002, supervised by Professor Timothy Stanton (Woods Hole Oceanographic Institute).

**Undergraduate Mathematics Scholarships at the University of Oklahoma:** 1999-2002

**Research Experiences for Undergraduates (REU) in Physics:** 2001, supervised by Professor Kieran Mullen (U. of Oklahoma).

**NASA-Epscor Research Fellowship:** 1999, supervised by Professor Semion Gutman (U. of Oklahoma).

## BIBLIOGRAPHY<sup>1</sup>:

### Scientific Publications Refereed or Submitted for Review:

"Quantitative bounds on Impedance-to-Impedance operators with applications to numerical merge procedures," (Thomas Beck, Yaiza Canzani and Jeremy L. Marzuola) submitted to *Pure and Applied Analysis* (2021).

"Dispersion control in deformable microchannels," (Garam Lee, Alan Luner, Jeremy L. Marzuola and Daniel Harris) accepted to *Microfluidics and Nanofluidics* (2021).

"Pointwise dispersive estimates for Schrödinger operators on product cones," (Blake Keeler and Jeremy L. Marzuola) submitted to *Journal of Differential Equations* (2020).

"Colored Noise in the Landau-Lifshitz System," (Yuan Gao, Jeremy L. Marzuola, Jonathan Mattingly, Katherine A. Newhall) *Physical Review E*, Vol. 102, No. 5 (2020), 052112.

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<sup>1</sup>Unless otherwise noted, as is standard in pure mathematics (and required for many of the journals below), the authors on all of the papers are listed alphabetically. The role of the authors is not indicated in the ordering, and all authors are assumed to have contributed equally.

- "A metric on directed graphs and Markov chains based on hitting probabilities," (Zachary M. Boyd, Nicolas Fraiman, Jeremy L. Marzuola, Peter Mucha, Braxton Osting, Jonathan Weare) *SIAM Journal on Mathematics of Data Science* **3**, No. 2 (2021), 467-493.
- "Limits of eigenfunctions of Sturm-Liouville operators subject to a spectral flow," (Thomas\* Beck, Isabel Bors, Grace Conte, Graham Cox, Jeremy L. Marzuola) to appear in *Annales Mathematiques du Quebec* (2020).
- "A Proximal-Gradient algorithm for crystal surface evolution" (Katy Craig, Jian-Guo Liu, Jianfeng Lu, Jeremy L. Marzuola, Li Wang) in revision with *Numerische Mathematik* (2020).
- "Defect resonances of truncated crystal structures," (Jianfeng Lu, Jeremy L. Marzuola, Alex B. Watson) in revision with *SIAM Journal on Applied Mathematics* (2021).
- "The essential spectrum of periodically-stationary solutions of the complex Ginzburg-Landau equation," (John Zweck, Yuri Latushkin, Jeremy L. Marzuola, Chris Jones) accepted to *Journal of Evolution Equations* (2020).
- "A local characterization of global extrema of the dispersion relation of a periodic graph," (Greg Berkolaiko, Yaiza Canzani, Graham Cox, Jeremy L. Marzuola) submitted to *Pure and Applied Analysis* (2020).
- "Local well-posedness for a quasilinear Schrödinger equation with degenerate diffusion,"\* (Benjamin Harrop-Griffiths, Jeremy L. Marzuola) to appear in *Indiana University Mathematics Journal* (2020).
- "Analysis of a fourth order exponential PDE arising from a crystal surface jump process with\* Metropolis-type transition rates," (Yuan Gao, Anya Katsevich, Jian-Guo Liu, Jianfeng Lu, Jeremy L. Marzuola) accepted to *Pure and Applied Analysis* (2021).
- "Edge-localized states on quantum graphs in the limit of large mass," (Gregory Berkolaiko, Jeremy L. Marzuola, Dmitry Pelinovsky) accepted to *Annales de l'Institut Henri Poincaré - Analyse non linéaire*, (2020).
- "Quasilinear Schrödinger equations III: Large Data," (Jeremy L. Marzuola, Jason Metcalfe, Daniel Tataru) to appear in *Archive for Rational Mechanics and Analysis* (2020).
- "On the behavior of 1-Laplacian Ratio Cuts on nearly rectangular domains," (Wesley Hamilton, Jeremy L. Marzuola, Hau-tieng Wu) accepted to *Information and Inference* (2020).
- "On the stability of traveling wave solutions to thin-film and long-wave models for thin-film\* flows inside a tube," (Roberto Camassa, Jeremy L. Marzuola, H. Reed Oogrosky, Sterling R. Swygert) *Physica D*, Vol 425 (2021), 132750.
- "Quadrature by two expansions: Evaluating Laplace layer potentials using complex polynomial plane wave expansions," (Lingyun Ding, Jingfang Huang, Jeremy L. Marzuola, Zhuochao Tang) *Journal of Computational Physics*, Vol. 428 (2021), 109963.
- "The radiation field on product cones," (Dean Baskin, Jeremy L. Marzuola) in revision with *Advances in Mathematics* (2019).
- "Analysis of a partial differential model from broken bond crystal surface models includ-\* ing evaporation/deposition terms," (Yuan Gao, Jian-Guo Liu, Jianfeng Lu, Jeremy L. Marzuola) *Nonlinearity*, Vol. 33, No. 8 (2020), 3816-3846.
- "Nodal line estimates for the second Dirichlet eigenfunction," (Thomas D. Beck, Yaiza\* Canzani, Jeremy L. Marzuola) *Journal of Spectral Theory*, Vol. 11 (2021), No. 1, 323-353.
- "Bulk soliton dynamics in bosonic topological insulators," (Jeremy L. Marzuola, Miguel\* Bandres, Braxton Osting, Mikael Rechtsman) in revision for *Physical Review Letters* (2020).

- "Nonnegative Weak Solutions of Thin Film Equations related to viscous flows in cylindrical geometries," (Jeremy L. Marzuola, Sterling Swygert, Roman Taranets) *Journal of Evolution Equations*, Vol. 20, No. 4 (2020), 1227-1249.
- "Symmetry Breaking in Density Functional Theory due to Dirac Exchange for a Hydrogen Molecule," (Michael Holst, Houdong Hu, Jianfeng Lu, Jeremy L. Marzuola, Duo Song, John Weare) in revision with *Journal of Nonlinear Science* (2019).
- "Existence and stability of Schrödinger solitons on non-compact manifolds," (David Borthwick, Roland Donninger, Enno Lenzmann, Jeremy L. Marzuola) *SIAM Journal of Mathematical Analysis*, **51**, No. 5 (2019), 3854-3901.
- "The Landau-Lifschitz equation as a limit of large scale spin ensembles using Metropolis dynamics," (Yuan Gao, Kay Kirkpatrick, Jeremy L. Marzuola, Jonathan Mattingly, Katherine A. Newhall) *Comm. Math. Sci.* Vol. 19, No. 2 (2021), pp. 453-494.
- "Nodal deficiency, spectral flow, and the Dirichlet-to-Neumann map," (Greg Berkolaiko, Graham Cox and Jeremy L. Marzuola) *Letters in Mathematical Physics*, **109**, No. 7 (2019), 1611-1623.
- "Spectral band degeneracies of  $\frac{\pi}{2}$ -rotationally invariant periodic Schrödinger operators,"\* (Rachael Keller, Jeremy L. Marzuola, Braxton Osting, Michael Weinstein) *SIAM Multiscale Modeling and Simulation*, **16**, No. 4 (2018), 1684-1731. Small erratum to appear in 2020.
- "Existence and uniqueness of solutions for a quasilinear KdV equation with degenerate dispersion," (Pierre Germain, Benjamin Harrop-Griffiths, Jeremy L. Marzuola) *Communications in Pure and Applied Mathematics*, **72** (2019), 2449-2484.
- "Compactons and their variational properties for degenerate KdV and NLS in dimension 1,"\* (Pierre Germain, Benjamin Harrop-Griffiths, Jeremy L. Marzuola) *Quarterly of Applied Math*, **78**, No. 1 (2020), 1-32.
- "The profile decomposition for the hyperbolic Schrödinger equation" (Benjamin Dodson,\* Jeremy L. Marzuola, Benoit Pausader, Daniel Spirn) *Illinois Journal of Mathematics*, **62**, No. 1-4 (2018), 293-320. Short erratum to the appendix accepted.
- "A symplectic approach to constrained eigenvalue problems," (Graham Cox, Jeremy L. Marzuola) *Journal of Differential Equations*, **266**, No. 6 (2019), 2924-2952.
- "Well-posedness for the Camassa-Choi equation," (Benjamin Harrop-Griffiths, Jeremy L. Marzuola) *Nonlinearity*, **31**, No. 5 (2018), 1868-1904.
- "Asymmetry in crystal facet dynamics of homoepitaxy in a continuum model," (Jian-Guo Liu, Jianfeng Lu, Dio Margetis, Jeremy L. Marzuola) *Physica D*, **393** (2019), 54-67.
- "Dark Soliton Scattering in Symmetric and Asymmetric Double Potential Barriers" (Fortini Tsitoura, Zacharias Anastassi, Jeremy L. Marzuola, Panos Kevrekidis, Dmitri Frantzeskakis) *Physics Letters A* Vol. 381, No. 31 (2017), 2514-2520.
- "Trigonometric integrators for quasilinear wave equations," (Ludwig Gauckler, Jianfeng Lu,\* Jeremy L. Marzuola, Frédéric Rousset, Katharina Schratz) *Mathematics of Computation*, **88**, No. 316 (2018), 717-749.
- "Locating resonances on hyperbolic cones," (Dean Baskin, Jeremy L. Marzuola) *Math Research Letters*, **26**, No. 2 (2019), 365-381.
- "Nonlinear Bound States in a Schrödinger-Poisson System with External Potential,"\* (Jeremy L. Marzuola, Sarah Raynor, Gideon Simpson) *SIAM Journal of Applied Dynamical Systems*, **16**, No. 1 (2017), 226-251.
- "Gross-Pitaevskii vortex motion with critically-scaled inhomogeneities," (Matthias Kurzke,\* Jeremy L. Marzuola, Dan Spirn) *SIAM Journal on Mathematical Analysis*, **49**, No. 1 (2017), 471-500.

- "Spectrally optimized pointset configuration" (Braxton Osting, Jeremy L. Marzuola) *Constructive Approximation*, **46**, No. 1 (2016), 1-35.
- "Dark solitons near potential and nonlinearity steps" (Fotini Tsitoura, Zacharias Anastassi, Jeremy L. Marzuola, Panos Kevrekidis, Dmitri Frantzeskakis) *Physical Review A*, **94** (2016), 063612.
- "Soliton bifurcation theory on the dumbbell graph," (Jeremy L. Marzuola, Dmitry Pelinovsky) *Applied Math Research Express*, **2016** (2016), 98-145.
- "A numerical study of traveling waves for a model of thin films in cylindrical domains,"\* (Roberto Camassa, Jeremy L. Marzuola, H. Reed Ogrosky, Nathan Vaughn) *Physica D*, **333** (2016), 254-265.
- Appendix to "Euler Equation on a Rotating Surface" by Michael Taylor, (Jeremy L. Marzuola, Michael Taylor) *Journal of Functional Analysis*, **270** (2016), 3884-3945.
- "Manifold decompositions and indices of Schrödinger operators," (Graham Cox, Chris Jones, Jeremy L. Marzuola) *Indiana University Mathematics Journal*, **66**, No. 5 (2017), 1573-1602.
- "A simple analytic proof for an isoperimetric inequality for an integral operator on flat tori"\* (Braxton Osting, Elena Cherkhaev, Jeremy L. Marzuola) *Illinois Journal of Mathematics*, **59**, No. 3 (2015), 773-793.
- " $L^p$ -bounds on spectral clusters in polygonal domains" (Matt Blair, Austin Ford, Jeremy L. Marzuola) *Revista Matemático Iberoamericana*, **34**, No. 3 (2018).
- "On discrete rarefaction waves in an NLS toy model relating to weak turbulence" (Sebastian Herr, Jeremy L. Marzuola) *Indiana University Mathematics Journal*, **65**, No. 3 (2016), 753-777.
- "Higher dimensional vortex standing waves for nonlinear Schrödinger equations," (Jeremy L. Marzuola, Michael E. Taylor) *Communications in Partial Differential Equations*, **41**, No. 3 (2016), 398-446.
- "The structure of global attractors for dissipative Zakharov systems with forcing on the torus" (Burak Erdogan, Jeremy L. Marzuola, Katherine A. Newhall, Nikos Tzirakis) *SIAM Journal of Applied Dynamical Systems*, **14**, No. 4 (2015), 1978-1990.
- "Schrödinger operators on  $\mathbb{H}^d$ " (David Borthwick, Jeremy L. Marzuola) *Mathematical Physics, Analysis and Geometry*, **18**, No. 1 (2015), 18:22.
- "A Morse index theorem for elliptic operators on bounded domains" (Graham Cox, Jeremy L. Marzuola, Christopher K.R.T. Jones) *Communications in Partial Differential Equations*, **40** (2015), 1467-1497.
- "Josephson tunneling solutions to the nonlinear Schrödinger / Gross-Pitaevskii Equation,"\* (Roy Goodman, Jeremy L. Marzuola, Michael Weinstein) *Discrete and Continuous Dynamical Systems - A*, **35**, No. 1 (2015), 225-246.
- "Strang splitting methods applied to a quasilinear Schrödinger equation - convergence, instability and dynamics," (Jianfeng Lu, Jeremy L. Marzuola) *Communications in Mathematical Science*, **13**, No. 5 (2015), 1051-1074.
- "Dynamics near the minimal mass soliton for the Korteweg-de Vries equation," (Jeremy L. Marzuola, Sarah Raynor, Gideon Simpson) *Dynamical Systems*, **29**, No. 2 (2014), 285-299.
- "Strichartz estimates on exterior polygonal domains," (Dean Baskin, Jeremy L. Marzuola, Jared Wunsch) *AMS Contemporary Mathematics Series*, Volume 630 - Centre de Recherches Mathématiques Proceedings on Spectral Invariants on Non-compact and Singular Spaces (2014), 291-306.

- "Quasilinear Schrödinger equations II: Small data and cubic interactions," (Jeremy L.\* Marzuola, Jason Metcalfe, Daniel Tataru) *Kyoto Journal of Mathematics*, **54**, Issue 3 (2014), 529-546.
- "Nonlinear bound states on weakly homogeneous spaces," (Hans Christianson, Jeremy\* L. Marzuola, Jason Metcalfe, Michael Taylor) *Communications in Partial Differential Equations*, **39** (2014), 34-97.
- "The relaxation of a general family of broken bond crystal surface models," (Jeremy L.\* Marzuola, Jon Weare) *Physical Review E*, **88** (2013), 032403.
- "Behavior of a model dynamical system with applications to weak turbulence," (Jim Colliander, Jeremy L. Marzuola, Tadahiro Oh, Gideon Simpson) *Experimental Mathematics*, **22**, Issue 3 (2013), 250-264.
- On the regularity of the flow map for the gravity-capillary equations," (R. Ming Chen,\* Jeremy L. Marzuola, Dan Sporn, J. Douglas Wright) *Journal of Functional Analysis*, **264**, Issue 3 (2013), 752-782.
- "Strichartz estimates for the wave equation on flat cones," (Matt Blair, G. Austin Ford,\* Jeremy L. Marzuola) *International Mathematical Research Notices*, **2013**, No. 3 (2013), 562-591.
- "Quasilinear Schrödinger equations I: Small data and quadratic interactions," (Jeremy\* L. Marzuola, Jason Metcalfe, Daniel Tataru) *Advances in Mathematics*, **231**, Issue 2 (2012), 1151-1172.
- "Existence of nonlinear quasimodes for the nonlinear Schrödinger equation on manifolds\* of positive sectional curvature," (Pierre Albin, Hans Christianson, Jeremy Marzuola, Laurent Thomann) *Physica D: Nonlinear Phenomena*, **241** (2012), 409-425.
- "On instability of some approximate periodic solutions for the quintic nonlinear Schrödinger\* equation" (Scipio Cuccagna, Jeremy L. Marzuola) *Indiana University Mathematics Journal*, **61**, Issue 6 (2012), 2053-2083.
- "Bose-Einstein condensation transition studies for atoms confined in Laguerre-Gaussian\* laser modes" (T.G. Akin, S. Kennedy, B. Dribus, Jeremy L. Marzuola, L. Johnson, J. Alexander, E.R.I. Abraham) *Optics Communications*, **285** (2012), 84-89.<sup>2</sup>
- "Nonconcentration in partially rectangular billiards," (Luc Hillairet, Jeremy L. Marzuola)\* *Analysis & PDE*, **5**, No. 4 (2012), 831-854.
- "Strichartz estimates for Schrödinger operators on polygonal billiard domains in  $\mathbb{R}^2$ ," (Matt\* Blair, G. Austin Ford, Jeremy L. Marzuola, Sebastian Herr) *Journal of Geometric Analysis*, **22**, No. 2 (2012), 339-351.
- "Small data scattering and soliton stability in  $H^{-1/6}$  for the quartic KdV equation," (Herbert Koch, Jeremy L. Marzuola) *Analysis & PDE*, **5**, No. 1 (2012), 145-198.
- "Wave operator bounds for singular perturbations of the Laplacian in  $1d$ ," (Vincent\* Duchêne, Jeremy L. Marzuola, Michael I. Weinstein) *Journal of Mathematical Physics*, **52**, Issue 1 (2011), 013505.
- "Spectral analysis of matrix Hamiltonian operators," (Jeremy L. Marzuola, Gideon Simpson)\* *Nonlinearity*, **24** (2011), 389-429.
- "Dispersive estimates using scattering theory for matrix Hamiltonian operators resulting from linearization about minimal mass soliton solutions of saturated nonlinear Schrödinger equations," (Jeremy L. Marzuola) *Discrete and Continuous Dynamical Systems - Series A*, **30**, No. 4 (2011), 995-1036.
- "Existence and stability of solitons for the nonlinear Schrödinger equation on hyperbolic\* space," (Hans Christianson, Jeremy L. Marzuola) *Nonlinearity*, **23** (2010), 89-106.

- "Long time dynamics near the symmetry breaking bifurcation for nonlinear\* Schrödinger/Gross-Pitaevskii equations," (Jeremy L. Marzuola, Michael I. Weinstein) *Discrete and Continuous Dynamical Systems Special Issue - Trends and developments in DE/Dynamical Systems II*, **28**, No. 4 (2010) 1505-1554.
- "A system of ODE's for a perturbation of a minimal mass soliton," (Jeremy L. Marzuola,\* Sarah Raynor, Gideon Simpson) *Journal of Nonlinear Science*, **20**, No. 4 (2010), 425-461.
- "A class of stable perturbations for a minimal mass soliton in three dimensional saturated\* nonlinear Schrödinger equations," (Jeremy L. Marzuola) *SIAM Journal of Mathematical Analysis*, **42**, Issue 3 (2010), 1382-1403.
- "Counting numerical sets with no small atoms," (Jeremy L. Marzuola, Andy Miller) *Journal\* of Combinatorial Theory, Series A*, **117**, No. 6 (2010), 650-667.
- "An eigenfunction concentration result for polygonal billiards," (Andrew Hassell, Luc\* Hillairet, Jeremy L. Marzuola) *Comm. Partial Differential Equations*, **34**, Issue 5 (2009), 475-485.
- "Strichartz estimates on Schwarzschild black hole backgrounds," (Jeremy L. Marzuola,\* Jason Metcalfe, Daniel Tataru, Mihai Tohaneanu) *Communications in Mathematical Physics*, **293**, No. 1 (2009), 37-83.
- "Strichartz estimates and local smoothing estimates for asymptotically flat Schrödinger\* equations," (Jeremy L. Marzuola, Jason Metcalfe, Daniel Tataru) *Journal of Functional Analysis*, **255**, No. 6 (2008), 1497-1553.
- "Wave packet parametrices for evolutions governed by PDO's with rough symbols," (Jeremy\* L. Marzuola, Jason Metcalfe, Daniel Tataru) *Proceedings of the American Mathematical Society*, **136**, No. 2 (2008), 597-604.
- "Soliton splitting by external delta potentials," (Justin Holmer, Jeremy L. Marzuola, Maciej\* Zworski) *Journal of Nonlinear Science*, **17**, No. 4 (2007), 349-367.
- "Fast soliton scattering by delta impurities," (Justin Holmer, Jeremy L. Marzuola, Maciej\* Zworski) *Communications in Mathematical Physics*, **274**, No. 1 (2007), 187-216.
- "Eigenfunctions for partially rectangular billiards," (Jeremy L. Marzuola) *Communications\* in Partial Differential Equations* **31** (2006), 775-790.

Articles that have completed the peer review process are marked with (\*). Page numbers included only for articles for which they are available from the journal of publication.

## Unrefereed Scientific Publications:

- "Ground states on the Dumbbell graph," Oberwolfach Reports Extended Abstracts from Nonlinear Partial Differential Equations on Graphs, **14**, (2018).
- "Radiation fields on product cones," Oberwolfach Reports Extended Abstracts from Non-linear Waves and Dispersive Equations, **14**, (2018).
- "Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence," (Stephen Gustafson, Jeremy L. Marzuola and Daniel Tataru) Final Report on Banff International Research Station Workshop 14w5080 (2014).
- "A first course on Ordinary Differential Equations with *Matlab*," (Jeremy L. Marzuola and Ben Wilson) developed for a new course Math 383L at the University of North Carolina, Chapel Hill (2014).
- "Lecture notes on nonlinear bound states, spectral theory, stability and scattering," (Jeremy L. Marzuola) informal lecture notes developed as a guest professor in courses given at Universität Bielefeld and Karlsruhe Institute of Technology (2013).

"Trapping of bound states by diffracting beams in photorefractive crystals", (Hanan Shinfox, Mikael Rechtsman, Jeremy L. Marzuola, Braxton Osting and Moti Segev) Conference on Light, Electronics and Optics Proceedings (2013).

"Dispersive estimates for the linearized KdV equation and applications," Oberwolfach Reports Extended Abstracts from Nonlinear Waves and Dispersive Equations, **7**, Issue 3 (2010), 2393-2463.

"Wave packet parametrices for evolutions governed by PDO's with rough symbols," Oberwolfach Reports Extended Abstracts from Nonlinear Waves and Dispersive Equations, **4**, Issue 4 (2007), 2609-2670.

"A class of stable perturbations for a minimal mass soliton in three dimensions," (thesis written under the direction of Daniel Tataru) filed May 2007.

## TEACHING RECORD:

### University of North Carolina, Chapel Hill -

Spring 2021: Graduate Student Reading/Research (4 students), Math 656 - Introductory Complex Analysis (14 students), Undergraduate Reading/Research (2 students, 1 Honors).

Fall 2020: Graduate Student Reading/Research (4 students), Math 347 - Linear Algebra (Sections 001 with 100 students), Undergraduate Reading/Research (2 students, 1 Honors); Math 528 - Mathematical Methods for the Physical Sciences (41 students).

Spring 2020: Math 751 - Partial Differential Equations (4 students), Graduate Student Reading/Research (4 students), Math 547 - Linear Algebra (Sections 001 with 126 students and 002 with 145 students), Undergraduate Reading/Research (2 students, 1 Honors, 1 in PHYS 428L).

Fall 2019: Undergraduate Reading Course on spectral theory of glued domains (3 students), Undergraduate Reading/Research (2 students, 1 Honors, 1 in PHYS 428L); Graduate Student Reading/Research (4 students).

Fall 2018: Math 753 - Measure Theory and Integration ( $\tilde{1}0$  students), Graduate Student Reading/Research (5 students).

Spring 2018: Math 233 - Multivariable Calculus ( $\tilde{8}5$  students); Graduate Reading/Research (5 students), Undergraduate Research on Numerical Optimization (1 student).

Fall 2017: Math 547 - Linear Algebra and Applications ( $\tilde{1}00$  students); Graduate Reading Course on Numerical Methods (2 students), Undergraduate Research on Numerical Optimization (1 student).

Spring 2017: Graduate Reading Course on Spectral Theory (1 student)/Undergraduate Reading on Spectral Methods (1 student)/Undergraduate Honors Reading (1 student).

Fall 2016: Math 653 - Introduction to Real Analysis, Fall 2016 (15 students).

Spring 2016: Math 547 - Linear Algebra and Applications, Spring 2016 (100 students); Math 754 - Functional Analysis (10 students).

Spring 2015: MATH 555 - Introduction to Dynamical Systems (20 students); Physics 428L - Mentored 1 student, Doctoral Dissertation Hours (1 student).



Fall 2014: MATH 383 - First Course in Differential Equations (35 students); MATH 290 - Lab Course for Differential Equations, Fall 2014 (6 students); Doctoral Dissertation Hours (1 student); MATH 690: Graduate Reading Course on Numerical Linear Algebra (1 student); MATH 290 - Undergraduate Reading Course on Periodic Waves in Thin Film Equations, Fall 2014 (1 student).

Spring 2014: MATH 754 - Functional Analysis, Spring 2014 (10 students); MATH 547 - Linear Algebra and Applications, Spring 2014 (40 students); Doctoral Dissertation Hours (1 student).

Fall 2013: MATH 547 - Linear Algebra and Applications (29 students), Doctoral Dissertation Hours (1 student).

Spring 2013: MATH 547 - Linear Algebra and Applications; Spring 2013 (70 students in 2 sections); Doctoral Dissertation Hours (1 student); Master's Project Hours (1 student).

Fall 2012: Master's Project Hours (1 student); Doctoral Dissertation Hours (1 student).

Spring 2012: MATH 89 - First Year Seminar on Special Relativity (21 students); MATH 690 - Graduate Reading Course on Dispersive Estimates (4 students); MATH 290 - Reading Course on Calculus on Manifolds (1 student).

Fall 2011: MATH 751 - Graduate Partial Differential Equations (11 students); MATH 383 - Linear Algebra and Ordinary Differential Equations (24 students); MATH 290 - Reading Course on Nonlinear Dynamical Systems, Fall 2011 (5 students); MATH 690 - Reading Course on Spectral Theory (1 student).

Spring 2011: MATH 564 - Mathematical Modeling, (21 students).

Fall 2010: MATH 383 - Linear Algebra and Ordinary Differential Equations (10 students).

#### **UNC Graduate Student Mentoring - Ph.D. Students:**

David Webb (Graduated August 2017, now an instructor at Shorter University) - "On a nonlinear  $2d$  Dirac equation related to conical scattering in optical graphene" .

Quentin Robinson (Graduated May 2018, now an Instructor at North Carolina Central University) - "Capillary and internal waves in the presence of an obstacle - experiment, analysis and computation."

Yuan Gao (Graduated May 2019, advised jointly with Katie Newhall, now a quantitative analyst at Wells Fargo) - "Spin dynamics using Metropolis-Hastings algorithms"

Sterling Swygert (Graduated May 2019, now a Data Scientist at Pearson Education) - "Analysis and Steady states for the Kerchman and Frenkel Thin Film Models"

Wesley Hamilton (Graduated May 2021, now a postdoc at University of Utah) - "Spectral Optimization on Graphs and Applications."

Dmitro Golovanich (Graduated May 2021, current position unknown) - "Potential Perturbations of non-self-adjoint operators."

Grace Conte (Expected Graduation May 2022) - "Numerical analysis on quantum graphs."

Gary Moon (Expected Graduation May 2022) - "Analysis of Water Waves Models with Topography, Obstacles and Damping."

#### **Master's Students:**

Matthew Harris - "The spectral renormalization method applied to curved spaces and singular potentials" (Graduated May 2013).

### **UNC Undergraduate Student Mentoring - Undergrad Researchers:**

Terry Rodriguez - "Solving NLS using finite element methods on the lumpy torus" (Graduated May 2012).

Nathan Vaughn - "Bifurcations of traveling waves in viscous flows through pipes" (Graduated May 2015, Now a Ph.D. student at University of Michigan).

Anya Katsevich - "Metropolis rates in problems of crystal evolution" (Graduated May 2017, now a Ph.D. student at NYU),

Alan Luner - "Numerical optimization tools in fluids and chemistry" (Graduated May 2018).

Isabel Bors - "Eigenfunctions of a spectral flow related to the Dirichlet-to-Neumann map" (Graduated May 2020), co-supervised with Tom Beck,

Becca Olson - "Stochastic optimization in scattering problems" (Graduated May 2020), co-supervised with Daphne Klotsa,

Alex McEntarfer - "Stochastic optimization in scattering problems" (Expected graduation May 2021), co-supervised with Daphne Klotsa,

Marichi Gupta- "Low energy eigenfunctions on chains of domains" (Expected graduation May 2021).

### **Karlsruhe Institute of Technology -**

Graduate Reading Course on Nonlinear Waves, Summer 2013 (8 students).

### **Universität Bielefeld -**

Graduate Reading Course on Nonlinear Waves, Summer 2012 (10 students).

### **Columbia University -**

Principles of Applied Mathematics, Spring 2010.

Graduate Numerical Analysis of PDE, Fall 2009.

### **University of California, Berkeley -**

Calculus TA, Spring 2007 (under M. Aganagic).

Graduate Functional Analysis TA, Fall 2006 (under M. Ratner).

Calculus TA\*, Spring 2005 (under N. Reshetikhin).

Calculus TA\*, Fall 2004 (under G. Dales).

Calculus TA\*, Spring 2004 (under N. Reshetikhin).

Calculus TA, Spring 2003 (under N. Reshetikhin).

\*Taught for the Professional Development Program.

## **GRANTS:**

**UNC SURF Grant:** Summer research funding related to a project on nodal sets for perturbed domains overseeing undergraduate research Marichi Gupta.

**NSF Grant DMS-1909035:** PI for \$285,000 grant to be distributed from 15.08.2019-14.08.2022 funded through the Applied Math Division of the NSF to support the project entitled "Algorithms and Analysis for Models in Materials Science, Fluids, and Probability." AGEP supplement approved for funding student Grace Conte.

**PI for NSF Conference Grant:** PI (0%) \$22,000 for a conference held at the Princeton Center for Theoretical Studies from September 10-11, 2015 and a follow-up at UNC Chapel Hill in 2017 - Co-PIs Peter Constantin.

**NSF CAREER Grant DMS-1352353:** PI for \$440,000 (30%) grant to be distributed from 01.06.2014-14.08.2019 funded through the Applied Math and Analysis Divisions of the NSF to support the project entitled "Nonlinear PDE Models in Mathematical Physics and Experiment."

**NSF Grant DMS-1312874:** PI for \$170,000 (30%) grant to be distributed from 15.08.2013-14.08.2016 funded through the Applied Math and Analysis Divisions of the NSF to support the project entitled

”Nonlinear Interactions and Dynamics in Problems from Fluids and Optics.”

**Simons Foundation Collaboration Grant:** \$6,000/year for up to five years to fund travel, research and equipment related expenses with \$1,000/year for five years to support departmental expenses related to the research - Declined in year 1 due to NSF funding received (2013).

**Graduate Research Consultant Grant:** \$750 for a Graduate Research Assistant granted by the Office of Undergraduate Research at UNC to assist in implementing a research component to the course Math 547: Linear Algebra with Application Spring 2013.

**NSF Conference Grant:** PI for NSF funding of \$37,000 (0%) for workshop entitled ”A Conference on Partial Differential Equations - Analytic and Geometric Aspects” held at UNC from July 16-20, 2012.

**IBM Junior Faculty Development Award:** PI for University of North Carolina development grant of \$7,500 for calendar year 2012.

**NSF Mathematical Sciences Postdoctoral Research Fellowship:** PI for \$108,000 Awarded February 2007. Award granted to work with Professor Michael Weinstein of Columbia University.

## PROFESSIONAL SERVICE:

### Expository Talks:

”Waves and Dynamics: Acoustics, Billiard Ball Dynamics and how they are connected,” Festival on the Hill 2016 - Music, Science, and Nature.

”Dispersion, nonlinearity and geometry,” University of North Carolina, Chapel Hill Graduate Math Association Talk.

”Introduction to Microlocal Analysis,” University of Oklahoma Math Club Lecture Series.

”Soliton existence for nonlinear Schrödinger equations,” UC-Berkeley student PDE/Analysis seminar.

”Strichartz estimates for dispersive equations,” UC-Berkeley student PDE/Analysis seminar.

”The Calderon-Zygmund decomposition and pseudodifferential operators,” UC-Berkeley student PDE/Analysis seminar.

### Original Research:

”A stable class of perturbations of a minimal mass soliton for saturated NLS equations in  $\mathbb{R}^3$ ”:

NYU Analysis Seminar - February 21, 2008,

Johns Hopkins University PDE Seminar - February 11, 2008,

University of Rochester PDE Seminar - February 1, 2008,

Massachusetts Institute of Technology PDE Seminar - November 14, 2007,

University of Oklahoma Mathematics Colloquium - August 29, 2007,

MSRI Session on Nonlinear PDE - August 9, 2007,

Australian National University PDE Seminar - July 16, 2007,

University of Toronto PDE Seminar - February 12, 2007,

Northwestern University PDE Seminar - November 2, 2006,

University of California, Berkeley PDE Seminar - October 30, 2006.

”Wave packet parametrices for evolutions governed by PDO’s with rough symbols”:

AMS Session - University of New Mexico - October 14, 2007.

MFO Workshop on Nonlinear Dispersive Equations - September 14, 2007,

University of Bonn PDE Seminar - September 7, 2007.

”Fast soliton scattering by delta function potentials”:

University of Duisburg-Essen PDE Seminar- February 17, 2009.

Columbia University - APAM Research Conferences - March 14, 2008,

New Jersey Institute of Technology PDE Seminar - February 6, 2008,

Columbia University Brown Bag Lunch Lecture Series - October, 2007.

“An eigenfunction concentration result for polygonal billiards”:  
University of North Carolina Ergodic Theory Seminar - August 31, 2010.  
University of North Carolina, Chapel Hill - January 25, 2010,  
University of Toronto Applied Math Seminar - December 4, 2009,  
University of Texas Mathematical Physics Seminar - October 15, 2009,  
Columbia University Applied Math Colloquium - September 15, 2009,  
University of Nice PDE Seminar- May 21, 2009,  
University of Bonn SFB Seminar - November 4, 2008.

“The quartic KdV equation: Stability and scattering in  $\dot{H}^{-\frac{1}{6}}$  near the soliton”:  
MFO Workshop on Nonlinear Dispersive Equations - September , 2010.  
SIAM Nonlinear Waves - Philadelphia, PA - August 17, 2010.  
AMS Session - Baylor University - October 18, 2009.  
Columbia University Geometry and Analysis Seminar - September 17, 2009.  
Institut Henri Poincaré Trimester on Analysis Workshop - June 24, 2009.

”Spectral analysis for matrix Hamiltonian operators”:  
SIAM Nonlinear Waves - Philadelphia, PA - August 19, 2010.  
McMaster University Analysis Seminar - March 23, 2010.

”Nonconcentration of eigenfunctions and Strichartz estimates on polygonal billiards”  
North Carolina State University Differential Equations Seminar - April 13th, 2011.  
University of Illinois-Urbana-Champaign Analysis/PDE Seminar - February 15th, 2011.  
Dartmouth Spectral Geometry Workshop - July 23, 2010.  
AMS Session - University of New Mexico - April 17, 2010.

”Geometry, dispersion and nonlinearity:”  
Tel Aviv University Analysis Seminar - November 23, 2010.

”Nonlinear bound states on manifolds:”  
Universität Basel Analysis Seminar - May 22nd, 2013.  
MFO Workshop on Nonlinear Evolution Equations - May 17th, 2012.  
Johns Hopkins University Analysis Seminar - April 2nd, 2012,  
Duke Geometry/Topology Seminar - February 7th, 2012,  
AMS Special Session on Infinite Dimensional Hamiltonian Dynamical Systems - January 4th, 2012.  
University of Maryland - College Park PDE/Applied Math Seminar - October 20th, 2011,  
University of Illinois-Urbana-Champaign Analysis/PDE Seminar - October 17th, 2011,  
University of Nantes Analysis Seminar - June 17th, 2011,  
Universität Bonn Oberseminar on Global Analysis - May 17th, 2011,  
IMACS Session on Nonlinear Dynamics - April 7th, 2011,  
University of New Mexico Colloquium - March 10th, 2011.

”Low regularity well-posedness for the quasilinear Schrödinger equation:”  
University of Illinois, Chicago - April 13th, 2015.  
Georgia Tech PDE Seminar - January 27th, 2015.  
Hausdorff Institute of Mathematics Trimester Workshop - June 6th, 2014.  
WAVES Conference 2013 - March 28th, 2013.  
Princeton University Analysis/PDE Seminar - March 11th, 2013.  
University of Kentucky Analysis Seminar - February 5th, 2013.  
Stanford University Analysis/PDE Seminar - October 30th, 2012.

University of Illinois-Urbana-Champaign Analysis/PDE Seminar - September 11th, 2012.  
Universität Bielefeld Analysis Seminar - July 10th, 2012.  
Universität Bonn SFB Seminar - June 7th, 2011.  
University of Chicago Calderon-Zygmund Seminar - May 2nd, 2011.

” $C^3$  ill-posedness for the gravity-capillary problem:”  
George Washington University AMS Session - March 17th, 2012.

“Strichartz estimates and local smoothing estimates for asymptotically flat Schrödinger equations”:  
Columbia University Geometry and Analysis Seminar - January 24, 2008,  
Universität Bielefeld Analysis Seminar - May 28, 2013,  
Blaubeuren Workshop for the Internet Seminar on Evolution Equations - June 14, 2013.

”Strichartz estimates for the wave equation on Euclidean cones and applications:”  
Roscoff Conference on Quantum Chaos - June 21st, 2013.  
University of Minnesota Analysis/PDE Seminar - November 7th, 2012.  
Universität Bonn Analysis/PDE Seminar - October 22nd, 2012.  
Universität Bielefeld Analysis Seminar - October 15th, 2012.  
CRM Workshop on Spectral Invariants - July 24th, 2012.  
Universität Jena Applied Physics Group - June 25th, 2012.  
Karlsruhe Institute of Technology Analysis Seminar - May 22nd, 2012.  
Cambridge University Analysis Seminar - March 5th, 2012.

”The relaxation of a general family of broken bond crystal surface models:”  
Giga Lab Workshop on ”Mathematical Aspects of Surface and Interface Dynamics” - October 20th, 2020,  
Paris-Sud PDE seminar - September 12th, 2019,  
University of Toronto PDE seminar - November 28th, 2018,  
Duke University KI-Net Math Physics Conference - August 21st, 2018,  
Midwest PDE Seminar- September 15th, 2017,  
University of Arizona Colloquium - March 30th, 2017,  
Georgia Tech PDE Seminar - February 7th, 2017,  
NYU Applied Math Seminar - September 9th, 2016,  
SIAM PDE 2015 - December 8th, 2015,  
PDE Seminar UC Berkeley - October 16th, 2015,  
ICIAM Beijing Minisymposium on Surface Defects and Materials - August 11th, 2015.  
UCSD Colloquium - January 15th, 2015.  
Duke Applied Math Seminar - March 24th, 2014.  
Columbia University Joint Applied Math/Analysis & Geometry Seminar - October 17th, 2013.  
University of Pittsburgh Applied Math Seminar - December 5th, 2012.  
SES Annual Technical Meeting Symposium on Surface Structure and Dynamics - October 12, 2011.  
University of Chicago Brown Bag Statistical Chemistry Seminar - May 3rd, 2011.

“Long time dynamics near the symmetry breaking bifurcation for nonlinear Schrödinger/Gross-Pitaevskii equations”:  
AMS Session - Albuquerque - April 6th, 2014.  
Indiana University Analysis Seminar - February 10th, 2014.  
University of Michigan Differential Equations Seminar - December 12th, 2013.  
University of Minnesota - Analysis/Dynamical Systems Seminar - February 7th, 2011.  
University of North Carolina - Applied Math Seminar - September 24, 2010.  
SIAM Nonlinear Waves - Philadelphia, PA - August 17, 2010.

AMS Session - New Jersey Institute of Technology - May 22nd, 2010.  
Purdue University - Spectral Theory Seminar - February 19, 2010.  
Banff Research Station - August 13, 2009.

Basque Center for Applied Mathematics - February 4, 2009,  
University of Bonn - Workshop on Nonlinear Phenomena - March 5, 2009,

”Behavior of a model dynamical system with applications to weak turbulence:”  
AMS Session - Knoxville - March 21st, 2014.  
University of Massachusetts PDE/Applied Math Seminar - October 1st, 2013,  
UNC Analysis Seminar - September 5th, 2012.

”A Morse Index Theorem on Bounded Domains:”  
De Giorgi Institute Workshop on Stability Theory - Pisa, Italy - May 27th, 2014,  
University of Utah Applied Math Seminar - Salt Lake City - October 26th, 2015.

”Fluid Flow Past Cones and Other Obstacles:”  
SIAM Meeting - Chicago, IL, USA - July 7th, 2014.

”Dispersive estimates for perturbed Schrödinger operators on  $\mathbb{H}^d$ :”  
Banff Workshop on Geometric Scattering Theory - Banff, Alberta, Canada - November 6th, 2014.

”Symmetry breaking in problems from quantum mechanics and general relativity:”  
Bielefeld Workshop on Longtime Behavior of Nonlinear Waves - Bielefeld, Germany - June 8th, 2015.

”Spectral cluster estimates for polygonal domains:”  
PDE Seminar at Yale University - September 8th, 2016,  
Erwin Schrödinger Institute Program on Wave Equations - July 14th, 2015,  
University of Bonn Analysis Seminar - July 2nd, 2015.  
University of Orleans Colloquium - June 18th, 2015.

”The Euler Equation on Rotating Spheres:”  
University of California, Berkeley PDE Seminar - November 23rd, 2015,  
University of California, Merced Applied Math Seminar - October 2nd, 2015.

”Fluid Flow Past Cones and Other Obstacles:”  
SIAM Meeting - Chicago, IL, USA - July 7th, 2014.

”Gross-Pitaevskii vortex motion with critically-scaled inhomogeneities:”  
SIAM PDE 2015 - Scottsdale, AZ - December 7th, 2015.

”Stationary States/Traveling Waves in Fluid Flows with Geometry:”  
University of Kentucky PDE Seminar - February 23rd, 2016,  
Bonn Workshop on Longtime Behavior of PDE - March 16th, 2016.

”Ground states for NLS on the barbell graph:”  
Lorentz center workshop on nonlinear PDEs on Networks - August 2018,  
MFO workshop on quantum graph - June 2017,  
University of Illinois, Urbana-Champaign - April 18th, 2017,  
Texas A&M Applied Mathematics Seminar - March 2017,

Brown University PDE Seminar - April 29th, 2016,  
SHANKS Conference at Vanderbilt University - May 19th, 2016.

"Vortices in External Potentials:"  
IMA Workshop on Optics - October 2016.

"Spectral Optimization over point set configurations:"  
IMA Workshop on Computation in Optics - December 2016.

"Trigonometric Integrators for Quasilinear Wave Equations:"  
IMACS special session on computational methods in nonlinear PDE - March 29th, 2017.

"The Camassa-Choi Equations:"  
JMM special session on quasilinear PDE - January 13th, 2018.

"Radiation fields on product cones:"  
MFO workshop on Nonlinear Evolution Equations - June 2017.

"Degenerate Dispersive Equations:"  
NYU Analysis Seminar - March 7th, 2019.

"Nonlinear and linear perturbations of topological tight binding models:"  
Columba Applied Math Seminar - March 6th, 2019,  
Mittag-Leffler Program on Mathematical Physics - March 18th, 2019,  
Mittag-Leffler Conference on Nonlinear dispersive waves, solitons and related topics - June 12th, 2019,  
Metamaterials 2020 conference - September 29th, 2020.

"Nodal Deficiency and the Dirichlet to Neumann Map:"  
SIAM Nonlinear Waves - June, 2018,  
Hausdorff institute follow-up workshop - May 10th, 2019,  
Wake Forest University Analysis Seminar, February, 2021.

"Linear and Nonlinear Problems on Graphs:"  
MSRI Program on Microlocal Analysis - October 24th, 2019.

"A local condition for global extrema in dispersion bands of periodic graphs:"  
Spectral Geometry in the Clouds - September 28th, 2020,  
Fernuniversität Hagen - December 9th, 2020.

"Water waves over fixed obstacles:"  
AMS Special Session on Free Boundary Problems - October 24th, 2020.

## Conferences Organized:

**Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence, Revisited (with Stephen Gustafson and Daniel Tataru):** February 2020 at the Banff International Research Station.

**SIAM Minisymposium on Challenges in Mathematical Modeling, Analysis and Computation of Quantum Systems:** organized with Dio Margetis at SIAM Nonlinear Waves in Anaheim, CA, Monday, June 11th, 2018.

**SIAM Minisymposium on Problems in Quasilinear Dispersive PDE** organized with David Ambrose at Joint Math Meeting in San Diego, CA, Saturday, January 13th, 2018.

**Waves, Spectral Theory, and Applications with a focus on the impact of the career of Prof. Michael I. Weinstein II (with Roy Goodman and Panos Kevrekidis):** October 13-15, 2017 at UNC Chapel Hill.

**Nonlinear Partial Differential Equations on Graphs (with Reika Fukuzumi, Dmitry Pelinovsky and Guido Schneider):** June 18-24, 2017 in Oberwolfach, Germany.

**Organizing Committee for SIAM PDE 2015 (Organizers Lia Bronsard and David Lannes):** December 7-10, 2015 in Scottsdale, AZ.

**Waves, Spectral Theory, and Applications with a focus on the impact of the career of Prof. Michael I. Weinstein on the occasion of his 60th birthday (with Roy Goodman, Eddy Kirr, Panos Kevrekidis, Peter Constantin, Charlie Fefferman, Vadim Zharnitsky, Judith Miller and Gideon Simpson):** September 10-11, 2015 at the Princeton Center for Theoretical Science.

**Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence (with Stephen Gustafson and Daniel Tataru):** May 4-9, 2014 at the Banff International Research Station.

**UNC PDE Mini-Schools (organized from a grant with Hans Christianson and Anna Mazzucato):** Academic Year, 2013-2014 in Chapel Hill, NC, USA. Featured speakers include Kevin Zumbrun, Chris Sogge and Maciej Zworski.

**A conference on Partial Differential Equations - Analytic and Geometric Aspects (with Hans Christianson and Anna Mazzucato):** July 16-20, 2012 in Chapel Hill, NC, USA.

**AMS Special Session on Nonlinear Dispersive Equations (with Sarah Raynor and Gideon Simpson):** September 2011 in Winston-Salem, NC, USA.

**ICIAM mini-symposium on Dispersive Equations in Mathematical Physics (with Stephen Gustafson, Jason Metcalfe, T.P. Tsai and Ian Zwiars):** July 2011 in Vancouver, BC, Canada.

**SIAM mini-symposium on Modulation in Nonlinear Dispersive Equations (with Justin Holmer and Gideon Simpson):** August 2010 in Philadelphia, PA, USA.

**AMS Special Session on Nonlinear Dispersive Equations (with Sebastian Herr):** May 2009 in San Francisco, CA, USA.

**Hausdorff Center Workshop on Nonlinear Structures Arising in Dispersive Differential Equations (with Herbert Koch):** April 2009 in Bonn, Germany.

## Conferences Attended:

**AMS Special Session on Free Boundary Problems:** October 24th, 2020 in Salt Lake City, Utah (held remotely).

**Surface and Interface Dynamics:** October 21-22, 2020 in Tokyo, Japan (held remotely).

**Nonlinear Dispersive Waves, Solitons and related topics:** June 2019 at Mittag-Leffler in Djursholm, Sweden.

**Harmonic Analysis and PDE :** May 2019 at the Hausdorff Institute in Bonn, Germany.

**Workshop on Many Body Theory in Mathematical Physics:** March 2019 at Mittag-Leffler in Djursholm, Sweden.

**Workshop on Analysis and Numerics for Evolution equations:** February 2019 at MFO in Oberwolfach, Germany.

**Lorentz Center Workshop on Nonlinear PDE on Networks:** August 2018 in Leiden, Netherlands.

**SIAM Nonlinear Waves:** June 2018 in Anaheim, CA.

**Midwestern PDE seminar:** September 2017 at University of Illinois, Chicago.

**Workshop on Nonlinear Dispersive Equations:** June 2017 at MFO in Oberwolfach, Germany.

**IMA workshops on Analysis and Computation in Optics:** Fall 2016 in Minneapolis, MN.



**Duke Mathematical Physics Working Group on Epitaxy:** July 5-8, 2016 in Durham, NC.

**AIMS meeting on Dynamical Systems and Differential Equations:** July 1-3, 2016 in Orlando, FL.

**Longtime Behavior and Singularity Formation in Dispersive PDEs:** March 14-18, 2016 in Bonn, Germany.

**MSRI Semester on New Challenges in PDE: Deterministic Dynamics and Randomness in High and Infinite Dimensional Systems:** August 17-December 18, 2015 in Berkeley, CA.

**Hydrodynamic Limits of Particle Systems in Epitaxial Growth:** Kinetic Interaction Team on Center for Scientific Computation & Math. Modeling at Univ. of Maryland, September 11-13, 2015.

**International Congress of Industrial and Applied Mathematics:** August 10-14, 2015 in Beijing, China.

**Modern Theory of Wave Equations:** Summer 2015 in the Erwin Schrödinger Institute in Vienna, Austria.

**Workshop on Longtime Behaviour of Nonlinear Waves:** June 8-12, 2015 in Bielefeld, Germany.

**Geometric Scattering Theory Workshop:** November 2-6, 2014 in Banff, Canada.

**SIAM Annual Meeting :** July 7-11, 2014 in Chicago, IL.

**De Giorgi Institute Workshop on Stability Theory:** May 26-29, 2014 in Pisa, Italy.

**Hausdorff Institute Trimester on Harmonic Analysis in Nonlinear Dispersive Equations:** Summer 2014 in Bonn, Germany.

**AMS Special Session on Nonlinear Dispersive Equations:** April 2014 in Albuquerque, NM.

**AMS Special Session on Nonlinear Dispersive Equations:** March 2014 in Knoxville, TN.

**Workshop on Geometric Analysis:** July 2013 in the Institute for Advanced Study/Park City Summer Session, Park City, Utah, USA.

**Quantum Chaos and Resonances (quantum and classical):** June 17-21, 2013 in the "Station Biologique" de Roscoff in Brittany, France.

**Graduate Student Internet Seminar Workshop:** Lecture on smoothing estimates in dispersive equations, June 12-15, 2013 in Blaubeuren, Germany.

**IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory:** March 25-28, 2013, at University of Georgia, Athens, Georgia.

**Workshop on Spectral invariants on singular and non-compact spaces:** July 2012 at Centre de Recherche Mathématiques (CRM) in Montreal, Canada.

**Workshop on Nonlinear Evolution Problems:** May 2012 at MFO in Oberwolfach, Germany.

**AMS Special Session on Nonlinear Dispersive Equations:** March 2012 in Washington, D.C.

**AMS Special Session on Stability Analysis for Infinite Dimensional Hamiltonian Systems:** January 2012 in Boston, MA.

**Society of Engineering Sciences Annual Technical Meeting:** October 2011 in Evanston, IL.

**AMS Special Session on Nonlinear Dispersive Equations:** September 2011 in Winston-Salem, NC.

**IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory:** April 2011 in Athens, Georgia.

**Non-equilibrium Interface and Surface Dynamics: Theory, Experiment and Simulation from Atomistic to Continuum Scales:** October 2010 in College Park, Maryland.

**Workshop on Nonlinear Dispersive Equations:** September 2010 at MFO in Oberwolfach, Germany.

**SIAM Meeting on Nonlinear Waves:** August 2010 in Philadelphia, PA.

**Dartmouth Workshop on Spectral Geometry:** July 2010 in Hanover, NH.

**AMS Special Session on Nonlinear Waves:** May 2010 in Newark, NJ.

**AMS Special Session on Harmonic Analysis and Partial Differential Equations:** April 2010 in Albuquerque, NM.

**AMS Special Session on Harmonic Analysis and Partial Differential Equations:** October 2009 in Waco, TX.

**BIRS conference on Analysis of nonlinear wave equations and applications in engineering:** August 2009 in Banff, Alberta, Canada.

**IHP trimester on Nonlinear waves and dispersion:** June 2009 in Paris, France.

**AMS Special Session on Harmonic Analysis applied to Partial Differential Equations:** October 2007 in Albuquerque, NM.

**Workshop on nonlinear dispersive equations:** September 2007 at MFO in Oberwolfach, Germany.

**MSRI workshop on nonlinear partial differential equations:** Summer 2007 in Berkeley, CA.

**Workshop on nonlinear dispersive equations:** Fall 2006 in Baltimore, MD.

**BIRS conference on Schrödinger evolution equations:** Spring 2006 in Banff, Alberta, Canada.

**MSRI session on nonlinear dispersive equations:** Fall 2005 at MSRI in Berkeley, CA.

**IACM conference on nonlinear dispersive wave phenomena:** Summer 2005 in Anogia, Crete, Greece.

**NSF-CBMS conference on nonlinear dispersive and wave equations with Professor Terry Tao:** Summer 2005 in Las Cruces, NM.

## Memberships and Services:

*Graduate Students:* David Webb (graduated 2017), Quentin Robinson (graduated 2018), Yuan Gao (joint with Katie Newhall, graduated 2019), Sterling Swygert (graduated Summer 2019), Dmitro Golovanich (graduated 2021), Wesley Hamilton (graduated 2021), Gracie Conte (expected graduation 2022), Gary Moon (expected graduation 2022).

*Chair of Analysis Postdoc Search Committee:* 2020-21.

*Analysis Postdoc Search Committee Member:* 2017-18.

*Math Department Advising Committee:* Spring & Fall 2020, Chairing Committee from Spring 2021-present.

*Chair's Advisory Committee:* 2019-Present.

*Director of Undergraduate Studies:* July 1, 2016 to January 1, 2019.

*University Curriculum Re-design sub-committee:* 2017-2018.

*Journal Referee:* Communications in Partial Differential Equations, Journal of Computational Physics, Mathematische Annalen, SIAM Journal of Mathematical Analysis, Physics Letters A, Journal of Nonlinear Science, Discrete and Continuous Dynamical Systems, International Mathematics Research Notices, Communications in Mathematical Physics, Communications in Pure and Applied Mathematics, Indiana University Journal of Mathematics, Mathematische Zeitschrift, Journal of Differential Equations, Journal of Functional Analysis, SIAM Journal on Applied Mathematics, Nonlinearity, Journal of Differential and Integral Equations, Analysis & PDE, Journal of Geometric Analysis, Proceedings of the Royal Society-B, Journal of Hyperbolic Differential Equations, Annales d'Institut Henri Poincaré, Journal of Spectral Theory, Quarterly of Applied Mathematics, Advances in Mathematics, Duke Math Journal (quick decision), SIAM Multiscale, Modeling & Simulation, Interfaces and Free Boundaries, Communications in Mathematical Sciences, Potential Analysis, Transactions of the AMS, Calculus of Variations and Partial Differential Equations, Journal of the London Mathematical Society (quick decision), Evolution Equations and Control

Theory, Studies in Applied Mathematics, SIAM Journal on Matrix Analysis and Applications, Memoirs of the AMS, Applied and Computational Harmonic Analysis, Letters in Mathematical Physics, Journal de l'École polytechnique, Journal de Mathématiques Pures et Appliquées, IMA Journal of Numerical Analysis, Probability and Mathematical Physics.

*NSF Panelist:* Multiple panels from 2015-present.

*NSERC External Reviewer:* 2019.

*Book Referee:* AMS Books, Cambridge Press 2015.

*Colloquium Committee Member/Chair:* UNC-Chapel Hill, 2011-2015. Chair of Colloquium Committee beginning Spring 2012 to Fall 2015.

*Honors Thesis Committee Member:* Laura James (2016), Anya Katsevich (2017, Chair), Aric Wheeler (2017), Isabel Bors (2020, Chair), Marichi Gupta (2020-21, chair).

*Undergraduate Reading:* Amir Vig (2015), Nathan Vaughn (2016), Alan Luner (2017-18), Rebecca Olson (2019-20), Alex McEntarffer (2020-2021).

*Analysis/PDE Seminar Co-Organizer:* UNC-Chapel Hill, Fall 2010-Present.

*Graduate Oral Exam Committees:* Amanda French (2011), John Helms (2011), Reed Ogrosky (2012), Joanna Furno (2012), Andrew Roberts (2012), Bevin Maultsby (2013), Ben Wilson (2013), Colton Willig (2014), Mayukh Muckerjee (2014), David Webb (2014), Chung-Nan Tzou (2014), Dylan Muckerman (2015), Colin Grudzein (2015), Paul Cornwell (2016), Perry Harabin (2016), Quentin Robinson (2016), Dangxing Chen (2016), Bob Booth (2017), Jacob Perry (2017), Yuan Gao (2017), Katri Morgan (2017), Caroline Yang (2018), Colin Thompson (2018), Blake Keeler (2018), Sterling Swygert (2018), Dmitro Golovanich (2019), Wyatt Bridgman (2019), Wesley Hamilton (2020), Derrick Novak (2020), Hyeju Kim (Drexel External Reviewer, 2020), Grace Conte (2020), Gary Moon (2020), Taylor Rhoads (2021).

*Undergraduate Committee Member:* UNC-Chapel Hill, 2012-2013, Curriculum Development for Math 383L in Fall 2013, Director of Undergraduate Studies June 2016- January 2019.

*Ph.D. Defense Committee:* Amanda French (2012), John Helms (2012), Reed Ogrosky (2013), Joanna Furno (2013), Andrew Roberts (2013), Bevin Maultsby (2014), Colton Willig (2015), Ben Wilson (2015), Mayukh Muckerjee (2015), Chung-Nan Tzou (2015), Colin Grudzein (2016), Perry Harabin (2016), Dangxing Chen (2017), David Webb (2017), Paul Cornwell (2017), Jacob Perry (2018), Bob Booth (2018), Quentin Robinson (2018), Caroline Yang (2018), Yuan Gao (2019), Jack Arbutich (UIC external reviewer, 2019), Sterling Swygert (2020), Mikel Agirre (Bilbao external reviewer, 2020), Blake Keeler (2021), Wesley Hamilton (2021), Dmitro Golovanich (2021), Wyatt Bridgman (2021).

*Math Department German Language Exam Coordinator:* Fall 2012-Spring 2016.

*Graduate Committee Member:* UNC-Chapel Hill, 2014-2015.

*Master's Defense Committee:* Evan Stafford (2018), Matt Harris (2013, Chair), Anna Geyer (2011).

*UNC Science Expo Volunteer/Organizer:* Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring 2015, Spring 2016, Spring 2017, Spring 2018.

*Y.E. Smith Elementary Math Club:* Working monthly problem sets with elementary students in East Durham Fall 2013-2015.

*AWM Mentor:* Mentored Francesca Bernardi and Caroline Yang from Summer 2014-2015.

*UNC ADMIRES Program Mentor:* 2014-2015.

*Curriculum Development:* Applied Mathematics Taskforce for analysis of entry level courses in Applied Mathematics, Development of Math 383L - A Computational Lab Module designed to accompany Math 383, Development of a First Year Seminar on Special Relativity.

*Analysis Comprehensive Exam Committee:* Fall 2013, Spring 2014. Fall 2016, Spring 2017, Fall 2021, Spring 2022.

*UNC Peer Coaching:* Mentored by Kelly Hogan and Jeremy Petranka to assist in innovation and instruction in the classroom, Spring 2013.

*Student PDE/Analysis Seminar Co-Organizer:* UC Berkeley, 2004.

*UCLEADS Undergraduate Student Mentor:* 2004.