Blake Keeler - Curriculum Vitae

Department of Mathematics
University of North Carolina
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Education

Ph.D. Mathematics - Expected May 2021
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina
Advisor - Dr. Yaiza Canzani

B.S. Mathematics - May 2015
Virginia Tech
Blacksburg, Virginia
Graduating GPA: 4.0

A.S. Engineering - May 2013
Central Virginia Community College
Lynchburg, Virginia
Graduating GPA: 4.0

Current Research Interests

Microlocal Analysis - Energy decay estimates for the wave equation with anisotropic damping.
Dispersive PDE - Scattering theory on manifolds with conic singularities.
Spectral Theory - Off-diagonal Weyl asymptotics on compact manifolds.

Publications and Preprints

B. Keeler and J. Marzuola. *Pointwise dispersive estimates for Schrödinger operators on product cones.* Submitted for publication (2020). arXiv:2010.09778v1 [math.AP].

B. Keeler and P. Kleinhenz. *Exponential energy decay of solutions to the wave equation with anisotropic damping.* Submitted for publication (2020). arXiv:2009.10832 [math.AP]

B. Keeler. *A logarithmic improvement in the two-point Weyl law for manifolds without conjugate points.* Submitted for publication (2020). arXiv:1905.05136v2 [math.AP]

M. Embree and B. Keeler. *Pseudospectra of matrix pencils for transient analysis of differential-algebraic equations.* SIAM Journal on Matrix Analysis and Applications 38-3 (2017), pp. 1028-1054. arXiv:1601.00044v3 [math.NA]

Articles in Progress

Y. Canzani, J. Galkowski, and B. Keeler. *Scaling asymptotics of the spectral projector on Zoll manifolds.* In preparation (2020).

B. Keeler and P. Kleinhenz. *On the necessity of the anisotropic geometric control condition for exponential energy decay.* In preparation (2020).

Teaching Record

Instructor of record for:

MATH 521, Advanced Calculus I	Summer 2020
MATH 383, First Course in Differential Equations	Summer 2018
MATH 232, Calculus of One Variable II	Summer 2017
MATH 383L, First Course in Differential Equations - Lab	Spring 2016
MATH 119, Introduction to Mathematical Modeling	Summer 2016

Recitation leader for:

MATH 232, Calculus of One Variable II	Spring 2020
MATH 231, Calculus of One Variable I	Fall 2019
MATH 233, Calculus of Functions of Several Variables	Spring 2019
MATH 232, Calculus of One Variable II	Fall 2016
MATH 118, Aspects of Modern Mathematics	Spring 2016

Teaching assistant for:

MATH 590, Topics in Mathematics: Geometry and Relativity	Spring 2020
MATH 383, First Course in Differential Equations	Fall 2016
MATH 524, Elementary Differential Equations	Fall 2015

Scholarships, Fellowships, and Awards

J. Burton Linker Award March. 2020
UNC Mathematics Department

- Granted by the UNC department of mathematics for excellence in undergraduate teaching.

Senior Teaching Fellowship AY 2018-2019
UNC Mathematics Department

- Fellowship awarded to exceptional graduate student teachers.
- Involved co-teaching a seminar which prepared first-year graduate students to be effective TAs and instructors.
- Acted as a preliminary level of department oversight for first-time graduate student instructors.
- Served as a liaison between graduate TAs and faculty instructors.

UNC GAANN Fellowship Spring 2016
UNC Mathematics Department

- Received funding from the Department of Education's GAANN program, designed to assist graduate students with strong academic records demonstrating financial need and planning to pursue the highest available degree in a field designated as an area of national need.

Overall Outstanding Senior May 2015
Virginia Tech Mathematics Department

John C. Layman Prize for Undergraduate Research May 2015
Virginia Tech Mathematics Department

T. W. Hatcher Scholarship July 2014
Virginia Tech

Mathematical Contest in Modeling - Meritorious Winner Apr. 2015
The Consortium for Mathematics and its Applications

Talks and Presentations

"Global Weyl Asymptotics on Manifolds without Conjugate Points," *CMS 75th Anniversary Summer Meeting: Scientific Session on Geometry in Spectral and Scattering Theory* (Canceled due to pandemic), Canadian Mathematical Society	June 2020
"Random Waves on Manifolds without Conjugate Points," *Ohio River Analysis Meeting* (Canceled due to pandemic), University of Kentucky, Dept. of Mathematics	Mar. 2020
"Random Waves and the Spectral Projector on Manifolds without Conjugate Points," *Analysis Seminar*, Johns Hopkins University, Dept. of Mathematics	Feb. 2020
"Spectral Asymptotics on Manifolds without Conjugate Points," *Triangle Area Graduate Mathematics Conference (TAGMaC)*, UNC Chapel Hill, Dept. of Mathematics	Nov. 2019
"Spectral Asymptotics and the Heat Kernel." Series of four lectures for *Graduate Mathematics Association Seminar*, UNC Chapel Hill, Dept. of Mathematics	Sept.-Oct. 2019
"Random Waves and the Spectral Projector on Manifolds without Conjugate Points," *Harmonic Analysis and Mathematical Physics Seminar*, Texas A&M University, Dept. of Mathematics	Sept. 2019
"A Logarithmic Improvement in the Pointwise Weyl Law on Manifolds without Conjugate Points," *Summer Northwestern Analysis Program Poster Session*, Northwestern University, Dept. of Mathematics	Aug. 2019
"Diagonalizing the Laplacian - A Tourist's Guide to Spectral Theory," *Graduate Mathematics Association Seminar*, UNC Chapel Hill, Dept. of Mathematics	Oct. 2018
"An Introduction to the Sharp Weyl Formula," *Graduate Student PDE Seminar*, UNC Chapel Hill, Dept. of Mathematics	Mar. 2018
"Construction of the Hadamard Parametrix for the Wave Operator on a Riemannian Manifold," *Graduate Mathematics Association Seminar*, UNC Chapel Hill, Dept. of Mathematics	Sept. 2017
"Analysis of Transient Behavior in Linear Differential Algebraic Equations," *John C. Layman Undergraduate Research Competition*, Virginia Tech, Dept. of Mathematics	May 2015
"The SIVCD Model: Population Response to Ebola Spread and Treatment Distribution," joint with M. Brandao and M. Brennan. *Mathematical Contest in Modeling Solution Presentations*, Virginia Tech, Dept. of Mathematics	Mar. 2015
"Making Greatness Tangible: An Analytical Approach to Quantifying Coach Talent," joint with E. Burke and R. Pelkey. *Mathematical Contest in Modeling: Solution Presentations*, Virginia Tech, Dept. of Mathematics	Mar. 2014

Conferences Attended

Triangle Area Graduate Mathematics Conference (TAGMaC) Nov. 2019
UNC Chapel Hill, Dept. of Mathematics

Recent Developments in Microlocal Analysis Oct. 2019
Mathematical Sciences Research Institute

Introductory Workshop on Microlocal Analysis Sept. 2019
Mathematical Sciences Research Institute

Summer Northwestern Analysis Program (SNAP) Aug. 2019
Northwestern University, Dept. of Mathematics

PDE Minischool - Trapping, Diffraction, and Decay of Waves Dec. 2018
UNC Chapel Hill, Dept. of Mathematics

Texas Analysis and Mathematical Physics Symposium Oct. 2018
Baylor University, Dept. of Mathematics

Random Waves in Oxford June 2018
Oxford University, Dept. of Mathematics

PDE Minischool - Resonances and non-self-adjoint Schrödinger operators Nov. 2017
UNC Chapel Hill, Dept. of Mathematics

PDE Minischool - Singularities in Mean Curvature Flow Apr. 2017
UNC Chapel Hill, Dept. of Mathematics

Resonances: Geometric Systems and Dynamics Mar. 2017
CIRM, Luminy in Marseilles, France

PDE Minischool - Dynamics of the energy critical wave equations Feb. 2017
UNC Chapel Hill, Dept. of Mathematics

PDE Minischool - Random Schrödinger operators: Basic properties, localization, and spectral statistics Oct. 2016
UNC Chapel Hill, Dept. of Mathematics

AMS Sectional Meetings Nov. 2016
North Carolina State University

Shenandoah Undergraduate Mathematics and Statistics Conference Sept. 2013
James Madison University, Dept. of Mathematics and Statistics

Conferences and Seminars Organized

Triangle Area Graduate Mathematics Conference Nov. 2019
UNC Mathematics Department *[View Conference Website]*
Co-organizer

- Hosted 58 attendees from Duke University, NC State University, and UNC-Chapel Hill.

Graduate Student PDE Seminar AY 2017-2018
UNC Mathematics Department
Primary Organizer

- Organized a weekly seminar where graduate students studying analysis met and shared their research topics with each other.

Administrative Experience

Vice President AY 2019-2020
UNC American Mathematical Society - Graduate Chapter

- Co-organized the annual TAGMaC conference and assisted with management of the yearly budget.

Social Chair AY 2019-2020 & 2016-2017
UNC Graduate Mathematics Association Chapter

- Organized social activities to keep the UNC graduate student body well-connected and supportive.

Synergistic Activities

Directed Reading Program - UNC Chapter Aug. 2018 - Present
UNC Mathematics Department *[View Program Website]*
Co-founding committee member and mentor

- Co-founded the UNC Chapter of the Directed Reading Program, a mentoring network designed to give undergraduate students opportunities to explore advanced mathematical ideas outside the classroom environment by meeting one-on-one with a graduate student mentor.
- Served as a committee member responsible for organizing the pairings of mentors and students, with special care taken to pair students from underrepresented minorities with graduate mentors who were sensitive to their unique backgrounds.
- Mentored two undergraduate students in the program and provided them with guidance both on learning mathematics and on effectively presenting what they had learned.

Workshop on Inclusive Teaching Practices Apr. 2019
UNC Mathematics Department *[View Program Website]*
Participant

- Attended an all-day workshop that discussed teaching practices which foster an inclusive teaching environment and which are sensitive to the potential difficulties encountered by members of underrepresented minorities in STEM.

AWM Mentor Network Program AY 2018-2019
UNC Mathematics Department *[View Program Website]*
Graduate Student Mentor

- Served as a graduate mentor for the Association for Women in Mathematics Mentor Network Program, an initiative designed to help undergraduates from underrepresented genders feel more comfortable and included in the mathematical community at UNC Chapel Hill.

Julia Robinson Math Festival May 2018 & May 2019
UNC Mathematics Department *[View Program Website]*
Activity Leader

- Led organized math puzzle activities designed to spark the curiosity of elementary and middle school children.

UNC Science Expo Apr. 2018 & Apr. 2019
Morehead Planetarium and Science Center *[View Program Website]*
Exhibit Leader

- Ran an exhibit demonstrating the intricate patterns formed by acoustic vibrations of Chladni plates, with the aim of showing young people the magic of mathematics.

Girls Talk Math Summer 2016
UNC Mathematics Department *[View Program Website]*
Curriculum Developer

- Designed curriculum for *Girls Talk Math*, an outreach program dedicated to inspiring and encouraging underrepresented genders in STEM by making advanced mathematics accessible through a free educational summer program.
- Developed worksheets explaining the fundamentals of fluid dynamics and outlining instructions for physical experiments to be done by program attendees.