

# Yilun (Allen) Wu

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## Academic Experience

- **University of Oklahoma** Norman, OK  
Assistant Professor 2018-present
- **Brown University** Providence, RI  
Tamarkin Assistant Professor 2015-2018
- **Indiana University** Bloomington, IN  
Visiting Assistant Professor 2014-2015
- **University of Michigan** Ann Arbor, MI  
Ph.D., Applied and Interdisciplinary Mathematics 2008-2014
- **Fudan University** Shanghai, China  
B.S., Mathematics 2004-2008

## Research Interests

- I'm generally interested in questions of existence, regularity and stability of solutions to partial differential equations, with applications to physics and geometry. I have recently been working on equations modeling rotating stars and water waves.

## Papers

- Global Continuation of a Vlasov Model of Rotating Galaxies. (with Walter Strauss, accepted by Kinetic and Related Models, 2023)
- Existence of Rotating Stars with Variable Entropy. (with Juhi Jang and Walter Strauss, accepted by SIAM journal of Mathematical Analysis, 2023)
- Rapidly Rotating White Dwarfs. (with Walter Strauss, Nonlinearity, 33 (9), 4783, 2020)
- Global Continuation and the Theory of Rotating Stars. (Quarterly of Applied Mathematics, 78 (1), 2020)
- Rapidly Rotating Stars. (with Walter Strauss, Communications in Mathematical Physics, 368, 701-721, 2019)

- Existence of Rotating Magnetic Stars. (with Juhi Jang and Walter Strauss, *Physica D: Nonlinear Phenomena*, 397, 65-74, 2019)
- Steady States of Rotating Stars and Galaxies. (with Walter Strauss, *SIAM Journal on Mathematical Analysis*, 49 (6), 4865-4914, 2017)
- Jost Solutions and the Direct Scattering Problem of the Benjamin-Ono Equation. (*SIAM Journal on Mathematical Analysis*, 49 (6), 5158-5206, 2017)
- Simplicity and Finiteness of Discrete Spectrum of the Benjamin-Ono Scattering Operator. (*SIAM Journal on Mathematical Analysis*, 48 (2), 1348-1367, 2016)
- Existence of rotating planet solutions to the Euler-Poisson equations with an inner hard core. (*Archive for Rational Mechanics and Analysis*, 219, 1-26, 2016)
- On rotating star solutions to the non-isentropic Euler-Poisson equations. (*Journal of Differential Equations*, 259 (12), 7161-7198, 2015)

## Grants

- NSF Grant, DMS-2006212, 8/2020-7/2024 (sole PI). *Stratified Fluids and Completely Integrable Partial Differential Equations*.
- NSF Grant, DMS-1714343, 7/2017-7/2021 (sole PI). *Gravitational Effects on Rotating Stars and Deep Water Waves*.
- Rackham Graduate School Dissertation Fellowship, Winter 2013
- Fellowships, Winter 2011, Winter 2012 (funded by NSF)
- University of Michigan Department Summer Fellowships, 2009, 2010, 2011

## Professional Service

- Karcher Colloquium Chair, University of Oklahoma, Fall 2021-present
- Graduate Committee member, University of Oklahoma, Fall 2019-Spring 2021, Fall 2022 - present
- NSF proposal review panelist, 2019

## Talks

- *Global Continuation for Rotating Stars and Galaxies*. AMS 2023 Spring Western Sectional Meeting, Fresno, May 2023
- *The Scattering Problem of the Intermediate-Long-Wave equation*. PDE seminar, Georgia Institute of Technology, March 2023
- *Existence of Rotating Star Solutions with Variable Entropy*. AMS 2022 Fall Eastern Sectional Meeting, October 2022
- *Existence of Rotating Star Solutions with Variable Entropy*. PDE Seminar. Brown University, September 2022

- *Existence of Rotating Star Solutions with Variable Entropy*. Nonlinear Analysis Seminar. Rutgers University, April 2022
- *Existence of Rotating Star Solutions with Variable Entropy*. Karcher Colloquium. University of Oklahoma, April 2022
- *The Complete Integrability of the Intermediate Long Wave Equation*. 12<sup>th</sup> Annual IMACS Conference, University of Georgia, March 2022
- *Global Continuation of Rotating White Dwarfs*. Analysis of PDE Web Seminar. University of Southern California, National University of Singapore, New York University, etc. August 2020
- *Small Data Direct Scattering Problem of the Intermediate Long Wave Equation*. Online Northeast PDE seminar. Carnegie Mellon University, Brown University, etc. June 2020
- *Small Data Direct Scattering Problem of the Intermediate Long Wave Equation*. PDE Seminar. Brown University, March 2020 (trip canceled due to Covid 19)
- *Complete Integrability of the Intermediate Long Wave Equation*. Analysis and PDE Seminar. University of Kentucky, March 2020 (trip canceled due to Covid 19)
- *Local Wellposed-ness of the Compressible Euler Equations (four lectures)*. Analysis Seminar. University of Oklahoma, January to February 2020
- *Small Data Direct Scattering Problem of the Intermediate Long Wave Equation*. Classical and Quantum Integrability, Dijon, France, September 2019 (invited but unable to attend due to US visa issues)
- *Small Data Direct Scattering Problem of the Intermediate Long Wave Equation*. Workshop on Nonlinear Dispersive Partial Differential Equations and Inverse Scattering, Fields Institute, Toronto, Canada, May 2019 (invited but unable to attend due to Canadian visa issues)
- *Steady Rapidly Rotating Stars*. Analysis and PDE Seminar. University of Kentucky, March 2019
- *Matrix Factorization and Riemann-Hilbert Problems (I) – Existence*. Analysis Seminar, University of Oklahoma, March 2019
- *Matrix Factorization and Riemann-Hilbert Problems (II) – Cubic NLS*. Analysis Seminar, University of Oklahoma, March 2019
- *Steady Rapidly Rotating Stars*. PDE Seminar, Georgia Institute of Technology, November 2018
- *Steady Rapidly Rotating Stars*. Differential Equations Seminar, University of Missouri, October 2018

- *Rapidly Rotating Stars*. Conference on Nonlinear Waves in Honor of Walter Strauss, Brown University, May 2018
- *Steady State of Rotating Stars and Galaxies*. Colloquium, Dartmouth College, February 2018
- *Jost Solutions and the Direct Scattering Problem of the Benjamin-Ono equation*. Analysis and PDE Seminar, UCLA, February 2018
- *Steady State of Rotating Stars and Galaxies*. Colloquium, University of Oklahoma, January 2018
- *Steady State of Rotating Stars and Galaxies*. Applied Math Seminar, University of Michigan, October 2017
- *Steady State of Rotating Stars and Galaxies*. PDE Seminar, Brown University, September 2017
- *Jost Solutions and the Direct Scattering Problem of the Benjamin-Ono equation*. Analysis Seminar, Yale University, September 2017
- *Asymptotics of Jost Solutions for the Direct Scattering Problem of the Benjamin-Ono Equation*. Workshop on Inverse Scattering and Dispersive PDEs in One Space Dimension, Fields Institute, Canada, August 2017
- *Rotating Star Solutions to the Euler-Poisson and the Vlasov-Poisson Equations*. Analysis and Differential Equations Seminar, University of Southern California, April 2017
- *Complete Integrability of the Benjamin-Ono Equation*. Analysis and PDE Seminar, University of Kentucky, December 2016
- *On the Inverse Scattering Problem of the Benjamin-Ono Equation*. SIAM Conference on Nonlinear Waves and Coherent Structures, Philadelphia, PA, August 10, 2016
- *The Direct Scattering Problem of the Benjamin-Ono Equation*. The Fourth International Conference: "Nonlinear Waves – Theory and Applications", Beijing, June 25, 2016
- *A Spectral Problem Related to the Scattering Transform of the Benjamin-Ono Equation*. SIAM Analysis of PDE Conference, Scottsdale, AZ, December 8, 2015
- *On Rotating Star Solutions to the Euler-Poisson Equations*. PDE Seminar, Brown University, October 16, 2015
- *A Spectral Problem Related to the Scattering Transform of the Benjamin-Ono Equation*. PDE/Applied Math Seminar, Indiana University, April 13, 2015

- *On Rotating Star Solutions to the Euler-Poisson Equations – Inner Hard Core and Non-isentropy.* SIAM Southeastern Atlantic Section Conference, University of Alabama, March 21, 2015
- *On Rotating Star Solutions to the Euler-Poisson equations.* Analysis and PDE Seminar, University of Kentucky, October 10, 2014
- *On Rotating Star Solutions to the Euler-Poisson equations.* PDE/Applied Math Seminar, Indiana University, September 15, 2014
- *On Rotating Star Solutions to the Euler-Poisson equations.* Applied Analysis and Dynamical Systems Seminar, University of Toledo, April 7, 2014
- *Introduction to general relativity.* Student AIM Seminar, University of Michigan, October 17, 2012
- *Mathematical introduction to classical electrodynamics.* Student AIM Seminar, University of Michigan, April 11, 2012
- *Euler-Poisson equations and rotating stars.* 2<sup>nd</sup> Annual University of Michigan SIAM Student Conference, November 12, 2011
- *Unbounded operators and the foundation of quantum mechanics.* Student Analysis Seminar, University of Michigan, November 9, 2011.
- *Mathematical foundations of statistical mechanics.* Student AIM Seminar, University of Michigan, September 21, September 28, 2011.

## Teaching Experience

- University of Oklahoma Norman, OK
  - *Course Instructor*
    - Math 4433 Introduction to Analysis I (Fall 2022)
    - Math 2934 Differential and Integral Calculus III (Fall 2022)
    - Math 5163 Partial Differential Equations (Spring 2021)
    - Math 1823 Calculus and Analytic Geometry I (Fall 2020, Spring 2022, Spring 2023)
    - Math 4163 Introduction to Partial Differential Equations (Fall 2019, Spring 2022)
    - Math 2443 Calculus and Analytic Geometry IV (Spring 2018, Fall 2019, Spring 2021, Fall 2021)
    - Math 2433 Calculus and Analytic Geometry III (Fall 2018)
- Brown University Providence, RI
  - *Course Instructor*
    - Math 540 Honors Linear Algebra (Fall 2017)
    - Math 1270 Functional Analysis (Fall 2016)
    - Math 1120 Partial Differential Equations (Spring 2016, Spring 2017)
    - Math 1110 Ordinary Differential Equations (Fall 2015, Fall 2016)
  - *Course Instructor and Coordinator*

- Math 190 Advanced Placement Calculus (Fall 2015, Fall 2017)
  - Math 200 Intermediate Calculus (Spring 2018)
- Indiana University Bloomington, IN
  - *Course Instructor*
    - Math 310 Statistical Techniques (Spring 2015)
    - Math 365 Probability and Statistics (Fall 2014, Spring 2015)
- University of Michigan Ann Arbor, MI
  - *Course Instructor*
    - Math 105 Pre-calculus (Fall 2008, Winter 2009, 2010)
    - Math 115 Calculus I (Fall 2009, 2010, Summer 2012, Spring 2013)
    - Math 116 Calculus II (Summer 2014)
  - *Recitation Instructor*
    - Math 215 Calculus III (Fall 2011)
    - Math 216 Differential equations (Fall 2012, Fall 2013)
  - *Course Coordinator and Exam Writer*
    - Math 115 Calculus I (Summer 2012, Spring 2013)
    - Math 116 Calculus II (Summer 2014)
  - *Teaching Assistant*
    - Math 526 Stochastic Processes (Winter 2014)

## Conferences Attended

- AMS 2023 Spring Western Sectional Meeting, Fresno, CA, May 2023
- AMS 2022 Fall Eastern Sectional Meeting, Amherst, MA, October 2022
- 12<sup>th</sup> Annual IMACS Conference, Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens, Georgia, March 2022 (invited to speak in two different sessions but obliged to decline one due to conference restrictions)
- Conference on Nonlinear Partial Differential Equations and Applications, Ann Arbor, July 2019
- 4<sup>th</sup> Annual Meeting of SIAM Central States Section, Norman, October 2018
- Conference on Nonlinear Waves in Honor of Walter Strauss, Providence, May 2018
- Focus Program on Nonlinear Dispersive Partial Differential Equations and Inverse Scattering, Fields Institute, Toronto, August 2017
- *SIAM Conference on Nonlinear Waves and Coherent Structures* Philadelphia, August 2015
- *The Fourth International Conference: "Nonlinear Waves – Theory and Applications"* Beijing, June 2015
- *SIAM Analysis of PDE Conference* Scottsdale, December 2015
- *SIAM Southeastern Atlantic Section Conference* Birmingham, March 2015
- *Scattering and Inverse Scattering in Multidimensions* Lexington, May 2014
- *American Math Society Joint Mathematics Meetings* Baltimore, Jan 2014

- *Integrable Systems, Random Matrix Theory, and Combinatorics*  
Tucson, Oct 2013
- *Midwest Partial Differential Equations Seminar*  
Ann Arbor, May 2013
- *New Perspectives in Nonlinear PDE's*  
Ann Arbor, May 2011
- *The Thirteenth International Conference on Hyperbolic Problems*  
Beijing, June 2010
- *IMA Summer School in Inverse Problems*  
Delaware, June 2009

## Other Experience

- *Founding Secretary of SIAM Student Chapter at University of Michigan*      2009 - 2010
- *Mentor at graduate instructor workshop for international students at University of Michigan*      2008