Curriculum Vitae

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EDUCATION

Doctor of Philosophy, Mathematics
Boston University, Boston, MA
Advisor: C. Eugene Wayne
GPA 3.97
May 2021

Master of Arts, Mathematics
Boston University, Boston, MA
GPA 3.97
May 2018

Bachelor of Science, with Distinction, Mathematics
University of Minnesota, Minneapolis, MN
GPA 3.90
May 2014

Bachelor of Science, with Distinction, Physics
University of Minnesota, Minneapolis, MN
GPA 3.90
May 2014

Associate's of Science, with Honors, Mathematics
Minneapolis Community and Technical College, Minneapolis, MN
GPA 3.63
May 2011

TEACHING AND WORK EXPERIENCE

Universität Hamburg, Hamburg, DE

Post-doctoral Researcher   September 2021 – Present
- Investigated heat transport in turbulent geophysical flows as a part of the TRR 181 Energy Transfers in Atmosphere and Ocean subproject M7

Teaching Assistant   April 2022 – Present
- Partial Differential Equations (Fall 2024), Advanced Topics in Fluid Mechanics (Fall 2022), Traffic Flow Models (Fall 2022), Advanced Topics in Fluid Mechanics (Summer 2022)

Boston University, Boston, MA

Teaching Assistant   Fall 2014 – December 2020
- Statistics 2 (Fall 2020), Statistics 1 (Spring 2019), Multivariable Calculus (Spring 2017), Probability (Fall 2016), Calculus 2 (Spring 2016), Statistics 2 (Fall 2015), Statistics 1 (Spring 2015), Calculus 1 (Fall 2014)

Research Assistant   Summer 2017 – May 2021
- Investigated well-posedness issues and the long time asymptotics of solutions to the compressible Navier-Stokes equations using an artificial viscosity method and a characteristic expansion of the Green's matrix.

Instructor of Record   Summer 2015 – Spring 2020
- Calculus 1 (Spring 2020), Probability (Summer 2017), Optimization Methods for Operations Research (Summer 2016), Ordinary Differential equations (Summer 2015)

University of Minnesota, Minneapolis, MN

Undergraduate Research Assistant, Department of Mathematics   May 2012 – Feb 2013
- Supervised by Prof. Carme Calderer and Prof. Ronald Seigel.
- Built models for a time-release drug delivery device using a finite difference scheme and perturbation theory.

Undergraduate Research Assistant, Department of Computer Science   Aug 2011 – May 2012
- Supervised by Prof. Karsten Steinhauser and Prof. Jaya Kawale.
- Wrote C++ and MATLAB programs to determine geographical correlations in climate variables using the Walktrap algorithm

PUBLICATIONS

Preprints

- Rademacher, J. D. M. and **Welter, R.** . *Submitted to* Nonlinearity *May 2025*, arXiv preprint `https://arxiv.org/abs/2402.14724`

Peer reviewed articles

3.) **Welter, R.** Rotating Rayleigh-Benard convection: Attractors, bifurcations and heat transport via a Galerkin hierarchy. In: SIAM Journal on Applied Dynamical Systems 24.2 (2025), pp. 1851–1890. doi: `10.1137/24M1641245`. eprint: `https://epubs.siam.org/doi/pdf/10.1137/24M1641245`. url: `https://epubs.siam.org/doi/abs/10.1137/24M1641245.`, arXiv preprint `https://arxiv.org/abs/2402.14724`

2.) Ovsyannikov, I., Rademacher, J.D.M., **Welter, R.**, Lu, B. Time Averages and Periodic Attractors at High Rayleigh Number for Lorenz-like Models. J Nonlinear Sci 33, 73 (2023). `https://doi.org/10.1007/s00332-023-09933-x` arXiv preprint `https://arxiv.org/abs/2302.14525`

1.) Goh, R., Wayne, C.E., **Welter, R.**, "Asymptotic approximation of a modified compressible Navier-Stokes system", Indiana Univ. Math. J. Vol. 72, 3 (2023), `https://doi.org/10.1512/iumj.2023.72.9272` arXiv preprint `https://arxiv.org/abs/2012.12966`

CONTRIBUTED TALKS

SIAM Conference on Dynamical Systems

Minisymposium organizer and speaker   Spring 2023
- Organized a minisymposium on geophysical flows, rotating convection and transport bounds
- Spoke about "Heat transport in the Lorenz-Stenflo system"

Minisymposium chair and speaker   Spring 2019
- Hosted a minisymposium on Fluid Dynamics and Geophysics
- Spoke about "Decay Profiles of a Linear Sys. Associated with the Comp. Navier Stokes Eq's"

SIAM Conference on Nonlinear Waves and Coherent structures

Minisymposium chair and speaker   Summer 2022
- Hosted a minisymposium on Analysis
- Spoke about "Localization and Asymp. Approx. of a Comp. Navier-Stokes-Fourier Sys."

Hanseatic Dynamical Systems Days
- "Results on heat transport in non-rotating vs rotating convection"   Summer 2023
- "Long time asymp. approx. for the comp. Navier-Stokes eq's"   Summer 2022

Lothar Collatz Seminar
- Spring 2022 - "Some remarks on heat transport in turbulent convection and a summary of Tucker's result on the Lorenz attractor"
- Spring 2022 - "Heat transport and chaos in the Lorenz '63 model"
- Winter 2021 - "Asymptotic approximation of compressible Navier-Stokes flows in R^3"

SUMMER SCHOOL/SPECIAL WORKSHOPS

Ecole de Physique des Houches

Summer school on "200 Years of Navier-Stokes and Turbulences"   Summer 2023
- Attended a comprehensive set of lectures from eminent experimentalists, physicists and mathematicians on the occasion of the 200th birthday of the Navier-Stokes equations. Topics included well-posedness theory, convex integration, anomalous dissipation, singularities, reduction of NS (LES, POD and other reduced models), machine learning approaches, entropy, energy cascade, Lagrangian dynamics, transition to turbulence, lattice Boltzmann, and more.
- https://gdr-turbulence.universite-lyon.fr/summer-school-2023-265651.kjsp

CRITICS group

Winter school on "Critical Transitions in Complex Systems"   Winter 2018
- Studied slow-fast systems, equation-free approaches for complex systems, and numerical methods for stochastic processes with applications to climate processes.
- http://www.criticsitn.eu/wp/?page_id=1222

Institute for Mathematics and its Applications

Summer workshop on Mathematics and Climate   Summer 2016
- Studied physical aspects of climate models, basic fluid dynamics, and cloud dynamics using stochastic analysis and data assimilation

- Worked with Prof. Eric Van Vleck on building a model of the permeation of rainfall in soil using data assimilation techniques.

ORGANIZATION AND SERVICE

Dynamics Days Europe

Conference organizer   Summer 2024
- Helped plan the Dynamics Days Europe 2024 conference
- `https://dynamicsdays.eu/bremen2024/`

Society of Industrial and Applied Mathematics

Mathematics of Planet Earth activity group news liaison   Winter 2019 – Summer 2021
- Volunteered to liaise with members of the SIAM MPE AG and find research which could be published in the monthly SIAM MPE digest

American Mathematical Society

Vice President of the BU student chapter of the AMS   Fall 2018 – Fall 2019
- Organized professional development seminars for BU graduate students, helped host guest speaker Jill Pipher.

Boston University Department of Mathematics

Teaching seminar lead organizer   Spring 2018 semester
- Prepared BU graduate students for their summer teaching assignments by giving lessons on designing a syllabus, choosing curriculum, and other teaching best practices.
- Gave lectures on material from Steven Krantz's "How to Teach Mathematics".
- Hosted guest speaker Chad Topaz to speak about teaching practices.

AWARDS

- Fall 2013: John Tate Memorial Scholarship
- Fall 2013: Prof. Hans Dalaker Scholarship
- Spring 2012: PSM Bates Endowed Scholarship
- Fall 2011: U PROMISE Scholarship
- Fall 2010: NSF STEM Scholarship

COMPUTER SKILLS

- *Programming Languages:* C++, Java, Dr. Scheme
- *Operating Systems:* Windows, Ubuntu
- *Mark-Up Languages:* LaTeX, HTML
- *Mathematical Software Packages:* MATLAB/Octave, Mathematica, MATCONT, Pde2Path, YALMIP

- *Other Software:* OpenOffice, MS Office