Matthew C. Pharr

matthew.pharr@columbia.edu
(410) 375-9882

EDUCATION

Columbia University, New York, NY
Ph.D. Plasma Physics, Expected 2026
M.Phil. Plasma Physics, Expected 2025
M.S. Applied Physics, Expected 2022

Rensselaer Polytechnic Institute, Troy, NY
B.S. Physics & Mathematics, 2021
Summa Cum Laude.

PUBLICATIONS, TALKS, AND PROCEEDINGS

Pharr M, Ebrahimi F. *Azimuthal Curvature Instability in Hall-MHD plasmas.* Draft in Progress, 2022.

Ebrahimi F, Pharr M. *A non-local magneto-curvature instability in a differentially rotating disk.* Draft Submitted to Astrophysical Journal, 2022.

Pharr M, Ebrahimi F, Blackman E. *Large Scale Magnetic Field Growth and Stability in Hall-MHD Simulations of Quasi-Keplerian Flows.* American Physical Society, Division of Plasma Physics 2021 Annual Meeting: Pittsburgh, PA. Section BO06.00003: Astrophysical Turbulence and Dynamos.

RESEARCH

Graduate Research Assistant May 2021 - Present
Columbia University Plasma Physics Lab, New York, NY
Supervisor: Dr. Carlos Paz-Soldan

- Model 3D fields in different coil lead configurations for DIII-D using GPEC
- Determine 3D field correction strategies for early ITER scenarios.

U.S. Department of Energy Research Intern Fall 2020, Summer 2021
Princeton Plasma Physics Lab, Princeton, NJ
Supervisor: Dr. Fatima Ebrahimi

- Investigate the relationship between Hall and MHD dynamo terms in the induction equation and the growth of large scale magnetic fields due to magnetorotational instability (MRI) using NIMROD.
- Write data analysis scripts for the PPPL MRI Experiment and model a new ideal MHD instability in differentially rotating plasmas (see second publication).

Undergraduate Research in Molecular Biophysics Summer 2020, Spring 2021
Rensselaer Polytechnic Institute, Department of Mathematical Sciences, Troy, NY
Supervisor: Dr. Peter Kramer

- Explore the efficacy of models for interactions between microtubule filaments using Monte Carlo methods.
- Implement Gillespie algorithm simulations for various models in python.
- Expand and connect the two theores in unexplored parameter space.

Project in Applied Mathematics and Economics Fall 2019 - Spring 2020

- Investigate the time evolution of Lorentz curves for Monte-Carlo models of economies.
- Computationally implement/explore various wealth/income distribution models.

Mathematical Competition in Modeling Spring 2020
Awarded Honorable Mention for Research Paper

- Synthesize a model for the changing of migration patterns of Mackerel and Herring due to climate change.
- Study how this will affect Scottish fishing markets for different climate change outcomes.
- Write a research paper detailing the results of the study.

PEDAGOGY

Graduate Teaching Assistant Fall 2021 - May 2022
Columbia University, Applied Physics and Applied Mathematics, New York, NY

- Hold office hours for upper undergraduate/introductory graduate courses on Complex Analysis and Linear Algebra.
- Grade Homework Assignments.

Undergraduate Facilitator Fall 2019 - Summer 2020, Spring 2021
Rensselaer Polytechnic Institute, Physics Department, Troy, NY

- Facilitate Honors Physics I/II Labs, Electromagnetic Theory, Introduction to Quantum Mechanics (third course in QM sequence)
- Hold weekly office hours
- Attend some courses to help answer questions

I-PERSIST Mentor Fall 2019
Rensselaer Polytechnic Institute, Physics Department, Troy, NY

- Run two small weekly group meetings to strengthen important problem solving skills in Physics I
- Guide 20 new freshmen to success in their first semester.

ALAC Tutor Fall 2019 - Spring 2020
Rensselaer Polytechnic Institute, Physics Department, Troy, NY

- Tutor Physics I, II, Honors Physics I, II students in private and group settings for Rensselaer's Learning Assistance Center

Private Tutor Spring 2018 - Spring 2020
Self-employed.

- Synthesize lessons, example problems, and meet with math, computer science, and physics students regularly to assist with coursework and test preparation.

HONORS AND AWARDS

Max Hirsch Prize in Mathematics
This prize is awarded to a Senior in the Department of Mathematical Sciences who has demonstrated outstanding ability in his or her academic work and also gives promise of outstanding success in a career in mathematical sciences.
J. Lawrence and Gertrude Katz Award in Physics
This award is presented to the student selected as the outstanding graduating senior receiving a Bachelor of Science in Physics.
ΣΠΣ, Physics Honor Society
Rensselaer Archimedian Society (4.0 award)
Honorable Mention for Research Paper, Mathematical Competition in Modeling
Rensselaer Leadership Award

SKILLS

Python/Conda, Java, NumPy, SciPy, MatPlotLib, Linux Terminal, Matlab, LaTeX
Society of Physics Students Build Team – Demos and Outreach
Use of vacuum technology and other plasma physics related lab equipment
Use of high voltage lab equipment
Conversational in French
Excellent English Reading/Writing Skills

HOBBIES

Hiking; Bouldering; Media Studies; Green, Queer, and Student Activism