Matthew C. Pharr

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EDUCATION

Columbia University, New York, NY
Ph.D. Plasma Physics, Expected 2026
M.Phil. Plasma Physics, 2025
M.S. Applied Physics, 2023

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

RESEARCH & PROJECTS

Graduate Research Assistant — August 2021 - Present
Columbia University Plasma Physics Lab, New York, NY
Advisor: Dr. Carlos Paz-Soldan, Dr. Nikolas Logan

- M. Pharr, N. C. Logan, C. Paz-Soldan, J. K. Park, and C. Hansen, *Error field predictability and consequences for ITER*, Nucl. Fusion 64, 126025 (2024).
- M. Pharr, N. C. Logan, J. K. Park, and C. Paz-Soldan, *Metrics for quantifying resonant drive in ideal and extended MHD*, Planned for submission 2025.
- M. Pharr, N. C. Logan, J. K. Park, and C. Paz-Soldan, *Quantifying resonant drive in kinetically relaxed tokamak perturbed equilibria*, Planned for submission 2025.

- X. Bai et al., *Time variation of error field correction in ITER*, submitted to Plasma Physics and Controlled Fusion (2025).
- The MANTA Collaboration et al., *MANTA: a negative-triangularity NASEM-compliant fusion pilot plant*, Plasma Phys. Control. Fusion 66, 105006 (2024).
- C. J. Hansen, I. G. Stewart, D. Burgess, M. Pharr, S. Guizzo, F. Logak, A. O. Nelson, and C. Paz-Soldan, *TokaMaker: An open-source time-dependent Grad-Shafranov tool for the design and modeling of axisymmetric fusion devices*, Computer Physics Communications 298, 109111 (2024).
- C. Paz-Soldan et al., *Simultaneous access to high normalized density, current, pressure, and confinement in strongly-shaped diverted negative triangularity plasmas*, Nucl. Fusion 64, 094002 (2024).
- C. T. Holcomb et al., *DIII-D research to provide solutions for ITER and fusion energy*, Nucl. Fusion 64, 112003 (2024).
- S. Guizzo et al, *Electromagnetic System Conceptual Design for a Negative Triangularity Tokamak*, ArXiv, submitted to Fusion Engineering and Design (2024).
- M. Pharr, S. Frank, O. Nelson, R. Nies, and T. Rubin, hansec/OpenPOPCON, (2024).
- J. Halpern, M. Pharr, N. Logan, et al., OpenFUSIONToolkit/JPEC, (2025).

- M. Pharr et al. *Quantifying the Resonant Drive for Magnetic Islands in Perturbed Ideal, Resistive, and Kinetic MHD Equilibria.* American Physical Society, Division of Plasma Physics 2025 Annual Meeting: Long Beach, CA. Section GO05.00007: MFE: MHD.
- M. Pharr et al. *Expected Error Fields in ITER: A full-device source model and strategies for stable operation.* American Physical Society, Division of Plasma Physics 2024 Annual Meeting: Atlanta, GA. Section PP11.00050: Research in Support of ITER.
- M. Pharr et al. *Error Field Predictability and Consequences for ITER.* American Physical Society, Division of Plasma Physics 2023 Annual Meeting: Denver, Co. Section PP11.00050: Poster Session VI: MHD and Stability.
- M. Pharr et al. *Error field source identification in early ITER plasmas.* American Physical Society, Division of Plasma Physics 2022 Annual Meeting: Spokane, Wa. Section PP11.00044: Poster Session VI: Diagnostics; Edge and Pedestal; Stability; Heating; Transport, Turbulence.

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

- F. Ebrahimi and M. Pharr, *A Nonlocal Magneto-curvature Instability in a Differentially Rotating Disk*, ApJ 936, 145 (2022).

- M. Pharr, F. Ebrahimi, *A nonlocal Curvature-Driven Flow-Shear Instability in Low-Field Plasmas* Sherwood Fusion Theory 2023 Conference: Knoxville, TN.
- M. Pharr, F. Ebrahimi, E. Blackman, *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 UO06.00014: Astrophysical Turbulence and Dynamos.

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

PEDAGOGY

Graduate Teaching Assistant, Intro Physics Lab Sequence August 2022 - Present
Barnard College of Columbia University, Physics and Astronomy, New York, NY

Graduate Teaching Assistant, Complex Analysis/Linear Algebra Fall 2021 - May 2022
Columbia University, Applied Physics and Applied Mathematics, New York, NY

Undergraduate Facilitator Fall 2019 - Summer 2020, Spring 2021
Rensselaer Polytechnic Institute, Physics Department, Troy, NY
- Facilitate Honors Physics I/II Lab, Electromagnetic Theory, Intro to Quantum Mech.

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

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

Private Tutor, Math/Physics Spring 2018 - Spring 2020
Self-employed. Took 2-4 hours per week of university-level tutoring.

HONORS & AWARDS

ORFEAS Fusion Design Contest Award; Columbia University, 2022
For contributions to the Columbia/MIT team's project on negative triangularity reactor pilot plant design scoping. Awarded $22,000 as a group.

Max Hirsch Prize in Mathematics; Rensselaer Polytechnic Institute, 2021
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; Rensselaer Polytechnic Institute, 2021
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 GPA award)
Honorable Mention for Research Paper, Mathematical Competition in Modeling
Rensselaer Leadership Award

SKILLS

Python, Java, Fortran, Matlab, Linux, LaTeX
Use of vacuum technology and other plasma physics related lab equipment
Use of high voltage lab equipment
Native English, Conversational French