

Matthew R. Walker

PHYSICS PHD

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Education

University of Virginia

PHD IN PHYSICS

Charlottesville, Virginia

Aug. 2019 – May. 2025

- Condensed Matter Theory– Statistical and Non-Equilibrium Dynamics
- Dissertation–Anomalous Thermal Relaxation and the Mpemba Effect in Overdamped Langevin Systems and Markov Jump Processes
- 3 first author publications, 1 equal author publication

University of Virginia

B.S. IN PHYSICS

Charlottesville, Virginia

Aug. 2016 – May. 2018

Experience

Research Staff Member

INSTITUTE FOR DEFENSE ANALYSIS(IDA)

Alexandria, Virginia

Jan. 2025 – Present

- Research scientist in air warfare sensors

Department of Defense(DoD) High Performance Computing Intern

NAVAL RESEARCH LAB(NRL)

Washington DC

Jun. 2024 –Aug. 2024

- 10 week internship working with computational fluid dynamics(CFD) and aero-optics in C++

Undergraduate and Graduate Researcher

UNIVERSITY OF VIRGINIA

Charlottesville, Virginia

Aug. 2016 –May. 2025

- 5 years experience in programming in Python and C++ with an emphasis on stochastic systems, computational fluid dynamics, and computational Electromagnetism (E&M)
4 publications

Publications

PUBLISHED

- [1] **M. R. Walker** and M. Vucelja. Anomalous Thermal Relaxation of Langevin Particles in a Piecewise Constant Potential. *J. Stat. Mech.* 2021 (11), 113105 arXiv:2105.10656.

SUBMITTED

- [2] **M. R. Walker**, and M. Vucelja. Mpemba effect in terms of mean first passage time *arXiv preprint arXiv:2212.07496*, 2022 arXiv:2212.07496
- [3] **M. R. Walker**, S. Bera and M. Vucelja. Optimal transport and anomalous thermal relaxations *arXiv preprint arXiv:2307.16103*, 2023 arXiv:2307.16103
- [4] S. Bera, **M. R. Walker**, and M. Vucelja. Effect of dynamics on anomalous thermal relaxations and information exchange *arXiv preprint arXiv:2308.04557*, 2023 arXiv:2308.04557

Honors & Awards

- 2025 **APS GSNP Junior Speaker Award Finalist** *Anaheim, CA*
Received Travel funding and selected to give a talk in special award session by the group on statistical and nonlinear physics(GSNP)
- 2024 **UVA Physics Department dissertation year fellowship** *Charlottesville, VA*
1 year fellowship funding provided by UVA physics department
- 2024 **2nd place for most outstanding research project** *Charlottesville, VA*
UVA graduate physics poster competition
- 2017 **2nd place for outstanding undergraduate research project** *Charlottesville, VA*
Sigma-Pi-Sigma honor society undergraduate research symposium

Presentations

INVITED

- Nov. 2024 Invited Seminar–Institute for Defense Analysis(IDA), Alexandria Virginia
- Aug. 2024 Invited Seminar– Department of Computational Physics, Naval Research Lab, Washington D.C.
- Mar. 2024 Invited Seminar– Center for Soft and Living Matter, University of Pennsylvania, Philadelphia Pennsylvania
- Apr. 2023 Invited Seminar– Physics Department, University of Virginia, Charlottesville Virginia
- APS TALKS**
- Mar. 2025 Non Markovian Mpemba Effect in Chemical Reaction Networks, APS Junior Speaker Award Session, APS Global Summit 2025, Anaheim, California
- Mar. 2024 Anomalous thermal relaxation dynamics in a Maxwell demon setup, APS March Meeting 2024, Minneapolis, Minnesota
- Mar. 2023 The Strong Mpemba effect in over-damped Langevin dynamics and connections to Kramer's escape rate, APS March Meeting 2023, Las Vegas, Nevada
- Mar. 2019 Anomalous thermal relaxation and the Mpemba effect of Langevin particles, APS March Meeting 2019, Boston, Massachusetts

Workshops

- 2024 **Young Investigators Workshop** *Raleigh, North Carolina*
Summer school discussing current research in the fields of active matter, liquid crystals, biophysics, and soft matter at North Carolina State University
- 2023 **Biophysics summer school** *Island of Crete, Greece*
Summer school discussing current research in biophysics at University of Crete

Skills

Programming Python, C++, Matlab, Mathematica, Pandas, data analysis