J. Clayton Peacock

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Research Interests

Theoretical Condensed Matter Physics: Quantum chaos and ergodicity-breaking; Non-equilibrium dynamics; Localizing systems; Disordered systems; Dissipative systems

Methods for Simulating Quantum Systems: Tensor Networks; Krylov Subspace Methods; Pauli Propagation

Education

New York University   New York, NY
Ph.D. Candidate in Physics, Center for Quantum Phenomena   August 2020 – Spring 2026 (expected)
Advisor: Prof. Dries Sels

University of Cincinnati   Cincinnati, OH
B.S. with honors in Physics, Mathematics, and Astrophysics (GPA 3.94/4.0)   May 2020
Advisor: Prof. Carlos J. Bolech

Research Experience

Graduate Student Researcher, Center for Quantum Phenomena   New York, NY
New York University, Department of Physics   August 2020 – Present

- Bounded the stability of many-body localization to quantum avalanches using MPS time evolution
- Developed new ergodicity-breaking conditions in Krylov space and applied it to the 3d Anderson transition
- Benchmarked pauli propagation methods against tensor networks for time evolution and Krylov expansion
- Explored analog Hawking radiation in a spin system using MPS time evolution and DMRG
- Studied dissipative spin chains using a mixture of tensor network methods and a quantum trajectories approach

Undergraduate Student Researcher   Cincinnati, OH
University of Cincinnati, Department of Physics   August 2018 – May 2020

- Implemented a novel continuous Matrix Product State ansatz for mixtures of Bosons and Fermions
- With this ansatz, described the ground state phases of mixtures when the inter-species interaction is attractive

Publications

- *The Anderson transition - A view from Krylov space*
  J. Clayton Peacock, Vadim Oganesyan, Dries Sels, arXiv:2510.26920 [cond-mat.dis-nn] (2025)

- *Quantum many-body simulations with PauliStrings.jl*
  Nicolas Loizeau, **J. Clayton Peacock**, Dries Sels, SciPost Phys. Codebases 54 (2025)

- *Many-body delocalization from embedded thermal inclusion*
  J. Clayton Peacock, Dries Sels, Phys. Rev. B 108, L020201 (2023)

- *Condensate States of Atomic Bose-Fermi Gas Mixtures*
  C. J. Bolech, **J. Clayton Peacock**, Aleksandar Ljepoja, J. Phys.: Conf. Ser. 2494 012015 (2023)

- *Quantum coherent states of interacting Bose-Fermi mixtures in one dimension*
  J. Clayton Peacock, Aleksandar Ljepoja, C. J. Bolech, Phys. Rev. Research 4, L022034 (2022)

Awards & Honors

Henry M. MacCracken Fellowship (2020)
Phi Beta Kappa Society Member (2020)
MUSE Fellowship (2019)
Sigma Pi Sigma Member (2019)
Junior Achievement Award in Physics (2019)
Dean's Honors (2017 –2020)
National Merit Scholarship Finalist (2016)

Presentations

New frontiers in out-of-equilibrium quantum many-body dynamics, Max Planck Institute (Poster) 2025
Instituto Superior Técnico Physics Seminar (Invited Talk) 2025
American Physical Society March Meeting (Contributed Talk) 2024
Quantum Science GRS/GRC (Poster) 2024
American Physical Society March Meeting (Contributed Talk) 2023
Aspen Winter Conference: Disorder and Quantum Phases of Matter (Poster) 2023
American Physical Society March Meeting (Contributed Talk) 2022
American Physical Society March Meeting (Contributed Talk) 2021
Ohio Supercomputing Center's Autumn Statewide Users Group Conference (Poster) 2019

Outreach and Service

Organizing Committee Member, Conference for Undergraduate Women and Gender Minorities in Physics (APS), New York University, NY 2025
Center for Quantum Phenomena Graduate Student Representative, GPHORCE, New York University, NY 2023–2024
President of Society of Physics Students, University of Cincinnati, OH 2019

Teaching Experience

Undergraduate Statistical Physics TA, New York University 2022
Undergraduate Statistical Physics TA, New York University 2021
Supplemental Review Session Leader and Mentor, University of Cincinnati 2018–2020
Math and Science Support Center Tutor, University of Cincinnati 2017–2019
Electricity and Magnetism TA, University of Cincinnati 2017

Programming Experience

Julia (ITensors.jl, PauliStrings.jl, KrylovKit.jl, Optim.jl, NLOpt.jl, HDF5.jl)
Python (Scipy, Numpy, Matplotlib)
Git (Repository management)
Other: SLURM for High Performance Computing, Linux, LaTeX

Websites

Google Scholar: https://scholar.google.com/citations?user=ORSR8BoAAAAJ
Github: https://github.com/cpeacockc
LinkedIn: https://www.linkedin.com/in/j-clayton-peacock-6970411a7/