J. Clayton Peacock

Github
Website
Scholar
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Research Skills & Interests

Theoretical Condensed Matter Physics: Quantum chaos and integrability; Non-equilibrium dynamics; Anderson and many-body localization; Disordered systems; Dissipative and driven systems

Quantum Simulation Methods: Tensor networks; Krylov subspace methods; Pauli string binary encoding; Global optimization; Sparse matrix methods; Quantum trajectories

Education

New York University — New York, NY
Ph.D. Candidate in Physics, Center for Quantum Phenomena — August 2020 – May 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 a many-body localizing system to rare Griffiths regions using MPS time evolution
- Developed an understanding of integrability in Krylov space based on dimerization of the Lanczos coefficients
- Characterized the extended, critical, and localized regimes of the 3d Anderson model in Krylov space
- Compared effectiveness of Pauli string binary encoding against tensor networks for quantum dynamics
- Studied a dissipation-induced zeno transition using tensor networks and a quantum trajectories approach
- Explored how to generate analog Hawking radiation in a spin system, utilizing DMRG and MPS

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

- *Anderson localization: A view from Krylov space*
  J. Clayton Peacock, Vadim Oganesyan, Dries Sels, Phys. Rev. B 113, 064204 (2026)
- *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)

Programming Experience

Julia: ITensors.jl, PauliStrings.jl, KrylovKit.jl, NLOpt.jl, HDF5.jl
Python: Scipy, Numpy, Matplotlib
High-Performance Computing: SLURM, Linux
Other: Git, LaTeX

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 Representative, GPHORCE, New York University 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
Calculus supplemental review session leader, University of Cincinnati 2018–2020
Math and Science Support Center Tutor, University of Cincinnati 2017–2019
Electricity and Magnetism TA, University of Cincinnati 2017

Languages

English (native), Portuguese (intermediate), Spanish (basic)

References

Prof. Dries Sels (Boston University)
- Email: dsels@bu.edu

Prof. Vadim Oganesyan (City University of New York)
- Email: vadim.oganesyan@gmail.com

Prof. Carlos Bolech (University of Cincinnati)
- Email: bolechcs@ucmail.uc.edu