

Méabh I. L. Allen

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Research Interests

Nonequilibrium quantum and classical many-body physics; critical phenomena and universality; strongly correlated and topological phases of matter; open quantum systems; entanglement and quantum information; thermalization and many-body quantum chaos.

Education

Ph.D. Candidate in Theoretical Condensed Matter Physics Jan. 2022–Present

University of California, Berkeley, USA

Thesis: “*Non-equilibrium many-body dynamics of quantum critical systems.*” Advisor: Prof. Joel Moore.

M.Sc. in Quantum Fields and Fundamental Forces Oct. 2020–Oct. 2021

Imperial College London, UK

Thesis: “*The Kosterlitz–Thouless phase transition in spin models and quantum field theory.*” Advisor: Prof. Arttu Rajantie.

Joint First Class Honours B.Sc. in Mathematics and Physics Sep. 2016–May 2020

University College Cork, Ireland & Technical University of Munich, Germany

Thesis: “*Surface vibrational modes in Bi_2Te_3 & Bi_2Se_3 , two layered topological insulators.*” Advisor: Prof. Stephen Fahy.

Peer-Reviewed Publications

J. Wei*, **M. I. L. Allen***, J. Kemp*, C. Wang, Z. Wei, J. E. Moore, and N. Y. Yao, “Universality of shallow global quenches in critical spin chains,” *Physical Review Letters* **136**, 180403 (2026).

Y. Huang, J. D. Querales-Flores, S. W. Teitelbaum, J. Cao, T. Henighan, H. Liu, ..., **M. I. L. Allen**, ..., S. Fahy, J. A. Sobota, and D. A. Reis, “Ultrafast measurements of mode-specific deformation potentials of Bi_2Te_3 and Bi_2Se_3 ,” *Physical Review X* **13**, 041050 (2023).

J. A. Sobota, S. W. Teitelbaum, Y. Huang, J. D. Querales-Flores, R. Power, **M. I. L. Allen**, ..., S. Fahy, D. A. Reis, and Z.-X. Shen, “Influence of local symmetry on lattice dynamics coupled to topological surface states,” *Physical Review B* **107**, 014305 (2023).

Manuscripts in Preparation

M. I. L. Allen, G. L. Woolls, C. W. Wächtler, and J. E. Moore, “Universality and multipartite entanglement in decohered critical spin chains.”

M. I. L. Allen, J. Kemp, J. E. Moore, and B. Béri, “Conformal spectroscopy in SYK.”

M. I. L. Allen, O. K. Diessel, and J. E. Moore, “Novel short-time universality for critical quenches in non-equilibrium phase transitions.”

M. I. L. Allen and Z. Wei, “Holographic dual to a shallow global quench in $2 + 1\text{D}$ spacetime.”

Awards and Fellowships

ICAM QuantEmX Exchange Scholarship — Extended two-month research visit to the University of Cambridge. 2026

North American Google Fellowship in Quantum Computing — Fellowship support to the value of \$160,000. 2025–2027

NSF Challenge Institute for Quantum Computation Seed Funding — Research support to the value of \$40,000. 2024

NSF CIQC Exchange Scholarship — Summer research exchange to Harvard University. 2024

UC Berkeley Leo Falicov and Heising-Simons Fellowships — Graduate research support. 2022–2023

Tyndall National Institute Fellowship — Summer research fellowship at the Irish Photonic Integration Centre. 2020

Erasmus Exchange Scholarship — One-year exchange to the Technical University of Munich. 2018–2019

UCC Quercus Scholarship — Perfect score in the Irish national state examination. 2015–2016

Selected Talks and Seminars

Dynamical probes of universality in quantum critical spin models

Student Seminar Series, Institute for Theoretical Physics, University of Cologne, Germany	June 2026
Theory of Condensed Matter (TCM), University of Cambridge, UK	May 2026
Centre for Quantum Information and Foundations (CQIF), DAMTP, University of Cambridge, UK	May 2026

Universality of shallow global quenches in critical spin chains

Theoretical Physics Seminar, Trinity College Dublin, Ireland	Apr. 2026
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Probing universal aspects of quantum critical dynamics in lattice systems

CIQC Annual Retreat, Asilomar Conference Center, USA	June 2025
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Academic Service, Mentoring and Outreach

Student and Postdoc Leadership Committee

Jan. 2023–Present

Challenge Institute for Quantum Computation (CIQC), UC Berkeley

Organise seminars, networking events, and journal clubs for Berkeley's cross-departmental quantum-computing community.

CIQC Delegate, NSF Quantum Showcase

Apr. 2024

NSF Headquarters and Capitol Hill, Washington, DC

Represented CIQC in meetings with NSF leadership, members of Congress, and congressional staff.

Graduate Mentor, MPS and COMPASS

Aug. 2022–May 2025

UC Berkeley

Mentored mathematics and physics undergraduates from underrepresented backgrounds in research and academic development.

Founding Committee Member

2019

Equal Physics Opportunities Network in Academia (EPONA), University College Cork

Helped establish a departmental network promoting gender equality and inclusion through seminars and outreach.

Teaching Experience

Graduate Student Instructor, Physics 141B: Solid State Physics, UC Berkeley	Spring 2024
Graduate Student Instructor, Physics 7A: Physics for Scientists and Engineers, UC Berkeley	Fall 2023
Undergraduate Student Instructor, Physics 2106: Astrophysics and Special Relativity, University College Cork	Spring 2020

Technical Skills and Languages

Numerical many-body methods: Tensor-network methods including purification, nonequilibrium unitary dynamics, and Lindbladian dynamics; Gaussian/free-fermion methods including stochastic unravelings of Lindbladian dynamics; Monte Carlo methods; nonequilibrium Schwinger–Dyson/Kadanoff-Baym numerics; exact diagonalization.

Programming: Python, Julia, Mathematica, MATLAB; TeNPy and ITensor; HPC and Slurm-based workflows.

Languages: Native Irish; German (CEFR C1); French (CEFR B2).