Josephine C. Meyer

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Research Interests

Physics education research: teaching and learning of quantum information science; curricular and assessment design. Student reasoning about quantum states in quantum computing contexts. Physics and STEM cultures and their construction and propagation. Social and ethical impacts of quantum computation.

Education

University of Colorado, Boulder
Ph.D. candidate in physics, 2019-2025 (est.)
Candidate, graduate certificate in comparative ethnic studies, 2025 (est.)
M.S. physics, 2022
Graduate-level coursework in physics, education studies, ethnic studies, cultural anthropology

Stanford University
B.S. physics, minor in urban studies (2019)
With distinction and Phi Beta Kappa

University of Oregon
Pre-baccalaureate student specializing in physics and mathematics (2012-2015)

Publications in Peer-Reviewed Journals

J. Meyer, G. Passante, B. Wilcox (2023). The question of equity: Who has access to US quantum information education programs? Submitted to *Quantum Sci Technol* arXiv:2309.TBD

J. Meyer, G. Passante, S. Pollock, B. Wilcox (2023). Introductory quantum information science coursework at US institutions: Content coverage. Submitted to *EPJ Quantum Technol* arXiv:2308.12929.

J. Mason *et al*. (2023): Coronal heating as determined by the solar flare frequency distribution obtained by aggregating case studies. *Astrophys J* 948, 71.

J. Meyer, G. Passante, S. Pollock, B. Wilcox (2023). How media hype affects our physics teaching: A case study on quantum computing. *Phys Teach* 61, pp. 339-342. (*Featured Article*)

J. Meyer, G. Passante, S. Pollock, B. Wilcox (2022). Today's interdisciplinary quantum information classroom: Themes from a survey of quantum information science instructors. *Phys Rev PER* 18, 010150.

Publications in Peer-Reviewed Conference Proceedings

J. Arrow, S. Marsh, J. Meyer. A holistic approach to quantum ethics education (2023). Accepted to *Proc. 2023 IEEE Conf. Quantum Comput. Eng. (QCE)*. arXiv:2306.00027

J. Meyer, G. Passante, S. Pollock, B. Wilcox (2022). Investigating student interpretations of the differences between classical and quantum computers: Are quantum computers just analog classical computers? In *Proc. 2022 Physics Education Research Conf.*, pp. 317-322.

J. Meyer, N. Finkelstein, B. Wilcox (2022). Ethics education in the quantum information science classroom: Exploring attitudes, barriers, and opportunities. In *Proceedings 2022 ASEE Annual Conf. & Expo*.

J. Meyer, G. Passante, S. Pollock, M. Vignal, B. Wilcox (2021). Investigating students' strategies for Interpreting quantum states in an upper-division quantum computing course. In *Proc. 2021 Physics Education Research Conf.*, pp. 289-294.

Research Background

Teaching and Learning of Quantum Information Science (2021-present)
Physics Education Research Group, University of Colorado Boulder. Advisor: Dr. Bethany Wilcox
Benchmarking state of QIS education at US universities
Developing scalable assessment to reliably measure student learning in and across QIS courses
Understanding student reasoning strategies in upper division quantum computing courses
Developing framework for quantum ethics education with Quantum Ethics Project

Spin Squeezing in a Sr Optical Lattice Clock (2019-20)
JILA, University of Colorado Boulder. Advisor: Dr. Jun Ye. Funded by NDSEG fellowship

FPGA-Enabled Real-Time Error Correction on Superconducting Qubits (2018)
University of Chicago. Advisor: Dr. Dave Schuster. Funded by NSF REU program

Optical Transport of Ultracold Cs Using Focus-Tunable Lenses (2016-17)
Stanford University. Advisor: Dr. Monika Schleier-Smith
Developed Gaussian Workbench, open-source applet to simulate Gaussian beam propagation

Excellence in Inclusion and Equity

AAPT Diversity, Equity, and Inclusion Task Force (2022-2023)
Developed DEI vision statement with targeted goals and objectives to diversify AAPT membership

Beauty in Decoherence (2020-)
Founder and primary contributor, blog and community resource list on physics culture and equity

Representation, Recruitment, and Retention Committee (2020-)
Department of Physics, University of Colorado Boulder

Equity and Inclusion Innovation Intern (2019)
Department of Physics, Stanford University
Developed portfolio of best practices in equity and inclusion drawing from peer institutions
Authored midterm report on progress toward 5-year Equity and Inclusion Plan
Implemented workshop series on fundamentals of racial and gender justice for researchers
Created LGBTQ+ equality working group, launching first-ever departmental Pride Month celebration

Student-Initiated Course Instructor, Climate and Equity (2019)
Department of Physics, Stanford University
Co-developed and co-taught two undergraduate courses focused on equity and inclusion:

Physics 93SI: Beyond the Laboratory: Physics, Identity, and Society (first offered winter 2019)
Deconstructed the social positioning of the discipline and researcher of physics
Analyzed texts from education studies, history, anthropology, feminist theory, and beyond
Sought to illuminate the historical trends that underlie physics' diversity issues today

Physics 94SI: Diverse Perspectives in Physics (first offered spring 2019)
Showcased Stanford physics faculty of diverse backgrounds and career paths
Faculty invited to discuss the interplay between their background and research interests

Physics Outreach through Inclusive Science Education (POISE) (2019)
Co-founder and student leader. Department of Physics, Stanford University.
Organized weeklong spring break experience for physics undergrads centered on 3 themes:
Service learning: Participants developed and taught workshops for San Lorenzo HS students
Leadership empowerment: Met with Bay Area innovators in science education, policy, E&I
Social responsibility: Reflected on social construction and ethics of researcher in society
Funded by $7250 grant from the Heising-Simons foundation

Physics Undergraduate Women and Gender Minorities at Stanford (PUWMAS) (2017-19)
Founding member; Inaugural Director of Diversity and Education, 2017-18

Honors and Awards

For Excellence in Academics and Research
NSF Graduate Research Fellowship Program (GRFP), 2021-26
Katharine Blodgett Fellowship, University of Colorado Boulder, 2019-24
National Defense Science and Engineering Graduate Fellowship (NDSEG), 2019-20

Participant in 69th Annual Lindau Nobel Laureate Meeting, 2019
Nominated by Dr. Carl Wieman, Nobel Prize in Physics 2001
Jeff Willick Memorial Award, Stanford University Department of Physics, 2019
Society of Exploration Geophysicists Foundation Scholarship, 2015-19
David S. Levine Award, Stanford University Department of Physics, 2018
Shell Technical Scholarship, 2015-17
President's Award for Academic Excellence in the Freshman Year, Stanford University, 2016

For Excellence in Equity and Inclusion
NOGLSTP Out to Innovate Career Development Fellowship, 2023
Figueroa Family Fellowship, University of Colorado Boulder, 2023
Deborah Jin Fellowship, University of Colorado Boulder, 2019-20
Woman of Impact Award, Stanford Women in Business, 2019

Invited Talks

The question of equity: For whom are US quantum education programs being developed?
J. Meyer, G. Passante, and B. Wilcox, "Building a National Ecosystem for Quantum Technologies." *Universität Jena,* 2023.

Effective and socially-responsible pedagogy for the 2nd quantum revolution
J. Meyer, G. Passante, S. Pollock, and B. Wilcox, Quantum Economic Development Consortium, 2022

Contributed Talks

Quantum ethics in action
J. Meyer, J. Arrow, S. Marsh, and R. Araiza Bravo. IEEE Quantum Week, Seattle, WA, US (2023)

Teaching quantum ethics
J. Meyer, J. Arrow, and S. Marsh. QSEEC23, Seattle, WA, US (2023)

The Quantum Computing Conceptual Survey: Preliminary work and next steps
J. Meyer, G. Passante, S. Pollock, B. Wilcox. QSEEC23, Seattle, WA, US (2023)

A crash course on quantum computing: cutting through the hype from a PER perspective
J. Meyer, University of Colorado Boulder, CU Prime, 2021

Preliminary findings from a survey of quantum information science instructors
J. Meyer, G. Passante, S. Pollock, B. Cervantes, and B. Wilcox, AAPT Summer Meeting, 2021

Let's talk about physics culture!
J. Meyer, University of Colorado Boulder, CU Prime, 2020

FPGA-enabled real-time error correction on superconducting qubits
J. Meyer, Y. Lu, and D. Schuster, University of Chicago, 2018

A setup for optical transport of ultracold atoms using focus-tunable lenses
J. Meyer, V. Borish, J. Hines, O. Markovic, M. Schleier-Smith, Stanford University, 2017

Contributed Posters

Quantum Computing Conceptual Survey: Identifying assessable content to inform learning goals
J. Meyer, G. Passante, S. Pollock, B. Wilcox. AAPT Summer Meeting, 2023

Educational initiatives at the Quantum Ethics Project
J. Arrow *et al*. (equal contributors) QSEEC, 2023; AAPT Summer Meeting, 2023

Investigating student interpretations of the differences between classical and quantum computers: Are quantum computers just analog classical computers?
J. Meyer, G. Passante, S. Pollock, B. Wilcox. QSEEC, 2023; AAPT Summer Meeting, 2022

Ethics education in the quantum information science classroom: Exploring attitudes, barriers, and opportunities
J. Meyer, N. Finkelstein, B. Wilcox. ASEE Annual Conference and Exposition, 2022

Investigating students' strategies for interpreting quantum states in an upper-division quantum computing course
J. Meyer, G. Passante, S. Pollock, M. Vignal, B. Wilcox. AAPT Summer Meeting, 2021

A setup for optical transport of ultracold atoms using focus-tunable lenses
J. Meyer, V. Borish, J. Hines, O. Markovic, M. Schleier-Smith
Stanford University, 2017; oSTEM National Conference, 2018

Additional Teaching and Academic Service

Quantum Ethics Project (2022-)
Education and Curriculum Development Team

Partnerships for Informal Science Education in the Community (PISEC) (2023)
University Educator, Lafayette Public Library

Referee for peer-reviewed publications and conference proceedings:
Quantum Science and Technology, IOP, 2022-present
Physics Education Research Conference (PERC), 2021-present

Graduate Teaching Assistant (2021)
Department of Physics, University of Colorado Boulder
Facilitated remote introductory undergraduate lab sections focused on analysis of solar flares
Grader for quantum information elective and upper-division quantum mechanics

Math and Physics Subject Tutor (2017-18)
Vice Provost for Teaching and Learning, Stanford University

Professional Affiliations

American Physical Society (APS)

Division of quantum information, physics education research topic group, forum on diversity and inclusion, forum on physics in society

American Association of Physics Teachers (AAPT)

American Society for Engineering Education (ASEE)

Engineering physics and physics division, engineering ethics division, liberal education division

Institute of Electrical and Electronics Engineers (IEEE)