

William Kirby

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Education

- 2017 Williams College, Williamstown, MA, U.S.A.
B.A. in Physics, *magna cum laude*
Thesis Title: “A Practical Quantum Schur Transform;” Highest Honors
Advised by Frederick Strauch

Research interests

Quantum information and quantum computation. I am interested in designing efficient quantum algorithms for tasks that lack efficient classical implementations. I also work on techniques for improving quantum computer performance, and on continuing the development of the foundations of quantum information theory.

Awards & fellowships

- 2018-2023 NSF Graduate Research Fellow
2018-2020 Tufts University Provost Fellow
2018 NDSEG Fellowship Alternate (top 200)
2017 Williams College Senior Research: Highest Honors
2017 Williams College’s Nominee for the LeRoy Apker Award
2016 Barry M. Goldwater Scholarship
2013-2017 Williams College Dean’s List

Affiliations

- since 2017 Phi Beta Kappa
since 2016 Sigma Xi, the Scientific Research Society
since 2016 American Physical Society (APS)

Research experience

- 2017-
present INDEPENDENT RESEARCHER (ACADEMIC YEAR)
Advisor: Shelby Kimmel (Middlebury College)
Currently developing methods for calibration of quantum computers. We are seeking to improve a protocol for estimating unitary errors in universal quantum gate sets.
- 2016-2017 SENIOR RESEARCH THESIS, WILLIAMS COLLEGE (SUMMER AND ACADEMIC YEAR)
Advisor: Frederick Strauch
Created a simple and efficient quantum algorithm for the Schur transform, a subroutine in numerous proposed tasks for quantum computers.
- 2015-2016 RESEARCH FELLOW, WILLIAMS COLLEGE (SUMMERS AND JANUARY TERMS)
Advisor: William Wootters
Developed approximation methods and bounds for the measure of entanglement known as *tangle*. Also studied Relational Quantum Mechanics, an information-based restructuring of the foundations of quantum mechanics.
- 2014 RESEARCH FELLOW, WILLIAMS COLLEGE (SUMMER)
Advisor: S. Charles Doret
Constructed apparatus for an experiment centered around trapping and interrogating Ca^+ ions in order to study quantum heat transfer.

Teaching experience

- 2016-2018 PHYSICS TUTOR, MOUNT GREYLOCK HIGH SCHOOL
Taught both individual and group tutoring sessions for standard and AP-level high-school physics students.
- 2014-2017 PHYSICS TEACHING ASSISTANT, WILLIAMS COLLEGE
TA for seven semesters: courses included mathematical methods, quantum mechanics, and philosophy of physics. Taught review sessions and graded.
- 2014 QUANTITATIVE SKILLS TUTOR, MOUNT GREYLOCK HIGH SCHOOL
Worked with middle-school students on developing basic quantitative intuitions and skills.

Publications and Manuscripts

ARTICLES

- 2017 William M. Kirby and Frederick W. Strauch, "A Practical Quantum Algorithm for the Schur Transform," [arXiv:1709.07119](https://arxiv.org/abs/1709.07119) (submitted for publication).
- 2016 William M. Kirby, "A Tight Bound on Tangle for Two and Three Qubits," manuscript.

TALKS

- 2017 William M. Kirby, "The Quantum Schur Transform," Williams College Physics Spring Thesis Talks, 5/15/17.
- 2016 William M. Kirby, "Building Quantum Algorithms," Williams College Physics Fall Thesis Talks, 12/12/16.
- 2015 William M. Kirby and William K. Wootters, "Quantum Entanglement: Enigma and Resource," Weekend for Williams Lecture, 10/3/15.

POSTERS

- 2016 William M. Kirby and Frederick W. Strauch, "Efficient Quantum Compiling," APS New England Fall Meeting.
- 2016 William M. Kirby and Frederick W. Strauch, "Efficient Quantum Compiling," Williams College Summer Science Poster Session.
- 2015 William M. Kirby and William K. Wootters, "A Tight Bound on Entanglement for Two Qubits," Williams College Summer Science Poster Session.
- 2014 Cole Meisenhelder and William M. Kirby, "Starting from Scratch, or: How I Learned to Stop Worrying and Lock the Laser," Williams College Summer Science Poster Session.