

William F. Braasch Jr.

National Institute of Standards and Technology
Quantum Measurement Division
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Current Positions

- 2022— **Physicist and National Research Council Postdoctoral Fellow**
Laser-Cooling and -Trapping Group, Quantum Measurement Division,
Physical Measurement Laboratory,
National Institute of Standards and Technology (NIST).
Advisor: Dr. Nicole Yunger Halpern.
- 2022— **Visiting Scholar**
Physics and Astronomy Department, Dartmouth College, Hanover, NH.

Education

- 2013—2020 **PhD** in Physics, Dartmouth College, Hanover, NH.
Advisor: Prof. Alexander Rimberg.
Collaborators: Prof. Miles Blencowe and Prof. William Wootters.
Dissertation: “Quantum dynamics in continuous and discrete phase space.”
- 2019 **Complex Systems Summer School**, Santa Fe Institute, Santa Fe, NM.
- 2007—2011 **BA** in Physics, St. Olaf College, Northfield, MN.

Awards & Grants

- 2021 **National Research Council Postdoctoral Fellowship**
NIST, Gaithersburg, MD (start date: June 21, 2022).

- 2019 **The Neukom Prize for Outstanding Graduate Research in Computational Science**
Dartmouth College.
- 2019 **Arthur L. Irving Institute for Energy and Society Student Mini-Grant**
Dartmouth College.
- 2019 **Guarini School of Graduate and Advanced Studies Travel Award**
Dartmouth College.
- 2018-2019 **Gordon Hull Fellowship**
Year-long stipend.
Dartmouth College.
- 2018 **Dartmouth Graduate Student Council Conference Travel Grant**
Dartmouth College.
- 2013–2014 **Graduate Assistance in Areas of National Need Fellowship**
Year-long stipend.
US Dept. of Education via Dartmouth College.
- 2007–2011 **Presidential Scholarship**
St. Olaf College.

Refereed Journal Publications

- [1] S. Majidy, W. F. Braasch Jr., A. Lasek, T. Upadhyaya, A. Kalev, and N. Yunger Halpern, “Noncommuting conserved charges in quantum thermodynamics and beyond,” *Nat. Rev. Phys.* (2023).
- [2] W. F. Braasch Jr. and W. K. Wootters, “A Classical Formulation of Quantum Theory?,” *Entropy* **24**, 137 (2022).
- [3] W. F. Braasch Jr. and W. K. Wootters, “A quantum prediction as a collection of epistemically restricted classical predictions,” *Quantum* **6**, 659 (2022).
- [4] B. L. Brock, J. Li, S. Kanhirathingal, B. Thyagarajan, W. F. Braasch Jr., M. P. Blencowe, and A. J. Rimberg, “Nonlinear charge- and flux-tunable cavity derived from an embedded Cooper-pair transistor,” *Physical Review Applied* **15**, 044009 (2021).
- [5] W. F. Braasch Jr. and W. K. Wootters, “Transition probabilities and transition rates in discrete phase space,” *Physical Review A* **102**, 052204 (2020).
- [6] W. F. Braasch Jr., O. D. Friedman, A. J. Rimberg, and M. P. Blencowe. “Wigner current for open quantum systems,” *Physical Review A* **100**, 012124 (2019).

Preprints

- [1] T. Upadhyaya, W. F. Braasch, Jr., G. T. Landi, and N. Yunger Halpern, “What happens to entropy production when conserved quantities fail to commute with each other” (2023) arXiv:2305.15480.

Invited Conference and Workshop Presentations

- [1] “The Kirkwood-Dirac Distribution: Quantum Thermodynamics and Non-classicality,” Workshop: Quasiprobability Distributions in Quantum Mechanics and Quantum Information, Université de Lille, Lille, France (November 8–10, 2023).
- [2] “What happens to entropy production when conserved quantities fail to commute with each other,” Conference: New Directions in the Foundations of Physics, Camera di Commercio, Viterbo, Italy (May 26–28, 2023).
- [3] “A quantum prediction as a collection of epistemically restricted classical predictions,” Quantum Intelligence Workshop, LOFAR, Birr, Ireland (September 5–8, 2022).
- [4] “A Geometric Approach To Engineering Quantum Dynamics via the Wigner Current”; International Conference on Micromechanics; Obergurgl Conference Center, Ötztal, Tyrol, Austria (February 10–14, 2020).

Colloquium

- [1] “What happens to entropy production when conserved quantities fail to commute with each other,” UMass Boston Physics Colloquium (October 4, 2023).

Seminars

- [1] “What happens to entropy production when conserved quantities fail to commute with each other,” Institute for Quantum Studies, Chapman University, Orange, California, USA (Nov. 1, 2023).
- [2] “What happens to entropy production when conserved quantities fail to commute with each other,” Institute for Quantum Science and Technology, University of Calgary, Calgary, Alberta, Canada (Oct. 25, 2023).

- [3] “A quantum prediction as a collection of knowledge-restricted classical predictions,” JQI Quantum Seminar, University of Maryland, College Park, Maryland, USA (Nov. 11, 2022).
- [4] “A quantum prediction as a collection of epistemically restricted classical predictions;” Quantum Physics Reading Group, MILA, Montreal, Quebec, Canada (Mar. 16, 2022).
- [5] “A quantum prediction as a collection of epistemically restricted classical predictions;” Quantum Foundations Seminar, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, Canada (Sept. 24, 2021).
- [6] “A Geometric Approach To Engineering Quantum Dynamics via the Wigner Current;” Department of Physics, University of Nottingham, Nottingham, England (Feb. 19, 2020).

Teaching & Mentoring Experience

Department of Physics and Astronomy, Dartmouth College:

- 2020—2021 **Lecturer.** I was the sole instructor for the undergraduate course titled Introductory Mathematical Methods for Physicists.
- 2018—2020 **Graduate mentor.** I mentored incoming graduate students as they explore research interests in quantum information and condensed matter physics.
- 2014—2019 **Teaching assistant.** I managed coursework and held help sessions for upper level undergraduate classes including Classical Mechanics, Electromagnetism, Quantum Mechanics, and Statistical Physics.
- 2017 **Guest lecturer.** I taught lectures and designed learning activities in Introductory Quantum Mechanics for the Stern-Gerlach experiment, Schrödinger time evolution, and the quantum harmonic oscillator.
- 2015 **Graduate mentor.** I mentored an undergrad research intern as the student learned nanofabrication techniques and calibrated a new piece of lab equipment. The student was a participant in the Women in Science Program at Dartmouth College.
- 2014 **Recitation instructor.** I prepared lectures to support course material and demonstrated problem solving techniques for general introductory physics course.

Professional Membership

Member: American Physical Society.

Computational fluency

Experienced: Python, QuTiP, Mathematica, LaTeX.

Ad Hoc Referee

2023— Physical Review X Quantum.

Public Engagement

2021—2022 I served as a physics consultant to the author and illustrator Jason Chin as he created the book *The Universe in You: A Microscopic Journey*.

References

Available upon request.