

# Jacob Bringewatt

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**SUMMARY STATEMENT** I'm a PhD candidate in theoretical physics and a Department of Energy Computational Science Graduate fellow. My research interests span many aspects of quantum information and quantum computing. Current areas of focus include adiabatic quantum computation and quantum annealing, quantum metrology, and quantum algorithms for nuclear theory.

**EDUCATION**

**Doctoral Candidate** in Physics 2018–  
University of Maryland, College Park  
*Advisor: Alexey Gorshkov*

**Bachelor of Science** in Physics 2014–2018  
University of Maryland, College Park  
*Cum laude with high honors in physics.*

**FELLOWSHIPS**

**Computational Science Graduate Fellow** 2018-2022  
US Department of Energy

**Lanczos Graduate Fellow** 2018-2020  
Joint Center for Quantum Information and Computer Science

**Banneker/Key Scholar** 2014-2018  
University of Maryland, College Park

- PUBLICATIONS**  
\* EQUAL CONTRIBUTION  
† ALPHABETICAL ORDER
9. T C Mooney, *J Bringewatt*, L T Brady. “Lefschetz thimble quantum Monte Carlo for spin systems.” Preprint. (2021) [arXiv:2110.10699]
  8. A Ehrenberg\*, *J Bringewatt*\*, A V Gorshkov. “Minimum entanglement protocols for function estimation.” Preprint. (2021) [arXiv:2110.07613]
  7. *J Bringewatt*, I Boettcher, P Niroula, P Bienias, A V Gorshkov. “Protocols for estimating multiple functions with quantum sensor networks: geometry and performance.” Phys. Rev. Research 3, 033011. (2021), [arXiv:2104.09540]
  6. T Qian, *J Bringewatt*, I Boettcher, P Bienias, A V Gorshkov. “Optimal measurement of field properties with quantum sensor networks.” Phys. Rev. A (Letter) 103, L030601. (2021), [arXiv:2011.01259]
  5. *J Bringewatt*, N Sato, W Melnitchouk, J Qiu, F Steffens, M Constantinou. “Confronting lattice parton distributions with global QCD analysis.” Phys. Rev. D. 103, 016003 (2021) [arXiv:2010.00548]
  4. *J Bringewatt*\*, M Jarret\*,† “Effective gaps are not effective: quasipolynomial classical simulation of obstructed stoquastic Hamiltonians.” Phys. Rev. Lett. 125, 170504 (2020), [arXiv:2004.08681]
  3. *J Bringewatt*, W Dorland, SP Jordan. “Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians.” Phys. Rev. A 100 (3), 032336 (2019), [arXiv:1905.07461]. Editors’ Suggestion.
  2. *J Bringewatt*, W Dorland, SP Jordan, A Mink. “Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians.” Phys. Rev. A 97 (2), 022323 (2018), [arXiv:1709.03971]
  1. K Pushkin, C Akerlof, D Anbajagane, J Armstrong, M Arthurs, *J Bringewatt*, T Edberg, C Hall, M Lei, R Raymond, M Reh, D Saini, A Sander, J Schaefer, D Seymour, N Swanson, Y Wang, W

Lorenzon. "Study of radon reduction in gases for rare event search experiments." Nucl. Instrum. Methods Phys. Res., Sect. A 903, 267-276 (2018), [arXiv:1805.11306]

AWARDS	<b>Communicate Your Science Essay Contest Winner</b> Krell Institute (Department of Energy Computational Science Graduate Fellowship)	2019
TEACHING EXPERIENCE	<b>Designed and wrote a self-study packet on quantum computing for high schoolers</b> Girls Talk Math Program, University of Maryland, College Park	2021
	<b>Math Tutor</b> University of Maryland, College Park	2016-2018
	<b>Teaching Assistant for Philosophy of Quantum Mechanics</b> University of Maryland, College Park	Fall 2016
MENTORSHIP	<b>Othello D. Gomes</b> (Montgomery College) For GRAD-MAP Winter Workshop project on geometry of quantum states.	2022
	<b>Connor Mooney</b> (George Mason University) For research project on Lefschetz thimble methods for sign problems.	2021
	<b>Akshita Gorti</b> (Cornell University) For a research project on quantum sensor networks.	2021
	<b>Victoria Adebayo</b> (Howard University) For GRAD-MAP Winter Workshop on adiabatic quantum computation.	2021
	<b>Timothy Qian</b> (Montgomery Blair High School) For a research project on quantum sensor networks. Outcome: Letter in Physical Review A and 5 <sup>th</sup> place Regeneron Science Talent Search.	2020
EDUCATION- RELATED TRAINING AND WORKSHOPS	<b>Seminar Course on Physics Education Research on Teaching Quantum Mechanics</b> University of Maryland, College Park	Fall 2021
	<b>Workshop on Relationships Among Intuition, Reasoning, and Conceptual Understanding in Physics</b> American Association of Physics Teachers	2021
	<b>Seminar Course on Introduction to Physics Education Research</b> University of Maryland, College Park	Fall 2020
	<b>Workshop on Science Communication</b> Skype a Scientist organization	2020
SERVICE TO SCIENTIFIC COMMUNITY	<b>Referee</b> for Quantum <b>Member</b> of UMD Physics Department Graduate Student Colloquium Committee <b>Panelist</b> at GRAD-MAP Winter Workshop <b>Organizer</b> of QuICS-JQI-CMTC Friday Seminar <b>Panelist</b> at Conference for Undergraduate Underrepresented Minorities in Physics (cu2mip) <b>Volunteer</b> at University of Maryland Prospective Graduate Student Open Houses	2021– 2022 2020–2021 2021 2019–2021
OUTREACH	<b>Skype a Scientist</b> Conversations with elementary and middle schoolers on physics. <b>Proctor</b> for U.S. Physics Olympiad F=ma Exam <b>Writing for Non-scientific Audience</b>	2020– 2022

“Spherical cows: Using barnyard animals to understand quantum computing.” (2019) – won Communicate Your Science Essay Contest, published in Deixis Magazine (magazine on computational science at DoE national labs)

PROFESSIONAL MEMBERSHIPS **American Physical Society (APS)**

**American Association of Physics Teachers (AAPT)**

- INVITED TALKS
3. “Lefschetz thimble quantum Monte Carlo for spin systems.” MIT Computational Research in Boston and Beyond (CRIBB) seminar. (Nov. 2021) Invited Talk.
  2. “Lattice data in the JAM framework.” Amherst Center for Fundamental Interactions (ACFI) Workshop on QCD Real-Time Dynamics and Inverse Problems. (Oct. 2020) Invited Talk.
  1. “Confronting lattice parton densities with global QCD analysis.” AI for Nuclear Physics Workshop. (Mar. 2020) Invited Talk.

- CONTRIBUTED TALKS
4. “Measuring functions with quantum sensor networks.” 23rd Annual SQuInT Workshop. (Oct. 2021) Talk.
  3. “Effective gaps are not effective: quasipolynomial simulation of obstructed stoquastic Hamiltonians.” DOE Computational Science Graduate Fellowship Annual Program Review. (July 2021) Talk.
  2. “Optimal measurement of field properties with quantum sensor networks.” March Meeting 2021. (Mar. 2021) Talk.
  1. “Confronting lattice parton densities with global QCD analysis.” DNP2019. (Oct. 2019) Talk.

- SEMINAR TALKS
11. “Ultimate limits for function estimation in quantum metrology.” Gorshkov Group Meeting. (Jan. 2022) Talk.
  10. “Lefschetz thimble quantum Monte Carlo for spin systems.” USC Condensed Matter Seminar. (Nov. 2021) Talk.
  9. “Minimum entanglement protocols for function estimation.” QuICS/JQI Friday Quantum Seminar. (Oct. 2021) Talk.
  8. “Fermionic mappings, qubit architectures, and graph coloring.” Davoudi Group Meeting. (Aug. 2021) Talk.
  7. “Estimating multiple functions with quantum sensor networks.” Gorshkov Group Meeting. (Jan. 2021) Talk.
  6. “Effective gaps are not effective.” Gorshkov Group Meeting. (April 2020) Talk.
  5. “Quantum sensor networks and Fisher information.” Gorshkov Group Meeting. (Aug. 2019) Talk.
  4. “Confronting lattice parton densities with global QCD analysis.” Jefferson Lab Theory Seminar. (July 2019) Talk.
  3. “Diffusion monte carlo approach versus adiabatic computation for local Hamiltonians.” Gorshkov Group Meeting. (Aug. 2018) Talk.
  2. “Diffusion monte carlo approach versus adiabatic computation for local Hamiltonians.” University of Maryland Undergraduate Research Showcase. (May 2018) Talk.

1. "Diffusion monte carlo approach versus adiabatic computation for local Hamiltonians." Undergraduate Thesis Defense. (May 2018) Talk.

## POSTERS

9. "Lefschetz thimble quantum Monte Carlo for spin systems." QIP2022. (Mar. 2022) Poster.
8. "Optimal measurement of field properties with quantum sensor networks." QuICS Admitted Students Days. (Apr. and May 2021) Poster.
7. "Optimal measurement of field properties with quantum sensor networks." QuICS Stakeholder Day. (Mar. 2021) Poster.
6. "Estimating multiple functions with quantum sensor networks." QuICS 5 Year Anniversary Symposium. (Jan. 2020) Poster.
5. "Effective gaps are not effective." FARQC Kickoff Meeting. (Nov. 2019) Poster.
4. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." DOE Computational Science Graduate Fellowship Annual Program Review. (July 2019) Poster.
3. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." QIP2019. (Jan. 2019) Poster.
2. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." STAQ Kickoff Meeting. (Nov. 2018) Poster.
1. "Diffusion monte carlo approach versus adiabatic computation for local Hamiltonians." QIP2018. (Jan. 2018) Poster.