

CONTACT INFORMATION	The College of William & Mary Department of Physics, Small Hall 153 300 Ukrop Way, Williamsburg, VA 23185 USA	Tel: +1 (651)-270-7195 E-mail: gbentsen@wm.edu, gregory.bentsen@gmail.com ORCID: 0000-0001-8576-2298
RESEARCH INTERESTS	Many-body quantum dynamics and quantum information scrambling. I am interested in understanding and exploiting the physics of quantum many-body systems using tools from quantum information theory, condensed matter theory, the holographic principle, and cold-atom quantum simulators. I have two interrelated goals: to enhance our understanding of naturally-occurring phenomena in quantum many-body systems, and to engineer new technologies and techniques inspired by these phenomena by leveraging controlled experiments in near-term quantum simulators employing neutral cold atoms, trapped ions, superconducting qubits, and other emerging quantum technologies.	
ACADEMIC APPOINTMENTS	Assistant Professor of Physics , The College of William & Mary Department of Physics, The School of Computing, Data Sciences & Physics (CDSP)	2025 - <i>present</i>
	Visiting Assistant Professor , Minerva University College of Computational Sciences	2023 - 2025
	Postdoctoral Fellow , Brandeis University B. Swingle Quantum Information, Matter, and Gravity Group	2020 - 2024
	Postdoctoral Researcher , Princeton University S.S. Gubser (<i>dec'd</i>) High-Energy Theory Group	2019 - 2020
EDUCATION	Stanford University , Stanford, CA Ph.D., August 2019. Thesis: <i>Nonlocal light-mediated interactions for fast scrambling</i> M.H. Schleier-Smith Cavity QED Experiment Group NSF Graduate Research Fellow	2013 - 2019
	University of Cambridge, Churchill College , Cambridge, UK MASt in Mathematics, July 2012 (Part III of the Mathematical Tripos) Cambridge Overseas Trust Scholarship	2011 - 2012
	University of Rochester , Rochester, NY B.S. Physics, B.A. Mathematics, May 2011 Minor Electrical Engineering Renaissance Full-Tuition Scholarship	2007 - 2011
HONORS AND AWARDS	Invited panelist, DAMOP Physical Review A: <i>Behind the Research</i> (PRA 94 , 040302)	2025
	Quanta Magazine feature, <i>One Lab's Quest to Build Space-Time Out of Quantum Particles</i>	2021
	Phys. Rev. A 50th Anniversary Milestone (PRA 94 , 040302)	2020
	NSF Graduate Research Fellowship	2014 - 2017
	Cambridge Overseas Trust Scholarship	2011 - 2012
	Nomination for Churchill Scholarship by University of Rochester	2010
	Goldwater Scholarship	2010
	Iota Chapter Book Award, Phi Beta Kappa	2008
	Renaissance full-tuition scholarship, University of Rochester	2007
GRANTS AND AWARDS	NSF 23-615 Quantum Information Science (pending)	Submitted Dec 2025
	<i>Developing Trainable Brownian Circuit Ensembles for Sample-Efficient Precision Randomized Benchmarking and Quantum Advantage in Near-Term NISQ Hardware</i>	
	Google PhD Fellowship (pending)	Submitted April 2026
	<i>Mining Hardware-Tailored Quantum Codes from Tunable Random Circuits (with Samuel Bevins)</i>	
	Virginia Space Grant Consortium Graduate STEM Research Fellowship (pending)	Submitted Feb 2026
	<i>Discovering Optimal Quantum Error-Correcting Codes via Measurement-Induced Phase Transitions in Small-World Quantum Circuits (with Samuel Bevins)</i>	

Virginia Space Grant Consortium Graduate STEM Research Fellowship (awarded)
Brownian Circuits for Quantum Information Science (with Michael Sizemore)

June 2025

PREPRINTS

- [1] **Bentsen, G.S.**, B. Fefferman, S. Ghosh, M.J. Gullans, Y. Liu (2026). Sample-efficient benchmarking of shallow all-to-all random quantum circuits. *arXiv:2605.22909*
- [2] J. Bringewatt, L. Zaporski, M. Radzihovsky, J. Albert, A.V. Gorshkov, V. Vuletic, **Bentsen, G.S.** (2026). Butterfly echo protocol for axis-agnostic Heisenberg-limited metrology. *arXiv:2602.23332*
- [3] **Bentsen, G.S.**, B. Fefferman, S. Ghosh, M.J. Gullans, Y. Liu (2024). On the complexity of sampling from shallow Brownian circuits. *arXiv:2411.04169*

REFEREED
JOURNAL
PUBLICATIONS

- [4] Nelson, J., **G.S. Bentsen**, S.T. Flammia, and M.J. Gullans (2025). Fault-tolerant quantum memory using low-depth random circuit codes. *Phys. Rev. Research* **7**, 013040
- [5] **Bentsen, G.S.**, P. Nguyen and B. Swingle (2024). Approximate Quantum Codes From Long Wormholes. *Quantum* **8**, 1439
- [6] Kuriyattil, S., T. Hashizume, **G.S. Bentsen**, and A.J. Daley (2023). Onset of Scrambling as a Dynamical Transition in Tunable-Range Quantum Circuits. *PRX Quantum* **4**, 030325.
- [7] Jian, S.K., **G.S. Bentsen**, and B. Swingle (2023). Linear Growth of Circuit Complexity from Brownian Dynamics. *J. High Energ. Phys.* **2023**, 190.
- [8] Antonini, S., **G.S. Bentsen**, C. Cao, J. Harper, S.K. Jian, and B. Swingle (2022). Holographic measurement and bulk teleportation. *J. High Energ. Phys.* **2022**, 124.
- [9] Sahu, S., S.K. Jian, **G.S. Bentsen**, and B. Swingle (2022). Entanglement phases in large-N hybrid Brownian circuits with long-range couplings. *Phys. Rev. B* **106**, 224305. *Featured as Editors' Suggestion.*
- [10] Hashizume, T., S. Kuriyattil, A.J. Daley, and **G.S. Bentsen** (2022). Tunable Geometries in Sparse Clifford Circuits. *Symmetry* **2022**, 14(4), 666.
- [11] Hashizume, T., **G.S. Bentsen**, and A.J. Daley (2022). Measurement-induced phase transitions in sparse nonlocal scramblers. *Phys. Rev. Research* **4**, 013174.
- [12] **Bentsen, G.S.**, S. Sahu, and B. Swingle (2021). Measurement-induced purification in large-N hybrid Brownian circuits. *Phys. Rev. B* **104**, 094304.
- [13] Hashizume, T., **G.S. Bentsen**, S. Weber, and A.J. Daley (2021). Deterministic Fast Scrambling with Neutral Atom Arrays. *Phys. Rev. Lett.* **126**, 200603.
- [14] Davis, E.J., A. Periwal, E.S. Cooper, **G.S. Bentsen**, S.J. Evered, K. Van Kirk, and M.H. Schleier-Smith (2020). Protecting Spin Coherence in a Tunable Heisenberg Model. *Phys. Rev. Lett.* **125**, 060402.
- [15] **Bentsen, G.S.**, I. Potirniche, V.B. Bulchandani, T. Scaffidi, X. Cao, X. Qi, M. Schleier-Smith, and E. Altman (2019). Integrable and chaotic dynamics of spins coupled to an optical cavity. *Phys. Rev. X* **9**, 041011.
- [16] **Bentsen, G.S.**, T. Hashizume, A.S. Buyskikh, E.J. Davis, A.J. Daley, S.S. Gubser, and M. Schleier-Smith (2019). Treelike interactions and fast scrambling with cold atoms. *Phys. Rev. Lett.* **123**, 130601. *Featured as Editors' Suggestion.*
- [17] Davis, E.J., **G.S. Bentsen**, L. Homeier, T. Li, and M.H. Schleier-Smith (2019). Photon-mediated spin-exchange dynamics of spin-1 atoms. *Phys. Rev. Lett.* **122**, 010405. *Featured as Editors' Suggestion.*
- [18] **Bentsen, G.S.**, Y. Gu, and A. Lucas (2019). Fast scrambling on sparse graphs. *PNAS Apr 2019*, **116** (14) 6689-6694.
- [19] Borregaard, J., E.J. Davis, **G.S. Bentsen**, M.H. Schleier-Smith, and A.S. Sørensen (2017). One- and two-axis squeezing of atomic ensembles in optical cavities. *New J. Phys.* **19**, 093021.
- [20] B. Swingle, **G.S. Bentsen**, M. Schleier-Smith, and P. Hayden (2016). Measuring the scrambling of quantum information. *Phys. Rev. A* **94**, 040302. *Selected as PRA 50th Anniversary Milestone.*
- [21] Davis, E.J., **G.S. Bentsen**, and M. Schleier-Smith (2016). Approaching the Heisenberg limit without single-particle detection. *Phys. Rev. Lett.* **116** 053601.

BOOK CHAPTER	[22] Bentsen, G.S. , A.J. Daley, and J. Schachenmayer (2022). Entanglement dynamics in spin chains with structured long-range interactions. <i>Entanglement in Spin Chains: From Theory to Quantum Technology Applications</i> , Springer.	
CONFERENCE PAPERS	[23] Bentsen, G.S. (2026). 3-body Interactions in Brownian Circuits for Randomized Benchmarking. <i>Proc. SPIE</i> 13914-35	
	[24] Albert, J., Bentsen, G.S. (2026). Brownian Spin Dynamics for Axis-Agnostic Precision Metrology. <i>Proc. SPIE</i> 13920-154	
	[25] Bentsen, G.S. , T. Hashizume, E.J. Davis, A.S. Buyskikh, M.H. Schleier-Smith, and A.J. Daley (2020). Tunable geometries from a sparse quantum spin network. <i>Proc. SPIE</i> 11296 , 112963W	
	[26] Bentsen, G.S. , E.J. Davis, L. Homeier, A. Periwal, E. Cooper, K. Van Kirk, and M.H. Schleier-Smith (2019). Photon-mediated spin mixing dynamics. <i>Proc. SPIE</i> 10934 , 109342P	
	[27] Davis, E.J., G.S. Bentsen , T. Li, and M. Schleier-Smith (2017). Advantages of interaction-based readout for quantum sensing. <i>Proc. SPIE</i> 10118 , 101180Z	
PROFESSIONAL SERVICE	Ph.D. Defense Committees, William & Mary Physics Department	
	<i>Dr. William Miyahira, Ph.D.</i>	Dec 2025
	<i>Dr. Jindi Wu, Ph.D.</i>	July 2025
	<i>Dr. Noah Donald, Ph.D.</i>	April 2025
	Honors Senior Thesis Defense Committees, William & Mary Physics Department	
	<i>Kalea Wen, B.S.</i>	May 2026
	Master's Defense Committees, Minerva University	
	<i>YunCheol Shin, MDA</i>	May 2025
	QISE Domain-Expert Consultant for Gartner, Inc. (www.gartner.com)	August 2025
	Physics Consultant for QuantWare (www.quantware.com)	March 2025
	Reviewer for Physical Review D	2025 - <i>present</i>
	Reviewer for Physical Review Applied	2025 - <i>present</i>
	Reviewer for Science Advances	2024 - <i>present</i>
	Reviewer for Science	2023 - <i>present</i>
	Reviewer for Physical Review X	2023 - <i>present</i>
	Reviewer for Physical Review B	2023 - <i>present</i>
	Reviewer for PRX Quantum	2023 - <i>present</i>
	Reviewer for Scientific Reports (Nature)	2023 - <i>present</i>
	Reviewer for Nature Communications	2022 - <i>present</i>
	Reviewer for Physical Review Research	2022 - <i>present</i>
	Reviewer for Physical Review A	2022 - <i>present</i>
	Reviewer for Physical Review Letters	2021 - <i>present</i>
	Organizer and Host: Quantum / Gravity Seminar Series, Brandeis University	2021 - 2022
ADVISING AND MENTORING	The College of William & Mary , Williamsburg, VA	
	Michael Sizemore, <i>Graduate Research Assistant</i>	anticipated graduation 2028
	Jasmine Albert, <i>Graduate Research Assistant</i>	anticipated graduation 2030
	Samuel Bevins, <i>Graduate Research Assistant</i>	anticipated graduation 2030
	Minerva University , San Francisco, CA	
	YunCheol Shin, <i>Master's Student</i>	MDA, May 2025
	Isabella Freitas, <i>Physics Undergraduate Student</i>	BS Physics, May 2025
	Brandeis University , Waltham, MA	
	Connor Wolfe, <i>Graduate Research Assistant</i>	anticipated graduation 2029
	Srishti Nautiyal, <i>Undergraduate Research Assistant</i>	BS Physics and Mathematics 2023

INVITED TALKS AND SEMINARS	Invited Seminar, NYU Center for Quantum Phenomena, New York City, NY <i>Quantum Information Scrambling For Precision Metrology and Tests of Quantum Advantage</i>	May 2026
	Invited Seminar, Bard College, Annandale-on-Hudson, New York <i>Quantum Information Scrambling For Precision Sensing and Tests of Quantum Advantage</i>	March 2026
	Invited Seminar, Virginia Commonwealth University, Richmond, Virginia <i>Quantum Information Scrambling For Precision Sensing and Tests of Quantum Advantage</i>	Feb 2026
	Invited Talk, Optical Sensing & Precision Metrology, SPIE Photonics West (OPTO) <i>How to efficiently sample from shallow Brownian circuits</i>	Jan 2026
	Invited Talk, Optical Sensing & Precision Metrology, SPIE Photonics West (OPTO) <i>Butterfly echo protocol for axis-agnostic Heisenberg-limited metrology</i>	Jan 2026
	Invited Panelist, DAMOP Phys. Rev. A: <i>Behind the Research</i> (PRA 94 , 040302)	June 2025
	Invited Talks, Optical Sensing & Precision Metrology, SPIE Photonics West (OPTO) <i>Simulating matrix quantum mechanics using crossed cavity arrays</i> (cancelled due to illness) <i>Scrambling, eigenstate thermalization, and precision metrology</i> (cancelled due to illness)	Jan 2025
	Invited Talk, A.J. Daley Group Meeting, University of Oxford, UK <i>Brownian Circuits & Quantum Randomness</i>	Nov 2024
	Invited Seminar, Perimeter Institute, Waterloo, Ontario, CA <i>Brownian Circuits & Quantum Randomness</i>	Nov 2024
	Colloquium, William & Mary <i>Harnessing Entanglement with Cold Atoms</i>	Feb 2024
	Invited Talk, ‘Pizza Talk’ Series, Brandeis University <i>Chaos, Scrambling, and Entanglement - Expanding the Frontiers of Many-Body Hilbert Space on Near-Term Quantum Devices</i>	Oct 2023
	Invited Seminar, Quantum / Gravity Seminar Series, Brandeis University <i>(Almost) Good Codes from Long Wormholes</i>	Sept 2023
	Invited Seminar, Quantum Matter Seminar Series, Northeastern University <i>Linear Growth of Complexity in Brownian Circuits</i>	March 2023
	Tutorial, APS March Meeting, Las Vegas NV <i>Quantum Information and Spacetime</i>	March 2023
	Colloquium, Virginia Tech <i>Chaos, Scrambling, and Entanglement - Expanding the Frontiers of Many-Body Hilbert Space on Near-Term Quantum Devices</i>	Feb 2023
	Colloquium, Rice University <i>Chaos, Scrambling, and Randomness - Expanding the Frontiers of Many-Body Hilbert Space on Near-Term Quantum Devices</i>	Jan 2023
	Invited Seminar, Institute for Robust Quantum Simulation, Univ. of MD <i>Linear Growth of Complexity in Brownian Circuits</i>	Dec 2022
	Invited Talk, Experimental QG and QI Workshop, Univ. of NH <i>Tunable Geometries in Nonlocally Interacting Cold Atom Systems</i>	Oct 2022
	Panelist, INFOVERSALITY21 Workshop at KITP <i>Universality in transport and scrambling: from condensed matter to high energy physics</i>	Oct 2021
	Invited Talk, GeoFlow Collaboration Meeting, UC Berkeley <i>Protecting Quantum Information using Long-Range Interactions</i>	Sept 2021
	Invited Talk, GeoFlow Collaboration Meeting, UC Berkeley <i>Measurement-Induced Purification at Large N</i>	April 2021
	Invited Talk, Workshop on Qubits and Spacetime, Institute for Advanced Study <i>Treelike Geometries and Fast Scrambling from Nonlocal Spin Models</i>	Dec 2019

Invited Talk, GeoFlow Collaboration Meeting, UC Berkeley
Integrability, chaos, and emergent geometry in non-local spin models Apr 2019

TEACHING

The College of William & Mary, Williamsburg, VA
 Instructor, PHYS 256: *Practical Computing for Scientists* Fall 2025
 Instructor, PHYS 622: *Graduate Quantum Mechanics II* Spring 2025 & 2026

Minerva University, San Francisco, CA
 Instructor, IL181.010 *Quantum Information Tutorial* Fall 2024
 Instructor, NS372: *Research Methods Across Contexts* Fall 2024
 Instructor, FA51: *Formal Analyses* Spring 2024
 Instructor, FA50: *Formal Analyses* Fall 2023 & 2024

Stanford University, Stanford, CA
 Teaching Assistant, PHY113: *Computational Physics* Spring 2019
 Teaching Assistant, PHY107: *Intermediate Physics Lab II* Winter 2017, Winter 2019
 Instructor, *How To Make a Video Game*, Stanford Splash Spring 2014, Spring 2015

Kaplan Test Prep, Boston, MA
 SAT Pre-College Instructor 2011, 2013

Personal Tutor - Wyzant, Boston, MA
 One-on-one algebra, calculus, and physics tutoring for local high-school students 2011, 2013

University of Rochester, Rochester, NY
 Personal Tutor, Office of Minority Affairs Fall 2009
 TA and Technical Instructor, ECE112: *Digital Logic Laboratory* Fall 2008, Fall 2009
 TA and Workshop Leader, MTH165: *Linear Algebra with Differential Equations* Spring 2009
 Weekly Physics Tutor, Society of Physics Students Fall 2008 - Spring 2009

OUTREACH

Nerd Nite SF - *The End of The World As We Know It*, music-driven science outreach Feb 21 2018
 Nerd Nite Silicon Valley - *The End of The World . . .*, music-driven science outreach Dec 6 2016
 Live Band for *Tested the Show: Journeys* with Adam Savage at the Castro Theater, SF Oct 29 2016
 Nerd Nite East Bay - *Songs About Science*, music-driven science outreach July 25 2016
 Host, Writer - *Goggles Optional*, science outreach podcast, Stanford University 2014 - 2016

ADDITIONAL
LEADERSHIP
EXPERIENCE

Graduate Board, Iota Chapter of St. Anthony Hall, Univ. of Rochester 2022 - *present*
 Senior Software Engineer, Brooktrail Technologies March - August 2013
 President, Community Learning Center, Univ. of Rochester Spring 2010 - Spring 2011
 Co-Founder, Iota Chapter of St. Anthony Hall, Univ. of Rochester 2009 - 2011
 President, National Honor Society, North St. Paul High School 2006 - 2007

PROGRAMMING
LANGUAGES

C++, C#, Python, Matlab, Mathematica, Java, Web Development (HTML, CSS, JavaScript)

HOBBIES &
ACTIVITIES

Songwriter, Guitar, Lead Vocals - *The Ten Thousand Ways*, Folk-Americana ([Spotify](#)) 2015 - 2025
 Downhill Skiing 1998 - *present*

REFERENCES

Monika H. Schleier-Smith (e-mail: schleier@stanford.edu; phone: +1 (650) 497-3069)

Associate Professor of Physics, Stanford University

★ *Prof. Schleier-Smith was my doctoral advisor.*

Brian Swingle (e-mail: bswingle@brandeis.edu; phone: +1 (617) 768-7018)

Associate Professor of Physics, Brandeis University

★ *Prof. Swingle was my postdoctoral advisor.*

Andrew J. Daley (e-mail: andrew.daley@physics.ox.ac.uk)

Professor of Physics, University of Oxford

★ *Prof. Daley is one of my mentors and research collaborators.*

Michael Gullans (e-mail: mgullans@umd.edu; phone: (301) 405-0125)

Adjunct Assistant Professor in the Department of Physics and the Institute for Advanced Computer Studies,
University of Maryland

★ *Prof. Gullans is one of my research collaborators.*

Ehud Altman (e-mail: ehud.altman@berkeley.edu)

Professor of Physics, University of California, Berkeley

★ *Prof. Altman is one of my research collaborators.*

Leo Hollberg (e-mail: leoh@stanford.edu; phone: +1 (650) 723-4227)

Professor of Physics, Stanford University

★ *Prof. Hollberg served on my thesis committee.*