

# Lillian Barrett Hughes Wyatt

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California Institute of Technology, 1200 East California Blvd. MC 104-44, Pasadena, CA 91125 U.S.A.

## RESEARCH VISION

Combining materials synthesis and characterization with qubit-based measurements to develop platforms for quantum technology with improved coherence and scalability.

## PROFESSIONAL EXPERIENCE

- **California Institute of Technology**

*AWS Quantum Postdoctoral Scholar*

*Nov. 2025 - Present*

Pasadena, CA, U.S.A.

## EDUCATION

- **University of California Santa Barbara**

*Ph.D. in Materials*

*Advisors: Professor Ania C. B. Jayich and Professor Kunal Mukherjee*

*Sep. 2019 - Sep. 2025*

Santa Barbara, CA, U.S.A.

- **University of Richmond**

*B.S. in Interdisciplinary Physics, concentration in Chemistry*

*Summa cum laude*

*Advisor: Professor Michael Leopold*

*Aug. 2015 - May 2019*

Richmond, VA, U.S.A.

## HONORS AND AWARDS

- **Materials Research Society Graduate Student Silver Award**, MRS Spring Meeting (2025)
- **Best Student Oral Presentation Award**, MRS Fall Meeting, diamond symposium (2023)
- **First Place Student Presentation Award**, New Diamond and Nano Carbon Conference (2023)
- **Best Student Oral Presentation Award**, European MRS Meeting, diamond symposium (2023)
- **UCSB Materials Department Service Award**, Bright Horizon Global Foundation (2022)
- **NSF GRFP** (2021)
- **NDSEG Fellowship** (2021)
- **UCSB NSF Quantum Foundry Graduate Fellowship** (2021)
- **NSF GRFP Honorable Mention** (2019)
- **UC Regents Fellowship**, Materials Department (2019)
- **David C. Evans Award for Outstanding Achievement in Scholarship**, College of Arts and Sciences, UR (2019)
- **Robert E. Loving Award for Top Graduating Student**, Department of Physics, UR (2019)
- **Goldwater Scholarship** (2018)
- **Phi Beta Kappa**, UR (2018)
- **Clarence Denoon Award for Top Junior Student**, Department of Physics, UR (2018)
- **J. Stanton Pierce Award for Top Junior Student**, Department of Chemistry, UR (2018)
- **Phi Beta Kappa Robert E. Loving Book Award**, UR (2018)
- **Stuart Clough Organic Chemistry Award**, UR (2017)
- **William H. Meyers Inorganic Chemistry Award**, UR (2017)

## PUBLICATIONS

- [1] S. Kim, P. London, D. Yang, **L. B. Hughes**, J. Ahlers, S. Meynell, W. J. Mitchell, K. Mukherjee, A. C. Bleszynski Jayich. Scalable nanoscale positioning of highly coherent color centers in prefabricated diamond nanostructures. *Nat. Comm.* **16**, 9803 (2025). [doi.org/10.1038/s41467-025-64758-4](https://doi.org/10.1038/s41467-025-64758-4)
- [2] H. Gao, L. S. Martin, **L. B. Hughes**, N. T. Leitao, P. Put, B. Ye, H. Zhou, W. Wu, N. U. Koyluoglu1, S. Meynell, E. Davis, N. Yao, A. C. Bleszynski Jayich, H. Park, M. D. Lukin. Signal amplification in a solid-state quantum sensor via asymmetric time-reversal of many-body dynamics. *Nature* **646**, 68-74 (2025). [doi.org/10.1038/s41586-025-09452-7](https://doi.org/10.1038/s41586-025-09452-7)
- [3] W. Wu, E. J. Davis, **L. B. Hughes**, B. Ye, Z. Wang, D. Kufel, T. Ono, S. A. Meynell, M. Block, C. Liu, H. Yang, A. C. Bleszynski Jayich, N. Y. Yao. Spin squeezing in an ensemble of nitrogen-vacancy centers in diamond. *Nature* **646**, 74-80 (2025). [doi.org/10.1038/s41586-025-09524-8](https://doi.org/10.1038/s41586-025-09524-8)
- [4] **L. B. Hughes**, S. A. Meynell, W. Wu, S. Parthasarathy, L. Chen, Z. Zhang, Z. Wang, E. J. Davis, K. Mukherjee, N. Y. Yao, and A. C. Bleszynski Jayich. A Strongly Interacting, Two-Dimensional, Dipolar Spin Ensemble in (111)-Oriented Diamond. *Phys. Rev. X* **15**, 021035 (2025). [doi.org/10.1103/PhysRevX.15.021035](https://doi.org/10.1103/PhysRevX.15.021035)

- [5] S. Parthasarathy, M. Joos, **L. B. Hughes**, S. A. Meynell, T. Morrison, K. Mukherjee, D. Weld, A. C. Bleszynski Jayich. Role of oxygen in laser induced contamination of diamond-vacuum interfaces. *Phys. Rev. Appl.* **22**, 024067 (2024). [doi.org/10.1103/PhysRevApplied.22.024067](https://doi.org/10.1103/PhysRevApplied.22.024067)
- [6] P. D. Reddy, L. Nordin, **L. B. Hughes**, A. K. Priedl, K. Mukherjee. Expanded stability of layered SnSe-PbSe alloys and evidence of displacive phase transformation from rocksalt in heteroepitaxial thin films. *ACS Nano* **18**, 13437-13449 (2024). [doi.org/10.1021/acsnano.4c04128](https://doi.org/10.1021/acsnano.4c04128)
- [7] L. V. H. Rogers, S. T. Nguyen, J. H. Cox, K. Zervas, Z. Yuan, S. Sangtawesin, A. Stacey, C. Jaye, C. Weiland, A. Pershin, A. Gali, L. Thomsen, S. A. Meynell, **L. B. Hughes**, A. C. Bleszynski Jayich, X. Gui, R. J. Cava, R. R. Knowles, N. P. de Leon. Diamond Surface Functionalization via visible light-driven CH activation for nanoscale quantum sensing. *PNAS* **121**, e2316032121 (2024). [doi.org/10.1073/pnas.2316032121](https://doi.org/10.1073/pnas.2316032121)
- [8] **L. B. Hughes**, Z. Zhang, C. Jin, S. A. Meynell, B. Ye, W. Wu, Z. Wang, E. J. Davis, T. E. Mates, N. Y. Yao, K. Mukherjee, and A. C. Bleszynski Jayich. Two-dimensional spin systems in PECVD-grown diamond with tunable density and long coherence for enhanced quantum sensing and simulation. *APL Materials* **11**, 021101 (2023). [doi.org/10.1063/5.0133501](https://doi.org/10.1063/5.0133501)  
\*Selected as a featured article.
- [9] L. V. H. Rogers, **L. B. Hughes**, M. Xie, S. W. Kolkowitz, P. C. Maurer, A. C. Bleszynski Jayich, N. P. de Leon. Materials challenges for quantum technologies based on color centers in diamond. *MRS Bulletin* **46**, 623-633 (2021). [doi.org/10.1557/s43577-021-00137-w](https://doi.org/10.1557/s43577-021-00137-w)
- [10] S. A. Meynell, C. A. McLellan, **L. B. Hughes**, W. Wang, K. Mukherjee, and A. C. Bleszynski Jayich. Engineering quantum-coherent defects: the role of substrate miscut in chemical vapor deposition diamond growth. *Appl. Phys. Lett.* **117**, 194001 (2020). [doi.org/10.1063/5.0029715](https://doi.org/10.1063/5.0029715)
- [11] **L. B. Hughes**,\* N. Labban,\* G. Conway, J. Pollock, and M.C. Leopold. Adaptable Xerogel-Layered Amperometric Biosensor Platforms on Wire Electrodes for Clinically Relevant Measurements. *Sensors* **19**, 2584 (2019). [doi.org/10.3390/s19112584](https://doi.org/10.3390/s19112584)
- [12] A. K. Jaini, **L. B. Hughes**, M. Kitimet, K. J. Ulep, M. C. Leopold, and C. A. Parish. Halogen Bonding Interactions for Aromatic and Non-Aromatic Explosive Detection. *ACS Sensors* **4**, 389-397 (2019). [doi.org/10.1021/acssensors.8b01246](https://doi.org/10.1021/acssensors.8b01246)
- [13] H. Oh, V. Dharod, C. Padgett, **L. B. Hughes**, J. Venkatraman, S. Parthasarathy, E. Osipova, I. Hedgepeth, J. V. Cady, L. Basso, Y. Wang, M. Titze, E. S. Bielejec, A. M. Mounce, D. Bouwmeester, A. C. Bleszynski Jayich. A spin-embedded diamond optomechanical resonator with mechanical quality factor exceeding one million. *Under review at Optica*. (2025) [arXiv:2508.05906](https://arxiv.org/abs/2508.05906)
- [14] Z. Zhang, T. Morrison, **L. B. Hughes**, W. Wu, R. Liu, D. Bluvstein, N. Yao, D. Fygenson, A. C. Bleszynski Jayich. Patterning programmable spin arrays on DNA origami for quantum technologies. *Submitted*. (2025) [arXiv:2509.10760](https://arxiv.org/abs/2509.10760)
- [15] C. C Newsom, **L. B Hughes**, B. L Green, A. C Bleszynski Jayich, M. E Newton. 200 keV energy electron irradiation of single crystal diamond: Quantification of vacancy and nitrogen-vacancy production. *Submitted*. (2025) [arXiv:2509.06517](https://arxiv.org/abs/2509.06517)
- [16] P. Put,\* N. T. Leitao,\* H. Gao,\* C. Spaegle,\* O. Makarova, **L. B. Hughes**, A. C. Maccabe, M. Mammen, B. Machielse, H. Zhou, S. Pustelnik, A. C. Bleszynski Jayich, F. Capasso, L. S. Martin, H. Park, M. D. Lukin. Collective many-body dynamics in a solid-state quantum sensor controlled through nanoscale magnetic gradients. *Submitted*. (2025) [arXiv:2506.11920](https://arxiv.org/abs/2506.11920)
- [17] B. Edelman, C. Sheppard, L. Chuidian, A. Vinnikov, F. Bevc, **L. B. Hughes**, K. Kittredge, C. Parish, M. Leopold. Engaging “Bond” Angle with Nanomaterial Composites for Enhanced Halogen Bonding Toward Explosive Detection Interfaces. *Submitted*. (2025)
- [18] H. Lee,\* H. C. Kleidermacher,\* A. J. M. Stein,\* H. Oh, **L. B. Hughes Wyatt**, C. K. Kim, L. Basso, A. Mounce, S. S. Su, M. Titze, A. C. Bleszynski Jayich, J. Vuckovic. Quantum Nanophotonic Interface for Tin-Vacancy Centers in Thin-Film Diamond. *Submitted*. (2025) [arXiv:2511.05740](https://arxiv.org/abs/2511.05740)
- [19] H. Gao, N. T. Leitao, S. Dandavate, **L. B. Hughes Wyatt**, P. Put, M. Mammen, L. S. Martin, H. Park, A. C. Bleszynski Jayich, M. D. Lukin. Dressed-state Hamiltonian engineering in a strongly interacting solid-state spin ensemble. *Submitted*. (2025)
- [20] E. Postelnicu, **L. B. Hughes Wyatt**, C. Jilly-Rehak, S. A. Meynell, T. Ngyuen, H. Yan, A. C. Bleszynski Jayich, K. Mukherjee. Nitrogen aggregation in diamond growth features. *In preparation*.
- [21] **L. B. Hughes Wyatt**,\* S. Parthasarathy,\* I. Kantor,\* T. Morrison, J. Ahlers, L. Chen, C. K. Kim, E. Osipova, K. Mukherjee, A. C. Bleszynski Jayich. Creation of high-sensitivity shallow NV centers via nitrogen delta doping. *In preparation*.
- [22] S. A. Meynell, H. Yang, L. Chen, S. Parthasarathy, **L. B. Hughes Wyatt**, E. Postelnicu, C. Jilly-Rehak, K. Mukherjee, A. C. Bleszynski Jayich. Step bunches as a platform for engineering one-dimensional quantum systems. *In preparation*.

## INVITED PRESENTATIONS

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- Materials Research Society, Spring Meeting, Apr. 2026, Honolulu, HI, U.S.A.
- American Physical Society Global Physics Summit, Mar. 2026, Denver, CO, U.S.A.
- Future Leaders Seminar Series, Northwestern University Materials Department, Apr. 2024, Virtual.
- Hasselt Diamond Workshop - SBDD XXVIII, Feb. 2024, Hasselt, Belgium.
- European Materials Research Society Meeting, Jun. 2023, Strasbourg, France.

## CONTRIBUTED PRESENTATIONS

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- Materials Research Society, Spring Meeting, Apr. 2025, Seattle, WA, U.S.A.
- Materials Research Society, Fall Meeting, Nov. 2023, Boston, MA, U.S.A.
- Electronic Materials Conference, Jun. 2023, Santa Barbara, CA, U.S.A.
- New Diamond and Nano Carbon Conference, Jun. 2023, East Lansing, MI, U.S.A.
- Hasselt Diamond Workshop - SBDD XXVI, Feb. 2022, Hasselt, Belgium.
- Electronic Materials Conference, Jun. 2020, Virtual.

## TEACHING

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- **Introduction to Quantum Mechanics (MATRL 200Q)** Fall 2020  
*Teaching Assistant for Professor Anton Van der Ven*
- **Engineering Quantum Mechanics (MATRL 211B)** Spring 2022 and Spring 2024  
*Reader for Professor Chris Van de Walle*

## UNDERGRADUATE MENTORING

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- Isaac Kantor, UCSB (2024-2025)
- Ekaterina Osipova, UCSB (2021-2025)
- Ian McGuire, Quantum Foundry REU (Summer 2024)
- Melika Dabiri, Quantum Foundry REU (Summer 2024)
- Haopu Yang, UCSB (2022-2023)  
*Now Ph.D. student in Physics at Harvard University.*

## SYNERGISTIC ACTIVITIES

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- **Teaching Assistant - Cleanroom Training Program** Aug. 2023 - Jan. 2024  
*Central Coast Partnership for Regional Industry-focused Micro/Nanotechnology Education, UCSB* []
  - Led cohorts of students in two 40 hour programs focused on wafer fabrication processes in the cleanroom.
  - Taught hands-on skills including photolithography, metal deposition, dry and wet etching, and device inspection/characterization.
  - Served primarily URM and community college students.
- **President, Treasurer and Committee Member - Materials Scientist Association (MSA)** Jan. 2021 - Sep. 2023  
*Materials Department, UCSB* []
  - Led student organization, planned prospective graduate student recruitment events, interfaced with department leadership.
  - Goals of promoting community and professional development for students in the Materials department.
  - Wrote a proposal and received grant funding for mental health-focused programming for students in the department.
- **Outreach Programs** Jan. 2021 - Sep. 2024  
*Quantum Foundry, Materials Research Lab, and Center for Science and Engineering Partnerships, UCSB* []
  - Directed outreach project building Quantum Kits for middle school teachers.
  - Led a team of 10 students to develop materials and lesson plans for introducing students to quantum information science.
  - Premiered the developed activities at World Quantum Day and in local middle schools as part of the Family Science Ultimate Exploration program.
  - Participated in other volunteering and outreach programs at local elementary schools.
- **Writing Consultant** Sep. 2021 - Nov. 2022  
*Graduate Writing Center, UCSB* []
  - Reviewed application essays through individual consultations with students applying for the NSF GRFP and NDSEG fellowships.
  - Provided tailored feedback as well as general strategies for successful proposal writing. Supervisor: Dr. Robby Nadler.

## REFERENCES

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1. **Ania C. Bleszynski Jayich**  
Professor, Department of Physics  
University of California Santa Barbara  
Email: ania@physics.ucsb.edu  
Phone: +1-805-893-8089  
*Relationship: Thesis Advisor*
2. **Kunal Mukherjee**  
Assistant Professor, Department of Materials Science and Engineering  
Stanford University  
Email: kunalm@stanford.edu  
*Relationship: Thesis Advisor*
3. **Norman Y. Yao**  
Professor, Department of Physics  
Harvard University  
Email: nyao@fas.harvard.edu  
Phone: +1-617-384-9386  
*Relationship: Collaborator*