Lillian Barrett Hughes Wyatt

+1-540-820-6289 | lbhwyatt@caltech.edu | lillianhugheswyatt.github.io | lillian-hughes-wyatt

California Institute of Technology, 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** — *Nov. 2025 - Present*
  AWS Quantum Postdoctoral Scholar — Pasadena, CA, U.S.A.

Education

- **University of California Santa Barbara** — *Sep. 2019 - Sep. 2025*
  Ph.D. in Materials — Santa Barbara, CA, U.S.A.
  Advisors: Professor Ania C. B. Jayich and Professor Kunal Mukherjee
- **University of Richmond** — *Aug. 2015 - May 2019*
  B.S. in Interdisciplinary Physics, concentration in Chemistry — Richmond, VA, U.S.A.
  Summa cum laude
  Advisor: Professor Michael Leopold

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 Graudate 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] 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

[2] 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

[3] **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

[4] 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

[5] 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

[6] 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

[7] **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
*Selected as a featured article.

[8] 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

[9] 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

[10] **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

[11] 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

[12] S. Kim, P. London, D. Yang, **L. B. Hughes**, J. Ahlers, S. A. Meynell, W. J. Mitchell, A. C. Bleszynski Jayich. Scalable nanoscale positioning of highly coherent color centers in diamond nanostructures. *Accepted to Nat. Comm.* (2025) arxiv:2502.01198

[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

[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

[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

[16] P. Put,* N. T. Leitao,* H. Gao,* C. Spaegele,* O. Makarova, **L. B. Hughes**, A. C. Maccabe, M. Mammen, B. Machielse, H. Zhou, S. Pustelny, 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)

[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] 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.*

[19] 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. *In preparation.*

[20] **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.*

[21] 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

- **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

- **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

- **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

- **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

- **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

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