Curriculum Vitae

Leah Tom

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Education

Ph.D. in Physics, University of Wisconsin–Madison 2023

Thesis: *Defect Identification using Kelvin Probe Force Microscopy and Optimization of Long Single-Channel One-Dimensional Quantum Wires*

Advisor: Dr. Mark Friesen

B.A. in Physics and Computer Science, University of California, Berkeley 2017

Research Appointments

Device Modeling Physicist, Diraq Sep 2026 – Present

- Device modeling for silicon spin-qubit processors fabricated in standard semiconductor foundry processes.

Postdoctoral Researcher, University of California, Los Angeles Sep 2023 – Sep 2026

Graduate Research Assistant, University of Wisconsin–Madison Jun 2018 – Aug 2023

Publications and Preprints

1. **Leah Tom**, John Nichol, Chris Anderson and Mark Gyure. "Localization of an individual charge fluctuator in a Si/SiGe spin-qubit device." *Manuscript completed; arXiv preprint scheduled for November 2026; to be submitted to Physical Review Letters.*

2. **Leah Tom***, Yik Kheng Lee*, Karina L. Hudson, Krittika Kumar, Jackson S. Smith, Alex R. Hamilton, S. N. Coppersmith, Jared H. Cole and Mark Friesen. "Optimizing one-dimensional lithographically-defined nanowires in semiconducting heterostructures." arXiv:2611.10177 (2026). *Submitted to Physical Review B.*

3. **Leah Tom**, Zachary J. Krebs, Joel B. Varley, E. S. Joseph, Wyatt A. Behn, M. A. Eriksson, Keith G. Ray, Vincenzo Lordi, S. N. Coppersmith, Victor W. Brar and Mark G. Friesen. "A scanning probe microscopy approach for identifying defects in aluminum oxide." arXiv:2512.22369 (2025). *Under review at Proceedings of the National Academy of Sciences.*

4. Thomas McJunkin, E. R. MacQuarrie, **Leah Tom**, S. F. Neyens, J. P. Dodson, Brandur Thorgrimsson, J. Corrigan, H. Ekmel Ercan, D. E. Savage, M. G. Lagally, Robert Joynt, S. N. Coppersmith, Mark Friesen and M. A. Eriksson. "Valley splittings in Si/SiGe quantum dots with a germanium spike in the silicon well." *Physical Review B* **104**, 085406 (2021).

Manuscripts in preparation

1. **Leah Tom**, David Kanaar, Chris Anderson and Mark Gyure. "Design of a backgated Si/SiGe double quantum well for valley splitting mapping." *arXiv preprint scheduled for March 2027.*

*Equal contribution; co-first authors.

Research Experience

Spatial Triangulation of a Two-Level Fluctuator in Si/SiGe Quantum Dot Devices using Device Simulations 2023–2026

- Conceived and developed a methodology for spatially localizing experimentally observed two-level fluctuators (TLFs) by combining measured quantum-dot chemical-potential shifts, gate–TLF detuning lever arms, and electrostatic device simulations.
- Established the modeling and data-analysis framework for quantitative comparison with experimental measurements and helped develop supporting computational tools.
- Applied the methodology to an experimentally observed fluctuator, constraining its location.

Advised by: Chris Anderson and Mark Gyure *Collaborator:* John Nichol

Optimization of Si/SiGe Double Well Device Geometry for Probing Valley Splitting using Scanning Probe Microscopy 2024–2026

- Designed a double-quantum-well device architecture for mapping spatial variations in valley splitting across Si/SiGe heterostructures to identify valley-splitting hotspots, using electrostatic simulations in MaSQE-MDMM to optimize device parameters.
- Optimized device geometry with the aim of minimizing leakage current and maximizing tunnel coupling between the lower quantum well and an induced quantum dot in the upper quantum well.
- Developed a methodology to infer valley splittings in the single-well operating mode from valley splittings measurable in the double-well operating mode.

Advised by: Chris Anderson and Mark Gyure

Using Scanning Probe Microscopy to Determine Energies of Charged Defects in Aluminum Oxide 2021–2024

- Led a collaborative research project to identify microscopic charged defects in aluminum oxide by integrating scanning-probe measurements, electrostatic modeling, and first-principles calculations.
- Developed the quantitative data-analysis methodology and performed electrostatic simulations to interpret experimental measurements and extract defect properties.
- Identified the need for additional experimental characterization through computational modeling, guiding subsequent measurements essential for obtaining quantitatively accurate results.
- Established the correspondence between experimentally measured quantities and density-functional-theory predictions, developing the methodology for comparing them to identify candidate defects.

Advised by: Mark Friesen and Susan Coppersmith

Collaborators: Victor Brar, Keith Ray, Joel Varley, Vincenzo Lordi and Mark Eriksson

Optimizing Length of 1D Quantum Wires 2019–2024

- Proposed a novel split-gate geometry for quantum point contacts (QPCs) to engineer extended one-dimensional conducting channels in semiconductor heterostructures.
- Used electrostatic simulations to demonstrate that the proposed geometry increases the effective channel length while reducing susceptibility to electrostatic noise.

- The proposed design was subsequently implemented and experimentally tested by collaborators at UNSW Sydney.

Advised by: Mark Friesen and Susan Coppersmith

Collaborators: Alexander Hamilton and Jared Cole

Computational Skills

Programming: Python, C++ (proficient); C, Java (prior experience)
Simulation and analysis: COMSOL Multiphysics, MATLAB, MaSQE-MDMM, FEniCS

Conference Presentations

Talks (presented by Leah Tom unless otherwise noted)

1. **Leah Tom**, David Kanaar, Chris Anderson and Mark Gyure. "Design and Simulation of a Backgated Si/SiGe Double Quantum Well for Valley Splitting Mapping." Silicon Quantum Electronics Workshop 2026. *(Competitively selected talk.)*

2. **Leah Tom**, David Kanaar, Chris Anderson and Mark Gyure. "Design and Simulation of a Backgated Si/SiGe Double Quantum Well for Valley Splitting Mapping." APS Global Physics Summit 2026.

3. **Leah Tom**, John Nichol, Chris Anderson and Mark Gyure. "Spatial Triangulation of Two-Level Fluctuators in Si/SiGe Quantum Dot Devices." Silicon Quantum Electronics Workshop 2025.

4. **Leah Tom**, John Nichol, Chris Anderson and Mark Gyure. "Spatial Triangulation of Two-Level Fluctuators in Si/SiGe Quantum Dot Devices." APS Global Physics Summit 2025.

5. **Leah Tom**, Zachary J. Krebs, Emily Joseph, Keith G. Ray, Joel Varley, Vincenzo Lordi, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Defect Identification in Atomic Layer Deposited Aluminum Oxide using Kelvin Probe Force Microscopy." APS March Meeting 2024.

6. **Leah Tom**, Zachary J. Krebs, Emily Joseph, Keith G. Ray, Joel Varley, Vincenzo Lordi, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Defect Identification in Atomic Layer Deposited Aluminum Oxide using Kelvin Probe Force Microscopy." International Conference on Defects in Semiconductors 2023.

7. Krittika Kumar, Karina L. Hudson, **Leah Tom**, Benjamin Ramsay, Yonatan Ashlea Alava, Qingwen Wang, Yik Kheng Lee, Jackson S. Smith, Jared Cole, Ian Farrer, David A. Ritchie, Mark Friesen, Sue N. Coppersmith and Alexander R. Hamilton. "Engineering Long Ballistic Single Mode Electrostatically Defined Quantum Wires for Future Detection of Majorana Zero Modes." APS March Meeting 2023. *(Presented by Krittika Kumar.)*

8. **Leah Tom**, Zachary J. Krebs, Emily Joseph, Keith G. Ray, Joel Varley, Vincenzo Lordi, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Characterizing Charged Defects in Oxide-on-Silicon using Kelvin Probe Force Microscopy." APS March Meeting 2023.

9. **Leah Tom**, Karina Hudson, Krittika Kumar, Alex Hamilton, Sue N. Coppersmith and Mark G. Friesen. "Optimizing Quantum Wires for Single-Mode Transmission using Electrostatic

Simulations." Gordon Godfrey Conference, November 23, 2022. **(Invited talk.)**

10. **Leah Tom**, Zachary J. Krebs, Justin T. White, Wyatt A. Behn, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Characterizing Charged Defects in Oxide-on-Silicon using Kelvin Probe Force Microscopy." APS March Meeting 2022.

Posters

1. **Leah Tom**, John Nichol, Chris Anderson and Mark Gyure. "Spatial Triangulation of Two-Level Fluctuators in Si/SiGe Quantum Dot Devices." Silicon Quantum Electronics Workshop 2025.
2. **Leah Tom**, Zachary J. Krebs, Emily Joseph, Keith G. Ray, Joel Varley, Vincenzo Lordi, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Defect Identification in Atomic Layer Deposited Aluminum Oxide using Electrostatic Force Microscopy." Gordon Research Conference: Defects in Semiconductors 2024.
3. **Leah Tom**, Zachary J. Krebs, Justin T. White, Wyatt A. Behn, Mark A. Eriksson, Victor W. Brar, Sue N. Coppersmith and Mark G. Friesen. "Characterizing Charged Defects in Oxide-on-Silicon using Kelvin Probe Force Microscopy." Silicon Quantum Electronics Workshop 2022.

Research Funding and Program Reviews

- Contributed project updates to progress reports for programs funded by Air Force Office of Scientific Research (AFOSR), Army Research Office (ARO) and Laboratory for Physical Sciences (LPS).

Posters presented at sponsor program reviews (first author)

ARO/LPS Fast Control and Readout Schemes (FastCARS) program review

"Spatial Triangulation of Two-Level Fluctuators in Si/SiGe Quantum Dot Devices" 2024, 2025, 2026

AFOSR/LPS Materials for Quantum Information Science program review

"Design and Simulation of a Backgated Si/SiGe Double Quantum Well Device for Valley Splitting Mapping" 2025, 2026

"Spatial Triangulation of Two-Level Fluctuators in Si/SiGe Quantum Dot Devices" 2026

Awards

Conference Presentation Award (competitive travel grant), Student Research Grants Competition, Graduate School, University of Wisconsin-Madison 2021

Hallet H. and Mary F. Germond Award, Department of Physics, University of Wisconsin–Madison 2019

Teaching and Mentoring Experience

Research Mentor, University of California, Los Angeles 2025–2026

- Mentored an undergraduate researcher for a year.
- Guided the design of a graphical interface for the group's device simulation code, including identifying users' needs and refining the interface from user feedback.

- Supervised the development and benchmarking of new electrostatics simulation capabilities in FEniCS.

Teaching Assistant, Introductory Electricity and Magnetism for Engineers, University of Wisconsin–Madison 2017–2018

- Led two discussion sections each term; wrote worksheets and quizzes, held office hours, proctored examinations, and managed laboratory sections.
- Designed a weekly practice system: recommended problem sets with quizzes drawn from an unannounced subset, and partial credit for sound reasoning, to encourage consistent practice.

Reader, CS 70 (Discrete Mathematics and Probability), Department of EECS, University of California, Berkeley Fall 2014

- Graded weekly assignments and proctored examinations.
- Staffed weekly homework parties, helping students work through problem sets.

Peer Tutor, PEACE Peer Tutoring Program, University of California, Berkeley 2017

- Tutored undergraduate students in lower-division mechanics and Introductory calculus.

Professional Service

Referee, *Quantum Science and Technology* 2025

Academic Service and Leadership

University of Wisconsin–Madison

International Student Representative, Physics Graduate Student Council (PGSC) 2019–2020

- Organized an international student town hall and follow-up discussions to identify concerns and coordinate responses with the Graduate Program Manager.
- Helped establish a virtual graduate visit weekend, enabling prospective international students to attend panels and talks and meet remotely with faculty.
- Connected students with professional tax seminars through the international student office and coordinated group attendance.
- Organized monthly dinners to build community.
- Several of these initiatives continued in later years.

Graduate Peer Mentor, PGSC Mentorship Program 2019, 2023

- Formally mentored four first-year graduate students as they began their PhDs.

Mentorship Coordinator, Gender Minorities and Women in Physics (GMaWiP) 2018–2020

- Established a peer-mentoring program matching newer graduate students with senior mentors and organized regular mentoring-group gatherings.
- Developed materials and led qualifying-examination preparation sessions for women and gender minorities; students continued to use the materials in subsequent years.
- Organized and led a career-planning seminar introducing myIDP, short-term goal setting, regular advisor feedback, and resources for planning careers after graduation.

Student Representative, Departmental Climate and Diversity Committee 2019–2020

- Brought graduate student perspectives to departmental discussions of climate, diversity, and student support.