

Benjamin W. Walker

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EDUCATION

Polytechnique Fédérale de Lausanne (EPFL) / Grenoble-INP / Politecnico di Torino <i>M.S. in Micro and Nanotechnologies for Integrated Systems</i>	May 2025
The University of Texas at Dallas <i>B.S. in Physics and B.S. Electrical Engineering, Minor in Nanotechnology</i>	May 2023 GPA: 3.93
Northwestern State University <i>Associate's of General Studies</i>	May 2019 GPA: 3.85
Louisiana School for Math, Science, and the Arts (LSMSA) <i>High School Diploma</i>	May 2019 GPA: 3.93

FELLOWSHIPS

National Science Foundation Graduate Research Fellowship Program <ul style="list-style-type: none">Three years of full PhD funding with a \$37,000 annual stipend	March 2023
McDermott Fellowship Program <ul style="list-style-type: none">4-Year annual \$10,000 discretionary research stipend and \$36,000 for 4th year of PhD funding	March 2023
Barry Goldwater Scholarship <ul style="list-style-type: none">Most prestigious award for an undergraduate researcher from my work in skyrmion logic devices	March 2022
National Merit Scholarship <ul style="list-style-type: none">Received full-ride scholarship at UT Dallas plus housing and \$28,000 in stipends	March 2019

PATENTS

- B. W. Walker**, A. E. Edwards, X. Hu, and J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *U.S. Patent Application No. 63/480,374* (Filed: 01-18-2023)

PROFESSIONAL EXPERIENCE

Research Assistant <i>University of Texas at Dallas - NeuroSpinCompute Laboratory</i> <ul style="list-style-type: none">Leading a team of undergraduate researchers to design and optimize skyrmion circuits, achieving thus far a $10\times$ reduction in energy consumptionDeveloping novel approaches to micromagnetic-based reservoir computing, which use machine learning to optimize device structure	May 2023 – Present Richardson, TX
Research Intern <i>Université Paris-Saclay - Integnano Laboratory</i> <ul style="list-style-type: none">Developed an STT-MRAM inference array which utilizes a novel write-in-series approach to reduce transistor overhead and minimize energy for compute-in-memory applicationsAnalyzed the performance of the array to ensure an error rate of fewer than 1 per 10,000	May 2024 – August 2024 Palaiseau, France
Undergraduate Research Assistant <i>University of Texas at Dallas - NeuroSpinCompute Laboratory</i> <ul style="list-style-type: none">Invented a novel skyrmion logic device that uses voltage-controlled magnetic anisotropy (VCMA) to control skyrmion propagation and synchronization, which reduces power consumption by over $100\times$Designed large-scale reversible skyrmion logic circuits, which demonstrate efficient pipelining and maintain efficiency at scale	Oct 2019 – May 2023 Richardson, TX
Hardware Engineering Intern <i>Microsoft - Physical Design Team</i> <ul style="list-style-type: none">Helped develop a custom floorplanning step by pre-placing standard cells and buffers and pre-routing trunks on high-speed critical buses to achieve flop to flop reach in several millimetersCreated an interpreter between Innovus and Fusion Compiler (FC) for our TCL Physical Design scripts, aiding my team's translation effort and improved its efficiency by 50%	May 2022 – July 2022 Raleigh, NC

Visiting Researcher

Jan 2022 – April 2022

Universidad de Salamanca - Simulación de Nanoestructuras Magnéticas (SINAMAG)

Salamanca, Spain

- Designed voltage-driven reversible skyrmion logic circuits to reduce energy consumption with Mumax3
- Parametrically modelled and optimized micromagnetic devices in COMSOL to increase electrical efficiency by 70%

MRSEC Research Experience for Undergraduates

May 2021 – Aug 2021

University of Texas at Austin - Integrated Nano Computing Lab

Austin, TX

- Fabricated and validated WSe₂-based devices via electron beam lithography (EBL), atomic force microscopy (AFM), and magneto-optic Kerr effect (MOKE) imaging

Electrical Engineering Intern

Jan 2021 – Aug 2021

University of Texas at Dallas - Texas Analog Center for Excellence

Richardson, TX

- Helped design a spin transfer torque (STT) memristor-based neuromorphic chip, collaborating with graduate students
- Verified aspects of device's logical operation via Verilog to prepare tapeout for foundry

JOURNAL PUBLICATIONS

1. X. Hu, C. Cui, S. Liu, F. Garcia-Sanchez, W. H. Brigner, **B. W. Walker**, A. J. Edwards, T. P. Xiao, C. H. Bennett, N. Hassan, M. P. Frank, J. A. C. Incorvia, and J. S. Friedman, Magnetic Skyrmions and Domain Walls for Logical and Neuromorphic Computing, *Neuromorphic Computing and Engineering*, Mar 2023, doi: 10.1088/2634-4386/acc6e8
2. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *ArXiv Condensed Matter*, Jan 2023, doi: 10.48550/arXiv.2301.10700
3. X. Hu, **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, P. Zhou, J. A. C. Incorvia, A. Paller, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *IEEE Magnetics Letters*, May 2022, doi: 10.1109/LMAG.2022.3174514
4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Skyrmion Logic Clocked via Voltage-Controlled Magnetic Anisotropy" *Applied Physics Letters*, May 2021, doi: 10.1063/5.0049024

CONFERENCE PUBLICATIONS AND ORAL PRESENTATIONS

1. **B. W. Walker**, K. Muthukrishnan, E. A. Rivas, R. Thapa, X. Hu, M. P. Frank, F. Garcia-Sanchez, A. J. Edwards, J. S. Friedman, Near-Landauer Pipelined Voltage-Propagated Skyrmion Logic, *IEEE Conference on Advances in Magnetics*, Feb. 2025.*
2. **B. W. Walker**, K. Muthukrishnan, R. Thapa, E. Rivas, X. Hu, M. P. Frank, F. Garcia-Sanchez, A. J. Edwards, J. S. Friedman, Pipelined Voltage-Propagated Skyrmion Logic with High Thermal Stability, *Joint IEEE International Magnetics Conference & Conference on Magnetism and Magnetic Materials*, Jan. 2025.
3. **B. W. Walker**, K. Muthukrishnan, R. Thapa, E. A. Rivas, X. Hu, M. P. Frank, F. Garcia-Sanchez, A. J. Edwards, J. S. Friedman, Voltage-Propagated Reversible Skyrmion Logic with near-Landauer Efficiency, *International Conference on Magnetism*, June-July 2024.*
4. **B. W. Walker**, K. Muthukrishnan, R. Thapa, X. Hu, M. P. Frank, F. Garcia-Sanchez, A. J. Edwards, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Conference on Magnetism and Magnetic Materials*, Oct.-Nov. 2023.
5. X. Hu, X. Li, P. Zhou, **B. W. Walker**, A. J. Edwards, J. A. C. Incorvia, J. S. Friedman, High-Performance Low-Power Chiplet Design with Emerging Technologies, *IEEE International System-on-Chip Conference*, Sep. 2023.
6. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, J. S. Friedman, Near Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Joint European Magnetic Symposia*, Aug. 2023.
7. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2023.*
8. X. Hu, **B. W. Walker**, F. Garcia-Sanchez, P. Zhou, J. A. C. Incorvia, A. Paller, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2022.
9. **B. W. Walker**, B. W. Walker, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, J. S. Friedman, Conservative Skyrmion Logic with Voltage-Controlled Magnetic Anisotropy Synchronization, *Joint IEEE International Magnetics Conference & Conference on Magnetism and Magnetic Materials*, Jan. 2022.*

10. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Skyrmion Logic Clocked via Voltage-Controlled Magnetic Anisotropy," *Texas Analog Center for Excellence Symposium*, Oct. 2021.*
11. X. Hu, M. Chauwin, F. Garcia-Sanchez, **B. W. Walker**, N. Betrabet, J. A. C. Incorvia, A. Paler, C. Moutafis, J. S. Friedman, Skyrmion Logic System for Large-Scale Reversible Computing, *IEEE International Conference on Nanotechnology*, Jul. 2021 (invited).
12. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Voltage Controlled-Clocked Skyrmion Logic Synchronizers," *International Conference on Nanomagnetism and Spintronics (Solitons and Skyrmion Magnetism)*, Jun. 2021.*

*Presented In-Person

POSTER PRESENTATIONS

1. **B. W. Walker**, F. Garcia-Sanchez, A. J. Edwards, X. Hu, M. P. Frank, F. Garcia-Sanchez, J. S. Friedman, Near-Landauer Reversible Skyrmion Logic with Voltage-Based Propagation, *Undergraduate Research Day at the Texas Capitol*, Apr. 2023
2. **B. W. Walker**, A. J. Edwards, F. Garcia-Sanchez, M. P. Frank, and J. S. Friedman, "Low-Dissipation Conservative Skyrmion Logic with Voltage-Based Propagation," *University of Texas at Dallas Undergraduate Research Scholar Awards*, Apr. 2022
3. **B. W. Walker**, X. Li, and J. A. C. Incorvia, "Fabrication and Analysis of WSe₂-based Electronic Devices," *MRSEC REU Poster Presentation*, Jul. 2021
4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, "Skyrmion Logic Clocked via Voltage-Controlled Magnetic Anisotropy," *University of Texas at Dallas Undergraduate Research Scholar Awards*, Apr. 2021

MISCELLANEOUS AWARDS

Pacific Crest Trail Thru-Hiker: Hiked 2000+ miles from Mexico to Canada	August 2023
Undergraduate Research Scholar Award: Accepted for presentation at UT Dallas	April 2021/2022/2023
Patti Henry Pinch Scholarship: UTD Funding for 2023 GOMAC Tech Presentation	March 2023
TxACE Best Poster Award: Presented research and won against 30 graduate students	October 2021
Colorado Trail Thru-Hiker: Hiked 500 miles from Denver to Durango, Colorado	August 2021
First Place CometHack: Our thermostat project won first prize	April 2021
National Youth Science Foundation Delegate: Louisiana's State Representative	May 2019
Hall of Fame: Highest honor for my high school (analogous to valedictorian)	May 2019
Eagle Scout: Boy Scouts of America's highest honor	July 2016