

Benjamin W. Walker

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EDUCATION

The University of Texas at Dallas	May 2023
<i>B.S. in Physics and B.S. Electrical Engineering, Minor in Nanotechnology</i>	<i>GPA: 3.92</i>
Northwestern State University	May 2019
<i>Associate's of General Studies</i>	<i>GPA: 3.85</i>
Louisiana School for Math, Science, and the Arts (LSMSA)	May 2019
<i>High School Diploma</i>	<i>GPA: 3.93</i>

FELLOWSHIPS

National Science Foundation Graduate Research Fellowship Program	March 2023
• Three years of full PhD funding with a \$37,000 annual stipend	
Barry Goldwater Scholarship	March 2022
• Most prestigious award for an undergraduate researcher from my work in skyrmion logic devices.	
National Merit Scholarship	March 2019
• Received full-ride scholarship at UT Dallas plus housing and \$28,000 in stipends	

PATENTS

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1. **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

Undergraduate Research Assistant	Oct 2019 – Present
<i>University of Texas at Dallas</i>	<i>Richardson, TX</i>
• Harnessed the properties of magnetic materials to explore and implement beyond-CMOS technologies for Dr. Joseph Friedman's NeuroSpinCompute laboratory	
• Designed micromagnetic skyrmion logic structures and performed Mumax3 simulations using voltage-controlled magnetic anisotropy (VCMA) for skyrmion synchronization and propagation, resulting in highly efficient and quick logic.	
Hardware Engineering Intern	May 2022 – July 2022
<i>Microsoft</i>	<i>Raleigh, NC</i>
• 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 millimeters	
• Created an interpreter between Innovus and Fusion Compiler (FC) for our TCL Physical Design scripts, aiding my team's translation effort	
• Improved the efficiency of my translated floorplanning procedures for a SOC block by over 50%	
Visiting Researcher	Jan 2022 – April 2022
<i>Universidad de Salamanca</i>	<i>Salamanca, Spain</i>
• Designed voltage-driven reversible skyrmion logic circuits to reduce energy consumption by over two orders of magnitude	
• Used parametric modeling in COMSOL to increase electrical efficiency of my micromagnetic device by 70%	
MRSEC Research Experience for Undergraduates	May 2021 – Aug 2021
<i>University of Texas at Austin</i>	<i>Austin, TX</i>
• Fabricated, and tested WSe ₂ -based devices for Dr. Jean Anne Incorvia's Integrated Nano Computing lab	
• Performed tape exfoliation, electron beam lithography (EBL), atomic force microscopy (AFM), and magneto-optic Kerr effect (MOKE) imaging to fabricate and validate device structure and operation	
• Created field-effect transistors (FETs) with ambipolar behavior, demonstrating the valley-Hall effect	
Electrical Engineering Intern	Jan 2021 – Aug 2021
<i>Texas Analog Center for Excellence</i>	<i>Richardson, TX</i>
• 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
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. Paler, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *IEEE Magnetism 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 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, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2023.*
2. X. Hu, **B. W. Walker**, F. Garcia-Sanchez, P. Zhou, J. A. C. Incorvia, A. Paler, M. P. Frank, J. S. Friedman, Logical and Physical Reversibility of Conservative Skyrmion Logic, *Government Microcircuit Applications & Critical Technology Conference*, Mar. 2022.
3. **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 Magnetism Conference & Conference on Magnetism and Magnetic Materials*, Jan. 2022.*
4. **B. W. Walker**, C. Cui, F. Garcia-Sanchez, J. A. C. Incorvia, X. Hu, and J. S. Friedman, Skyrmion Logic with Voltage-Controlled Magnetic Anisotropy Clocking *Texas Analog Center for Excellence Symposium*, Oct. 2021*
5. 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).
6. **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**, 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
2. **B. W. Walker**, X. Li, and J. A. C. Incorvia, "Fabrication and Analysis of WSe₂-based Electronic Devices," *MRSEC REU Poster Presentation*, Jul. 2021
3. **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

AWARDS

Undergraduate Research Scholar Award: Accepted for presentation at UT Dallas	April 2021/2022/2023
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