Benjamin W. Walker

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EDUCATION

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

FELLOWSHIPS

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

Professional Experience

Undergraduate Research Assistant

Oct 2019 – Present

University of Texas at Dallas

Richardson, TX

- 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

Microsoft

Raleigh, NC

- 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

Universidad de Salamanca

Salamanca, Spain

- 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

University of Texas at Austin

Austin, TX

- Fabricated, and tested WSe2-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

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. **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
- 2. 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 Magnetics Letters*, May 2022, *doi*: 10.1109/LMAG.2022.3174514
- 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" *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 Magnetics 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*

Poster Presentations

*Presented In-Person

- 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
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