Benjamin W. Walker

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Education

The University of Texas at Dallas May 2023
Bachelor of Science in Physics and Electrical Engineering, Minor in Nanotechnology *GPA: 3.94*
Full-Ride National Merit Scholarship, Collegium V Honors College

Northwestern State University May 2019
Associate's of General Studies *GPA: 3.85*

Louisiana School for Math, Science, and the Arts (LSMSA) May 2019
High School Diploma *GPA: 3.93*

Professional Experience

Undergraduate Researcher January 2022 – Present
Universidad de Salamanca *Salamanca, Spain*

- Designed ultra-low dissipation reversible skyrmion logic circuits to reduce energy consumption by over two orders of magnitude
- Developing mathematical models to simulate complex micromagnetic devices more efficiently

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

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*

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

Journal Publications

1. **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. 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.

2. **B. W. Walker**, N. Betrabet, J. A. C. Incorvia, A. Paler, C. Moutafis, J. S. Friedman, Skyrmion Logic System for Large-Scale Reversible Computing, *Joint IEEE International Magnetics Conference & Conference on Magnetism and Magnetic Materials*, Jan. 2022.

3. **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

4. 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).

5. **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

1. **B. W. Walker**, X. Li, and J. A. C. Incorvia, "Fabrication and Analysis of WSe2-based Electronic Devices," *MRSEC REU Poster Presentation*, Jul. 2021

2. **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

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
Undergraduate Research Scholar Award: Accepted for presentation at UT Dallas	Feburary 2021
National Youth Science Foundation Delegate: Louisiana's State Representative	May 2019
Hall of Fame: Highest honor for an LSMSA graduate (analogous to valedictorian)	May 2019
National Merit Scholar: Winner of National Merit Scholarship Corporation's scholarship	March 2019
Eagle Scout: Boy Scouts of America's highest honor	July 2016

Academic Projects

Music CheckIn: A Service for Monitoring Music Activity June 2021

- Developed a web service utilizing Amazon Web Services (AWS) to monitor users' Spotify activity and notify their friends about unhealthy listening behavior

EcoStat: A Smarter and More Environmentally Friendly Thermostat April 2021

- Collaborated with team of three to develop smart thermostat using Raspberry Pi and Python that actively calculates the thermal resistance of its environment via simulation to conserve energy
- Won first prize at CometHack 2021 and is the current thermostat for my apartment

Simulation of Cane Toads with Parallel Processing March 2019

- Using MPI for Python, created an agent-based model to simulate the dietary habits of the invasive Cane Toad
- Identified the most efficient form of fencing to minimize ecological damage

Organic Synthesis of Paranitraniline Red January 2019 - May 2019

- Collaborated with a team for a semester in an organic chemistry lab. Used theoretical knowledge of chemistry to pioneer an alternative approach to the standard synthesis pathway which improved yield.

Technical Skills

Languages: Python, C/C++, Bash, MATLAB, Verilog, JavaScript, LaTeX
Frameworks/OS/Applications: AWS, Unix/Linux, LabQuest, PSpice, Mathematica, MS Office, Adobe Suite
Instrumentation: Nanofabrication/Characterization, Physics/Electrical Engineering Laboratories, Organic Synthesis

Community Involvement

IEEE - Head Tutor for Digital Circuits — August 2020 – Present

University of Texas at Dallas

- Tutors students in a variety of electrical engineering courses for 4+ hours per week
- Collaborates with professors and hosts review sessions prior to each test

Society of Physics Students - Secretary — August 2020 – Present

University of Texas at Dallas

- Takes notes and helps run a variety of social and professional events for our SPS chapter

Outdoors Club - President — January 2018 - May 2019

LSMSA

- Founded and ran the Outdoors Club which organized bimonthly hiking and kayaking trips.

Relevant Coursework

University of Texas at Dallas

Condensed Matter Physics (IP)	Electronic Circuits (IP)	Quantum Computing (IP)
Quantum Mechanics I/II (A-/A)	Electromagnetic Engineering (A+)	Modern Physics (IP)
Classical Mechanics (A+)	Electronic Devices (A)	Systems and Controls (A)
Thermo / Statistical Mechanics (A)	Electrical Network Analysis (A+)	Differential Equations (A)
Numerical Methods (A+)	Signals and Systems (A+)	Theoretical Physics (A-)
Nanoscience I/II (A/A-)	Digital Circuits (A+)	Advanced Engineering Math (CR)
Contemporary Physics (A+)	Digital Systems (A+)	Linear Algebra (A)

Northwestern State University

Comparative Neurobiology (B)	Certified Ethical Hacking (A)	Multivariable Calculus (A)
Calculus of Complex Variables (A)	Network Design/Hardware (A)	Theory of Probability (A)

Louisiana School for Math, Science, and the Arts

Ind. Study Tensor Analysis (A)	Mathematical Physics (A)	Organic Chemistry I/II/Lab (A)
Electrodynamics (A)	Graph Theory (A)	Biochemistry (A)
Inorganic Chemistry I (A)	Chaos Theory (A)	Thermochemistry (A)
Quantum Mechanics I (A)	Differential Equations (A)	Intro Chemistry I/II/Lab (A)
Modern Physics/Lab (A)	Calculus I/II/III (A)	Mathematical Modeling (A)
Intro Physics I/II/Lab (A)	Computer Science I (A)	Data Analysis & Visualization (A)