

# NATHAN A. WAGNER

Madison, WI | [LinkedIn Profile](#)

## SUMMARY

- 3.96 cumulative undergraduate GPA towards dual major (UW-Madison, B.S. Math and Physics, Expected May 2026); Math and Physics GPA 4.00 (for 400+ courses)
- Recipient of five national scholarships, including research-oriented Astronaut and Barry Goldwater Scholarships
- Finalist for Hertz Fellowship – 1<sup>st</sup> Round Interview in early January 2026, results pending
- Over four years academic level research experience across three different and non-course related physics projects
- Eight math and physics courses already taken at graduate/advanced level
- Graduate-level physics/math courses currently underway or to be enrolled in next semester: Statistical Mechanics, Theoretical Physics (Dynamics), Elementary Topology, Advanced Solid State Physics, Advanced Quantum Mechanics, Group Theory for Physics and Quantum Information Science
- One first-author manuscript published (*International Journal of Quantum Information*), one additional being prepared for arXiv pre-print and submission to *Physics Review A* or *Quantum* in late January/early February 2026, and another possible theoretical paper (Fermi-Segrè formula analysis) for *American Journal of Physics* in Spring 2026

## EDUCATION

### University of Wisconsin – Madison; Madison WI

*Bachelor of Science, Physics and Mathematics*

*Expected May 2026*

*Cumulative GPA 3.96/4.0*

- Have taken eight math and physics courses (24 credits) at graduate/advanced-level (500-level and above)
- Enrolling in graduate-level classes senior year (Fall 2025 – Spring 2026): Statistical Mechanics, Theoretical Physics (Dynamics), Elementary Topology, Advanced Solid State Physics, Advanced Quantum Mechanics, , Group Theory for Physics and Quantum Information Science

### Madison College, UW-Madison Pathways/Humanities Transfer Program, Madison WI

*Cumulative GPA 4.0/4.0*

*Fall Semester, 2022*

- Completed required humanities/general education courses (5 courses, 15 credits) prior formal UW-Madison start

## RESEARCH EXPERIENCE

### Undergraduate Researcher – Wisconsin Quantum Institute (WQI) – Saffman Group

University of Wisconsin-Madison, Physics Department – Madison WI

September 2021 – Present (*with three-month absence to work at Argonne National Laboratory*)

*Project 1: Benchmarking a Neutral-Atom Quantum Computer; September 2021 – November 2023*

Advisors: Professor Mark Saffman and Assistant Professor Trent Graham

- Developed software-based quantum computing noise simulator and used benchmarked simulator to determine optimum entangled Cesium atom configuration for scalability while maintaining data fidelity
- Tools/Methods: Python, C++, publicly available quantum benchmarking standards, JAX, HTML, public dataset library integrations, Anaconda, JupyterLab, Visual Studio and Visual Studio Code
- Resulted in first-author publication in *International Journal for Quantum Information* and multiple presentations

*Project 2: Robust Optimization of Entangling Gates on a Neutral-Atom Quantum Computer; August 2024 – Present*

Advisors: Professor Mark Saffman, Dr. Jeffrey Larson (ANL), Assistant Professor Matt Otten

- Project continuation started as a SULI intern at Argonne National Laboratory (below)
- Using similar tools and methods summarized below, have performed more advanced automatic differentiation and other analyses to refine results; has also included more detailed comparative analysis to associated international research
- In collaboration with research team, I've led development of first-author paper being prepared being prepared for arXiv pre-print and submission to *Physics Review A* or *Quantum* (late January/early February 2026)

## **RESEARCH EXPERIENCE (CONTINUED)**

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### **Undergraduate Research Intern – Summer Undergraduate Laboratory Internship (SULI) Program**

Argonne National Laboratory (ANL), U.S. Department of Energy (DoE) – Chicago IL

May 2024 – August 2024

*Project: Robust Optimization of Entangling Gates on a Neutral-Atom Quantum Computer*

*Advisors:* Dr. Jeffrey Larson (ANL), Dr. Matt Otten (ANL, project moved to UW-Madison Fall 2024)

- Project goal was to begin determination optimal robust gate design via multivariable qubit entanglement methods in neutral-atom quantum computers
- Using tools/methods below, developed multiple software-based models to model, simulate and test multiple atomic lattice laser trap configurations necessary to optimize entangled qubits (i.e., laser amplitude, frequency, detuning, etc.)
- Tools/Methods: Julia, Python, C++, JAX, HTML, public dataset library integrations, Anaconda, JupyterLab, Visual Studio and Visual Studio Code
- DoE Technical Research Report and end-of-summer presentation at graduate-level research symposium, multiple poster and interim paper presentations sessions since; work carried over to UW-Madison WQI *Project 2* above

### **Undergraduate Researcher – High Energy Physics Group – International CERN-CMS Future Collider Design Collaborative**

University of Wisconsin-Madison, Physics Department – Madison WI

May 2023 – October 2023

*Project: Delphes Studies On Angles of Acceptance*

*Advisors:* Professor Sridhara Dasu and Professor Tulika Bose

- Project goal was to determine viability of future high-energy particle collider collimators (“lenses” that steer particles)
- Used several 3-D modeling, CERN ROOT particle collision datasets, event generation and reconstruction software tools to determine what shape, size and materials could withstand and steer future 15-20 TeV particle collisions
- Determined models likely not viable with known materials; presented results to internal UW-Madison and international collaborative design teams; findings contributed to 2025 *Nature* article discussing future of European exascale collider(s)

## **PUBLICATIONS, MANUSCRIPTS, AND PRESENTATIONS**

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### **Publication**

Wagner N, Poole C, Graham T, Saffman M. “Benchmarking a Neutral-Atom Quantum Computer.” *International Journal of Quantum Information*. arXiv identifier 2311.04141. Published February 17, 2024.

### **Being Finalized For Submission / arXiv Preprint**

Wagner N, Otten M, Larson J, Saffman M. “Robust Optimization of Entangling Gates on a Neutral-Atom Quantum Computer.” Anticipated manuscript submission date – January/February 2026, *Physics Review A* or *Quantum*

### **Under Development**

Wagner, N, Walker, T. “An Analysis of the Fermi-Segrè Formula.” Being considered for the *American Journal of Physics*.

### **Major Presentations**

Wagner, N. “Benchmarking a Neutral-Atom Quantum Computer.” Astronaut Scholarship Foundation Technical Conference, 16 August 2025. Houston, TX.

Wagner, N. “Robust Optimization of Entangling Gates on a Neutral-Atom Quantum Computer,” 2025 Undergraduate Symposium, April 25, 2025. UW-Madison, Madison, WI.

Wagner, N. “Robust Optimization of Entangling Gates on a Neutral-Atom Quantum Computer,” 2024 Graduate Research Symposia, July 30, 2024. Argonne National Laboratory, Lemont, IL. National audience and participation.

Wagner, N. “Benchmarking a Neutral-Atom Quantum Computer,” UW-Madison Physics Department Board of Visitors Annual Meeting, October 13, 2023. UW-Madison, Madison, WI.

Wagner, N. “Delphes Studies On Angles of Acceptance,” International CERN-CMS Future Colliders Design Meeting, August 17, 2023. UW-Madison, Madison WI and via Zoom with Geneva/FermiLab-based CERN/CMS collaborators.

Wagner, N. “Benchmarking a Neutral-Atom Quantum Computer,” 2023 Undergraduate Symposium, April 28, 2023. UW-Madison, Madison, WI.

*Past research artifacts available at: [nwhome.page](http://nwhome.page)*

### **SCHOLARSHIPS AND AWARDS (INCLUDING STATUS OF THOSE IN FINALIST STATUS)**

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- **2026 Hertz Foundation Fellowship – *Finalist Status Pending*** (informed in late November 2025 of my status as Finalist, within top 15% of applicant pool; 1st round interview in early January 2026; results pending)
- **2025 Astronaut Foundation Scholarship** (nationally competitive scholarship recognizing and supporting outstanding undergraduate STEM students who demonstrate exceptional motivation, imagination, and performance in their chosen fields; August 2025 award ceremony in Houston, TX; \$15,000/year)
- **2025 UW-Madison Physics Department Hagengruber Award** (awarded to one UW-Madison physics student per year deemed by Department demonstrating “exceptional promise for a future in physics”; \$10,000/year)
- **2024/2025 Barry Goldwater Scholar for Excellence in Undergraduate Research** (nationally competitive scholarship awarded to outstanding undergraduate STEM students for academic excellence, research experience, and potential for significant contributions in their field; awarded for junior and senior years at \$7,500/year)
- **2024 Optica Bonenfant International Travel Scholarship** (one of two top \$9000/semester named awardees selected nationally; declined for Spring 2025 semester due to research/academic scheduling conflicts)
- **2024 UW-Madison Pulvermacher Scholarship** (\$3,500)
- **2022 SPIROL International Charitable Foundation Scholarship** (\$5,000/year; ongoing)
- **2022 American Nuclear Society (ANS) Freshman Scholarship** (top freshmen award offered nationally; \$3,000)
- **2022 Wisconsin Assoc. of School Business Officials Freshman Scholarship** – Top Award in State of Wisconsin (\$5,000)
- **2022 West High School Senior Scholarship for Academic Excellence** (Freshman Year; \$2,500)

### **SOCIETIES AND MEMBERSHIPS**

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- American Physical Society (APS, 2022 – Present)
- American Mathematical Society (AMS, 2023 – Present)
- American Nuclear Society (ANS, 2022 – Present)
- Optica (formerly Optical Society of America, 2023 – Present)
- Society of Physics Students (SPS, 2023 – Present)

### **LABORATORY SKILLS, ANALYSIS, AND SOFTWARE TOOLS**

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- **Advanced Optics and Atomic Physics:** Laser beam walking with single-mode polarization maintaining optical fiber, laser locking, orientation of wave plates, use of magneto-optical traps for laser alignment and cooling, development of time-sequenced imaging controller for use with laser pulse sequencing and experimental electronic controls, use of acousto-optic modulators (AOMs) and electro-optic modulators (EOMs)
- **Advanced Modern Physics Laboratory Coursework (see above for optics related laboratory coursework):** Experimental setup of gamma-ray spectroscopy, x-ray diffraction, blackbody radiation, Cavendish measurements of gravitational constant
- **Programming Languages and Datasets:** Julia, Python, C++, JAX, HTML, public dataset library integrations, Anaconda, JupyterLab, Visual Studio and Visual Studio Code
- **Analysis:** Mathematica, NumPy/SciPy, Matplotlib, Pandas, TensorFlow, MATLAB
- **Quantum Computing:** QuTiP, Qiskit/Cirq (both used for quantum simulations)
- **High Energy Physics:** ROOT (CERN-based large data set analysis), Pythia8 (event generation), Delphes (event reconstruction), MadGraph (event generation), Whizard (event generation)
- **Modeling:** Geant4 (detector simulation and 3D modeling), SolidWorks (3D modeling), COMSOL (3D modeling)

### **SERVICE AND COMMUNITY ACTIVITIES**

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- Food Distribution Volunteer – Second Harvest Foodbank, Madison WI (2021–Present)
- Conservatory Volunteer – Owen Park, Madison WI (2021–Present)
- Badger Volunteer – Morgridge Center for Public Service [STEM outreach/mentoring to local schools], Madison WI (2023)
- Student Advisory Member – Wisconsin Center for Academically Talented Youth, Madison WI (2021–2023)
- STEM Education Youth Team Lead – Madison Public Schools, Madison WI (2021)