Cordell Umland

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Education

Auburn University, Auburn, AL
Doctor of Philosophy in Physics
Expected May 2031

***St. Norbert College*, De Pere, WI**
Bachelor of Science: Physics
Bachelor of Arts: Mathematics
Graduated May 2025
Major GPA: 3.84 (Physics), 3.66 (Mathematics) | Overall GPA: 3.76

Relevant Experience

DOE Science Undergraduate Laboratory Intern — June 2025 – August 2025

General Atomics/DIII-D National Fusion Facility, San Diego, CA

- Worked with Drs. Raúl Gerrú Migueláñez and Laszlo Horvath on LLAMA diagnostic calibration
  - Developed an analysis method to better understand how the diagnostic degrades throughout a campaign cycle
  - Evaluate changes observed in the LLAMA measurements during reference experiments due to changing wall conditions and diagnostic degradation

NSF Research Experiences for Undergraduates Fellow — June 2024 – August 2024

University of Colorado Boulder, Boulder, CO

- Worked with Dr. Xu Wang on dust charging mechanisms
  - Built a large-scale model of a dust particle microcavity to investigate two dust charging mechanisms: charge pumping and ion lensing
  - Used LabView and the Interface Description Language (IDL) to characterize plasma parameters inside a vacuum chamber with a Langmuir probe

Research Assistant — May 2023 – May 2024

St. Norbert College, De Pere, WI

- Worked with Dr. Erik Brekke on quantum optics research
  - Utilized a Fabry-Perot interferometer to calculate a frequency-to-voltage conversion for two lasers by scanning a Fabry-Perot cavity piezo and a laser piezo
  - Investigated Rydberg excitation through detuned microwave transitions in rubidium resulting in a publication
  - Generated 480nm light through four-wave mixing in rubidium, and experimented with various parameters for overall signal optimization

Research Assistant — May 2022 – July 2022

St. Norbert College, De Pere, WI

- Worked with Dr. Nicholas Mauro on materials science research
    - Prepared samples for experimentation using an arc melter and performed a neutron diffraction experiment at Oak Ridge National Laboratory
    - Performed statistical analysis of metallic glasses simulation data using Python, resulting in a publication

Teaching Assistant — August 2025 – Present
Auburn University, Auburn, AL

- Teach two calculus-based lab sections, including facilitating recitation worksheets, quizzes, and lab activities
- Grade quizzes, lab activities, and exams

Homework Grader – Physics — August 2022 – May 2025
St. Norbert College, De Pere, WI

- Grade twenty-two General Physics student's homework for six hours weekly
- Complete homework problems and create a grading scheme
- Meet weekly with professor to review course content and confirm solutions and grading scheme

Teaching Assistant – Physics — January 2022 – May 2025
St. Norbert College, De Pere, WI

- Assist students in introductory physics courses during set drop-in TA hours
- Prepare to provide homework help and answer questions about course materials

Relevant Skills

- Experience in working on Neutron Electrostatic Levitator at the Spallation Neutron Source at Oak Ridge National Laboratory
- Familiarity working with an arc melter for making alloys for materials science research
- Experience in vacuum systems, including rough and turbo pumps, backfilling, and valve systems
- Experience in the setup and alignment of optical equipment
- Skilled in using a Fabry-Perot cavity to determine laser frequencies
- Experienced in Python for data analysis, computational modeling, plotting, and fitting
- Conversant in Arduino IDE for data acquisition and process automation
- Conversant in C++ for object-oriented programming
- Experience in building, testing, and analyzing digital and analog circuitry, including soldering for electronics hardware
- Conversant in Overleaf for writing scientific papers and research articles

Publications

- José H. Pagán Muñoz, Xu Wang, Mihály Horányi, Cordell Umland, Vladimir Kvon, Luuk Heijmans, Manis Chaudhuri, Mark van de Kerkhof, Andrei M. Yakunin, Pavel Krainov, Dmitry Astakhov; Charging mechanisms of dust on a surface at different neutral pressures. *Phys. Plasmas* 1 August 2025; 32 (8): 083702. https://doi.org/10.1063/5.0279838
- E. Brekke and C. Umland, "Rydberg excitation through detuned microwave transition in rubidium," J. Opt. Soc. Am. B 40, 2758-2761 (2023) https://doi.org/10.1364/JOSAB.502442
- F. Z. Chen, K. Ruhland, C. Umland, S. M. Bertrand, A. J. Vogt, K. F. Kelton, and N. A. Mauro, "Structural evolution in Au- and Pd-based metallic glass forming liquids and the case for

improved molecular dynamics force fields", J. Chem. Phys. 157, 194501 (2022) https://doi.org/10.1063/5.0123907

Presentations

- Evaluating LLAMA Degradation Throughout a Campaign
  - Presented at the 2025 General Atomics/DIII-D SULI Student Poster Presentation on August 6, 2025
- Effects of Plasma on Electron-Beam-Induced Dust Microcavity Charging on a Surface
  - Presented at the Student Presentation Symposium as part of the 2024 Physics REU Program University of Colorado Boulder on August 4, 2024
- Generation of a New Laser through Atomic Interactions in Rubidium
  - Presented at the Student Undergraduate Research Forum at St. Norbert College on April 27, 2024
- Laser Frequency Control and Atom-Light Interactions
  - Presented at a Physics Student Seminar at St. Norbert College on April 4, 2024
- Laser Calibration Using a Fabry-Perot Cavity
  - Presented at the 2023 Summer Undergraduate Research Forum at St. Norbert College on August 31, 2023
- Investigating the Flow Behavior in a Radial Gate/Crump Weir System
  - Presented at Student Undergraduate Research Forum at St. Norbert College on April 28, 2023

Leadership

St. Norbert College Society of Physics Students September 2021 – May 2025

- Vice President, 2024 - Secretary, 2023
  - Helped organize nine club events
  - Partnered with three area schools to give physics demonstrations and help foster scientific thinking

Residential Assistant August 2022 – May 2025

- Contribute to supervising residents and responding to complaints, reports, requests, and emergencies
- Create door decorations and bulletin boards as well as plan community-building programs for fifty-three upper-class residents in an upper-classmen residence hall

Honors and Awards

- St. Norbert College Winter 2024 Student-Faculty Collaborative Grant for Research, Scholarship, and Creative Activities "Generation of 480 nm Light through Four-Wave Mixing in Rubidium"
- St. Norbert College Distinguished Trustee Scholar, 2021-Present
- Dean's List (Fall 2021 – Spring 2022, Spring 2023 – Spring 2025)

Relevant Coursework

Physics:

Graduate:

- Classical Mechanics
- Statistical Mechanics
- Electricity and Magnetism 1
- Quantum Mechanics 1

- Graduate Physics Teaching Seminar
- Graduate Physics Research Seminar

Undergraduate:

- Electricity and Magnetism
- Quantum Mechanics
- Atomic and Optical Physics
- Thermal Physics
- Modern Physics
- Advanced Laboratory
- Classical Mechanics, including computational laboratory
- Electronics (Analog and digital circuits)
- Physics of Metals (Independent Study, Spring 2022)
- Pd/Au-Si Analysis and Arc Melter Work (Directed Research, Fall 2022)
- General Physics 1 & 2

Mathematics:

Graduate:

- Fundamentals of Physics: Math Methods
- Numerical Analysis

Undergraduate:

- Mathematical Modeling
- Real Analysis
- Advanced Foundations of Mathematics
- Methods of Applied Mathematics
- Introduction to Fluid Mechanics
- Differential Equations
- Linear Algebra
- Calculus & Analytical Geometry 3
- Calculus & Analytical Geometry 2
- Calculus & Analytical Geometry 1

Computer Science:

- Software Engineering and Elementary Data Structures

Chemistry:

- General Chemistry 1

Other

- Graduate Physics Teaching Seminar
- Graduate Physics Research Seminar