THEODORE WECKER

twwecker (at) gmail (dot) com • linkedin.com/in/theodore-wecker/ • twecker.com

EDUCATION

Northwestern University — Evanston, IL
Master of Science in Physics — 2025

Bowdoin College — Brunswick, ME
Bachelor of Arts in Physics — 2022

RESEARCH & PUBLICATIONS

Northwestern University | Research Thesis, Master of Science | 2024-2025
Title: *Classical Observables in the Limits of Quantum Field Theory for 3-Body Dynamics*
Advisor: John Joseph Carrasco

- Calculated a generating function for classical observables using modern scattering amplitudes techniques in scalar quantum chromodynamics and gravity to improve computational astrophysics simulations of three-body black hole dynamics and gravitational wave emission
- Systematically constructed quantum effective field theories designed to model bound state dynamics and radiation emission constructed from case studies in scalar quantum electrodynamics
- Communicated results to field-leading experts through a seminar and written thesis

Bowdoin College | Undergraduate Honors Research Project | 2021-2022
Title: *Relations between four-point amplitudes in N=4 supersymmetric Yang-Mills theory and N=8 supergravity at one, two, and three loops*
Advisor: Stephen Naculich

- Contributed to research in multi-loop scatting amplitudes, verifying a conjectured relationship between N=4 supersymmetric Yang-Mills and N=8 supergravity at the three-loop level
- Developed custom computational workflows in Wolfram Mathematica to streamline symbolic manipulation, and calculation

Publication: Proof of a three-loop relation between the Regge limits of four-point amplitudes in N=4 SYM and N=8 supergravity, *JHEP* 07 (2022) 043 [arXiv:2204.02417] [INSPIRE]

PROJECTS

Northwestern University | Coursework Research Paper, Magnetic Monopoles | 2025
- Collaborated with other graduate students on a research investigation of magnetic monopoles
- Demonstrated a Lorentz covariant derivation of Maxwell's equations allowing for magnetic source terms
- Researched condensed matter systems whose behaviors emulate magnetic monopoles

Northwestern University | Coursework Research Paper, Scalar QED to Quantum Optics | 2025
- Presented a derivation of Schrödinger Dynamics as emergent in the non-relativistic limit of Scalar Quantum Electrodynamics, drawing connections to methods used in quantum optics experiment
- Delivered a presentation to peers and a written 8-page research paper

Bowdoin College | Computational Physics Modeling in Python | 2022
- Collaboratively developed Python code for modeling physical phenomena, statistical analysis, and data visualization. Delivered Jupyter notebook writeups and research paper-type submissions
- Simulated 2D quantum Ising model, obstructed fluid flow, traffic shocks, and neutron star gravitation

Bowdoin College | Experimental Physics Investigations | 2022

- Designed & conducted experiments related to radioactivity, superconducting materials, engineering, and classical mechanics. Deliverables include written research paper-type submissions
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Personal Website | twecker.com | 2024

- Created a website for personal and professional development using CSS and HTML

Teaching Experience

Cate School | Faculty Member | Physics and Mathematics Instructor | 2023 - 2024

- Coordinated and collaborated across teaching teams in physics, chemistry, biology, and calculus
- Coached water polo and soccer, facilitating human development, leadership, and sportsmanship education
- Courses: 9th Grade Physics, "Probability, Statistics, and Calculus" elective, Advanced Physics (substitute)

Millbrook School | Faculty Member | Mathematics Instructor | 2022 - 2023

- Planned curriculum and created course materials independently
- Engaged in professional development opportunities related to STEM education
- Courses: Geometry, Pre-Calculus

Bowdoin College | Undergraduate Learning Assistant and Grader | 2020 - 2022

- Led weekly office hours and graded assignments for Introduction to Physics II
- Worked closely with teaching faculty and peers to ensure consistent expectations

Tutoring in Mathematics and Physics | 2020 - Present

- Supported the learning of students in high school and college through weekly tutoring in Algebra I, Geometry, Algebra II, Pre-Calculus, Calculus I, High School Physics, Undergraduate Quantum Mechanics

Outreach & Volunteering

Northwestern University | Physics & Astronomy Graduate Student Leadership | 2025

- Volunteer member of Physics Masters Student Committee
- Supported MS students acting as liaison between students and faculty, collecting and communicating student feedback, and planning events.

Skills

Programming Experience: Python (NumPy, SciPy, Qiskit), Wolfram Mathematica, LaTeX, Git, CSS/HTML

Soft Skills: Technical writing, cross-disciplinary collaboration, scientific & technical communication, leadership, decision making under pressure, high-precision workflows

Conceptual Areas: Quantum mechanics, electromagnetism, statistical mechanics, astronomy, classical mechanics, classical field theory, linear algebra, differential equations, statistics, complex analysis, machine learning

Certifications

Federal Aviation Administration Certifications

- Private Pilot | 14 CFR Part 61 | 2018
- Instrument Rating | 14 CFR Part 61 | 2020
- Drone Pilot | 14 CFR Part 107 | 2025

PADI Certification

- Advanced Open Water Diver | 2016