BRADEN K. OH, CV

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ACADEMIC HISTORY

- **Olin College of Engineering** - B.S. Engineering: Physics, anticipated graduation: May 2023
  - GPA: 3.95/4.0 (Fall 2022)
- **La Canada High School** - High School Diploma, June 2017
  - Academic GPA: 4.61/4.0

RESEARCH EXPERIENCE

Olin Satellite + Spectrum Technology & Policy Group, Research Team Lead — Aug 2020-present
Satellite systems and telecommunications research laboratory

- **Currently:** Writing MATLAB-based tool for evaluating megaconstellation compliance with FCC interference regulations by performing dynamic interference-to-noise (I/N) calculations.
- **Previously:**
  - Wrote radiation mitigation plan and shielding requirements for the multi-university SWARM-EX CubeSat by building radiation environment model and performing total ionizing dose analysis.
  - Collaborated with NASA experts to develop the first framework for estimating single event effect (SEE) rates in CubeSats and published the framework at the Small Satellite Conference.
  - Secured in-kind donation of wire harnessing components from Glenair Inc., designed spacecraft interconnect harness, and wrote accompanying system diagrams.
  - Wrote Python analysis software with GUI to calculate link budget and power flux density of orbital spacecraft transmitters.
  - Conceived, manufactured, and experimentally tested a novel method for affixing deployable CubeSat solar panels without fasteners.
  - Verified OneWeb's constellation compliance with FCC regulations by performing static I/N calculations and co-authored a paper reporting the findings.
  - Delivered orbital debris assessment report and accompanying NASA DAS re-entry simulation for SWARM-EX.

Student-Directed Hall Effect Thruster Research Group Lead
Self-directed undergraduate team developing Hall thrusters and heaterless cathodes

- Founded and lead undergraduate research group.
- Lead-authored award-winning paper published by ASEE in 2020 and follow-on paper presented at the International Electric Propulsion Conference in 2022.
- Secured funding, academic, and laboratory resources from NASA, MIT, Busek Co., Draper Labs, C. Lal Alloys, the Massachusetts Space Grant, and the Babson Olin Wellesley (BOW) Consortium.
- Wrote institutionally-approved project curriculums to engage students from other institutions.
- Fabricated hardware by hand in Olin College machine shop and materials science labs.
- **Heaterless Cathodes (2022 academic year)**
  - Assembled a team of 7 students from Olin, Wellesley, Brandeis, and the University of Virginia.
  - Designed and manufactured a turbopump based high-vacuum chamber for cathode testing.
  - Secured funding from Draper Labs and the Massachusetts Space Grant.
  - Coordinated literature review and design/manufacturing activities.
  - Currently designing and manufacturing a heaterless cathode prototype.
- **50mm Electromagnet Hall Thruster (2021 academic year)**
  - Assembled a team of 6 students from Olin, Wellesley, and Brandeis University.
  - Secured a BOW Presidential Innovation Grant to fully fund thruster development.
  - Designed and manufactured a 300W Hall effect thruster.
  - Developed and patented a novel 3D printed propellant diffuser.
  - Performed live-fire tests at the MIT Space Propulsion Lab in May 2022.
- **19.5mm Permanent Magnet Hall Thruster (Fall 2018)**
  - Founded a team of 4 Olin College students and faculty advisor.
  - Created all CAD models and manufacturing diagrams.
  - Manufactured cathode and Boron Nitride components in Olin's machine shop.

PUBLICATIONS

- **Interference-to-Noise (I/N) Compliance Validation of Telesat, OneWeb and SpaceX's 2020 Ka-Band NGSO FCC Processing Round Applications** *(upcoming)*
  – Proceedings of the AIAA SciTech Forum and Exposition, accepted into Jan 2023 conference.
- **CubeSat Radiation Hardness Assurance Beyond Total Dose: Evaluating Single Event Effects**
  – Proceedings of the AIAA/USU Small Satellite Conference (SSC), *lead author*, 2022.
- **Design, Fabrication, and Testing of an Undergraduate Hall Effect Thruster**
  – Proceedings of the 37th International Electric Propulsion Conference (IEPC), *lead author*, 2022.
  – **Under peer review by the Journal of Electric Propulsion*, per IEPC 2022 recommendation.
- **Coordinating Development of the SWARM-EX CubeSat Swarm Across Multiple Institutions**
  – Proceedings of the AIAA/USU Small Satellite Conference (SSC), *second author*, 2021.
- **Undergraduate Demonstration of a Hall Effect Thruster: Self-Directed Learning in an Advanced Project Context**
  – Proceedings of the American Society of Engineering Education Annual Conference, *lead author*, 2020.
  – Earned the Aerospace Division Distinguished Student Paper Award.

CONFERENCE PRESENTATIONS

- **2023 AIAA SciTech Forum** *(upcoming)*
  – Interference-to-Noise (I/N) Compliance Validation of Telesat, OneWeb and SpaceX's 2020 Ka-Band NGSO FCC Processing Round Applications, *oral*, 2023.
- **35th AIAA/USU Small Satellite Conference (SSC)**
  – CubeSat Radiation Hardness Assurance Beyond Total Dose: Evaluating Single Event Effects, *poster*, 2022.
- **37th International Electric Propulsion Conference (IEPC)**
  – Design, Fabrication, and Testing of an Undergraduate Hall Effect Thruster, *oral*, 2022.
- **2022 CubeSat Developers Workshop (CDW)**
  – 3U CubeSat Hinge Design and Analysis for Dual Deployable Solar Panels, *poster*.
  – Analysis of Single Event Effects in Small Satellites, *poster*.

PATENTS

- **Additively Manufactured, Azimuthal Gas Diffuser for Hall Thrusters**
  – US Provisional Patent Application No. 63/340566, filed May 11, 2022.

AWARDS & SCHOLARSHIPS

- **Olin Scholarship** — Half-tuition merit scholarship awarded by Olin College in 2017.
- **Massachusetts Space Grant Undergraduate Research Awards** — Funding awards for research in 2021 and 2022.
- **BOW Consortium Presidential Innovation Grant** — Funding grant awarded by the Babson-Olin-Wellesley College Consortium for the 2021-22 Hall thruster research project.
- **ASEE 2020 Aerospace Division Distinguished Student Paper Award** — Awarded by the American Society of Engineering Education (ASEE) in 2020. See publications section for paper details.
- *Co-Chair,* **SIGBOVIK 2022** — Co-chair of Carnegie Melon University's SIGBOVIK conference. Held online, April 2022.
- **BSA Eagle Scout** - Awarded by the Boy Scouts of America, December 2012

SOCIETIES & ASSOCIATIONS

- *Member,* **Electric Rocket Propulsion Society** — 2022-present.
- *Student Member,* **American Association of Aeronautics and Astronautics (AIAA)** — 2021-present.
- *Student Researcher,* **Olin Satellite + Spectrum Technology & Policy Group** — 2021-present.
- *Founding Member,* **Olin Rocketry** — 2017-2021.

WORK & ACADEMIC EXPERIENCE

Blue Origin, Student Engineering Team Subject Lead — Sep 2022-present
Olin College senior capstone team developing rocket assembly tools for Blue Origin

- Designing lift and transport system to assist technicians moving heavy batteries to laboratory and installation locations.
- Performing analyses to drive system requirements, such as high-torque motor requirements.

Busek Co. Inc., Electric Propulsion R&D Intern — May 2022-present
Hall effect thruster and cathode plasma source research and development internship

- Studied principles of hollow, inductively coupled plasma, and electron cyclotron resonance cathodes.
- Coordinated partnership with Olin College materials science laboratory for testing and consulting.
- Conducted live-fire Hall thruster and cathode testing and operated high-vacuum chambers.
- Assisted mechanical design of laboratory model cathodes by designing hardware, drafting manufacturing drawings, and assembling manufactured hardware.
- Designed and conducted material experiment to investigate root cause of thruster hardware failure.
- Assisted acquisition of high-resolution handheld 3D scanner by conducting purchasing, acquisition, and training activities for COTS systems.
- Collected 3D scan data of channel wall erosion in thrusters subject to lifetime testing.

Olin College, Course Assistant — Jan 2022-present
Teaching assistant for core academic classes

- **Thermodynamics & Transport Phenomena:** Lead weekly recitation-style support sessions outside of scheduled class time to assist students in problem sets, projects, and exams.
- **Astronomy & Statistics:** Created a structured project and lecture to teach Monte Carlo simulation of spacecraft radiation effects; support students through the process of literature reviews, technical writing, and computational data processing and interpretation in small group settings during and outside of class periods.

Operation Underground Railroad (OUR), Volunteer — Jul-Dec 2020
Pro-bono computer programming for a nonprofit that fights child trafficking

- Delivered Python GUI tool and portable touch-screen server to help untrained operatives back up terabytes of media and evidence files to the cloud.
- Wrote JavaScript software tool to visualize internal OUR operational and statistical data on an interactive map.

NASA Jet Propulsion Laboratory — Summers 2017 & 2018
Systems engineering internships on robotic NASA flagship missions to Mars and Europa

- **Mars 2020/Perseverance Entry Descent & Landing Intern (2018)**
  – Wrote and performed flight software system V&V procedures in a flight system hardware testbed.
  – Developed automation capabilities for Entry, Descent, and Landing (EDL) simulation engines.
  – Delivered Python scripts to perform autonomous state configuration of a simulated spacecraft and documentation for all source code, in addition to software test procedure and anomaly report.
- **Europa Fault Protection Intern (2017)**
  – Wrote JavaScript based interactive data visualization software to aid in fault tree analysis (FTA).
  – Analyzed the use of SysML as a tool to model spacecraft fault protection systems.
  – Wrote high-level FTA templates used by Europa Clipper, Europa Lander, and Psyche missions.
  – Delivered SysML training document and cost/benefit analysis, standalone visualizer application and source code, and Excel FTA templates for four mission phases.

NASA CubeQuest Challenge, Team Lead & Systems Engineer — 2014-2017
Centennial Challenge program commissioning teams to build CubeSats capable of achieving lunar orbit

- Founded and led a team of ∼40 high school students from across the country.
- Secured ∼$650,000 of in-kind support and eventual merger with MIT team.
- Lead-authored a technical design document package submitted to first CubeQuest tournament.
- Trade-studied COTS CubeSat propulsion and optical communication technologies and led subsystem design teams.
- Coordinated product acquisition and shipping efforts for crowdfunding campaign.

SKILLS & CERTIFICATIONS

Laboratory	Instron tensile testing machines; vacuum chamber design and operation; live cathode and Hall thruster testing, including recording power supply data; analog instrumentation, including calibration curves.
Software	Python; MATLAB; LTspice; LaTeX; NASA DAS; TRAD OMERE; software documentation.
Fabrication	Rapid prototyping w/ laser cutter and FDM/SLA/DMLS 3D printers; basic machine shop and sheet metal tools; manual & CNC mill; manual & CNC plasma cutting; MIG welding; brazing.
CAD	Fusion 360 CAD/CAM, Solidworks, Autodesk Inventor Certified User.
Certifications	FCC ham radio General license (2022); STK L1 (2021); LDS Bishop's Storehouse system certification for forklift operation (2020); NASA JPL certifications for radiation (2018) and ESD environments (2017).

NOTABLE SELF-DIRECTED PROJECTS

White papers and/or video clips available at *vaguesalutations.github.io*

- **Estimating the Probability That the Explosion of an Ink Sphere Produces a Dictionary**
  – Developed a computational approach for evaluating enormous factorials with mathematicians at Texas A&M and Brigham Young Universities to establish the first estimate for the probability of an explosion printing a dictionary. Published by Olin College Frankly Speaking, November 2022.
- **Solving Double Execution of Java's paint() Method by Counting to the Heat Death of the Universe**
  – Led 20-author collaboration to publish methods for counting down to the heat death of the universe in 36 computer languages at the Carnegie Mellon University SIGBOVIK conference, April 2022.
- **Cat Toy Laser-based Free Space Optical Communications Link**
  – Designed analog transmitter and receiver circuits for extracting binary data encoded in an amplitude-modulated pet store laser and wrote supporting waveform encoder/decoder scripts in Python.
- **Free-falling RC Car Attitude Control System**
  – Developed PID control system for a RC car that used quad-copter motors to spin 3D-printed reaction wheels during free fall, enabling the car to land flat on its wheels.
- **Carbon Fiber Rocket Body Tube Winder**
  – Built power and command bus for a carbon fiber filament tube winder and manufactured ∼30g tubes with diametric compressive yield strengths exceeding 5.5 MPa.