BRADEN K. OH, CV

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ACADEMIC HISTORY

- **Olin College of Engineering** - B.S. Engineering Physics, anticipated graduation: May 2023
  - *Olin Scholarship*: Half-tuition, four-year merit scholarship
  - *Societies*: Olin Rocketry (co-founder), Olin Satellite + Spectrum Technology & Policy Group
  - GPA: 3.94/4.0
- **La Canada High School** - High School Diploma, June 2017
  - Academic GPA: 4.61/4.0

AWARDS & HONORS

- **Massachusetts Space Grant Undergraduate Research Awards** — Spring, Summer, Fall, 2021; Summer, Fall 2022.
- **Co-Chair, SIGBOVIK 2022** - Co-chair of Carnegie Melon University's SIGBOVIK conference. Held online, April 2022.
- **BOW Consortium Presidential Innovation Grant** — Full funding grant for 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.
- **BSA Eagle Scout** - Awarded December 2012

- **Member, American Association of Aeronautics and Astronautics (AIAA)** — 2021-present.
- **Member, Electric Rocket Propulsion Society** — 2022-present.

TECHNICAL EXPERIENCE

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

- Studied principles of hollow, inductively coupled plasma (ICP), and electron cyclotron resonance (ECR) cathodes.
- Performed mechanical design activities for laboratory model cathodes including designing hardware, drafting manufacturing drawings, and assembling hollow, ICP, and ECR cathodes.
- Operated vacuum chambers to conduct live-fire thruster and cathode testing.
- Designed and conducted material science experiment to investigate root cause of thruster hardware failure.
- Coordinated partnership with Olin College materials science laboratory for experimental testing and consulting.
- Performed trade study of commercially available high-resolution handheld 3D scanners and conducted purchasing, acquisition, and training activities for a 3D scanning system.
- Collected 3D scan data to study channel wall erosion in various Hall effect thrusters subject to lifetime duration testing.

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

- **Currently:** Leading a team performing rate calculations and developing mitigation strategies for radiation-induced single event effects in avionics on board the multi-university SWARM-EX CubeSat mission.
- **Previously:**
  - Designed, manufactured, and strength tested a solder-based electro-mechanical joint for affixing the circuit boards of CubeSat dual-deployable solar panels directly to structural hinges and without fasteners.
  - Contacted and secured in-kind donation of spacecraft wire harnessing components from Glenair Inc. for SWARM-EX; designed spacecraft interconnect harness and wrote accompanying system diagrams.
  - Built radiation environment model, performed total ionizing dose (TID) analysis, and wrote mitigation plan that included avionics shielding requirements for SWARM-EX.
  - Conducted interference-to-noise (I/N) compliance validation calculations for the OneWeb satellite constellation; co-authored a paper reporting the results of I/N compliance calculations for multiple satellite constellations.
  - Delivered orbital debris assessment report and accompanying NASA DAS re-entry simulation for SWARM-EX.
  - Wrote a Python link budget and power flux density (PFD) calculator for orbital spacecraft; later worked on a team to develop an interactive GUI for the tool.

Olin College, Hall Effect Thruster Research Group Lead
Undergraduate team developing electric/plasma based in-space propulsion engines

- Founded and lead undergraduate research group developing Hall effect thrusters (HETs) and hollow cathodes.
- Wrote independent study curriculums that incorporated topics across physics, electrical and mechanical engineering, computational modeling, and manufacturing.
- Conducted analyses to determine crucial design parameters, such as combining physics principles to derive a discrete estimate for the mean free path of propellant atoms prior to ionization via electron bombardment.
- Initiated and conducted all correspondence with experts from NASA, MIT, and Busek Co; secured all funding, in-kind, and laboratory resources.

- **Current: 50mm Electromagnet Hall Thruster (Fall 2021-present)**
  – Assembled multidisciplinary team of 6 students from Olin and Wellesley Colleges and Brandeis University.
  – Lead-authored a BOW Presidential Innovation Grant proposal that won full funding ($2,566).
  – Lead-authored research paper abstract submitted in Nov. 2021 to the International Electric Propulsion Conference.
  – Coordinated live-fire testing operations in the MIT Space Propulsion Lab, scheduled for early 2022.
- **Previous: 19.5mm Permanent Magnet Hall Thruster (Fall 2018)**
  – Founded a multidisciplinary team of 4 Olin College students and faculty advisor.
  – Created all CAD models and manufacturing diagrams.
  – Coordinated external manufacturing of metallic components with engineers at C. Lal Alloys.
  – Manufactured cathode and collaboratively manufactured Boron Nitride components in Olin's machine shop.
  – Lead authored an award-winning paper published by ASEE in 2020.

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 verification test 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 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 for lab-wide use (used by Europa Clipper, Europa Lander, and Psyche mission teams).
  – 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.
- Trade-studied COTS CubeSat propulsion and optical communication technologies and led subsystem design teams.
- Lead-authored a technical design document package submitted to first CubeQuest tournament.
- Coordinated product acquisition and shipping efforts for crowdfunding campaign.
- Secured approximately $650,000 of in-kind support and eventual merger with MIT team.

PUBLICATIONS

4. **CubeSat Radiation Hardness Assurance Beyond Total Dose: Evaluating Single Event Effects**
   – Proceedings of the AIAA/USU Small Satellite Conference (SSC), *lead author*, 2022.
3. **Design, Fabrication, and Testing of an Undergraduate Hall Effect Thruster**
   – Proceedings of the 37th International Electric Propulsion Conference (IEPC), *lead author*, 2022.
2. **Coordinating Development of the SWARM-EX CubeSat Swarm Across Multiple Institutions**
   – Proceedings of the AIAA/USU Small Satellite Conference (SSC), *second author*, 2021.
1. **Undergraduate Demonstration of a Hall Effect Thruster: Self-Directed Learning in an Advanced Project Context**
   – Proceedings of the American Society of Engineering Education Virtual Annual Conference, *lead author*, 2020.
   – Earned the Aerospace Division Distinguished Student Paper Award.

- **Solving Double Execution of Java's** paint() **Method by Counting Down to the Heat Death of the Universe**
  – Proceedings of the Carnegie Mellon University SIGBOVIK conference, *lead author*, 2022.

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, *poster*, 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*.

SUBMITTED WORKS

- **Interference-to-Noise (I/N) Compliance Validation of Telesat, OneWeb and SpaceX's 2020 Ka-Band NGSO FCC Processing Round Applications**
  – AIAA SciTech 2023, *paper submitted May 2022.*

PATENTS

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

NOTABLE SELF-DIRECTED COURSE PROJECTS

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

- **Cat Toy Laser-based Free Space Optical Communications Link**
  – Designed and built analog transmitter and receiver circuits and wrote waveform encoder/decoder scripts in Python for an amplitude-modulated laser radio that transmits data using a red laser purchased at a pet store.
- **Free-falling RC Car Attitude Control System**
  – Developed a PID control system for a remote controlled car that uses quad-copter motors to spin 3D-printed reaction wheels which spin while the car is in free fall, leveling the car to land flat on its wheels.
- **Carbon Fiber Rocket Body Tube Winder**
  – Built the power and command bus and co-designed the control algorithm for a single-axis, dual-motor carbon fiber filament winder capable of winding small rocket body tubes at specific helical angles.
  – Manufactured and strength tested carbon fiber tubes at helical angles of 10°, 25°, and 40° under a diametrically applied compressive load; yield strengths for ∼30g tubes exceeded 5.5 MPa.

SKILLS

Laboratory Instron tensile testing machines; vacuum chamber operation; live Hall thruster testing; JPL certifications for ESD (summer 2017) and radiation environments (summer 2018), LDS Bishop's Storehouse system certification for forklift operation (fall 2020).

Software Python; MATLAB; LTspice; LaTeX; STK L1 Certified; 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 Drafting manufacturing drawings, Fusion 360 CAD/CAM, Solidworks, Autodesk Inventor Certified User.