

# BENJAMIN CULMER

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<https://benjamin-culmer.github.io>

## EDUCATION

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**University of Pennsylvania**, Philadelphia, PA

*Master of Science in Engineering, Fluid Mechanics Concentration*

**September 2022 – Present**

GPA 3.77/4.0

**Dartmouth College**, Hanover, NH

*Bachelor of Engineering, Mechanical Concentration*

**September 2016 – June 2020**

Major GPA 3.35/4.0

*Bachelor of Arts, Engineering Science*

GPA 3.29/4.0

## EXPERIENCE

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**WD Lab Grown Diamonds, Beltsville, MD**

*Mechanical Design Engineer for Research and Development Group*

**Part-Time August 2022 – Present**

**Full-Time June 2021 – August 2022**

- Designed modifications to custom chemical vapor deposition chambers (CVD) using SolidWorks (CAD)
- Created drawings including Geometric Dimensioning & Tolerancing (GD&T) principles
- Reviewed new engineer's drawings and designs prior to manufacturing and testing
- Communicated with machine shops, negotiated quotations, and had custom parts manufactured based on drawings
- Designed and executed experiments to improve equipment and infrastructure
- Introduced 3D Printing to the company resulting in rapid prototyping and cost-effective parts
- Managed data migration to Product Data Management (PDM) software
- Troubleshoot equipment malfunctions and designed solutions to prevent malfunctions
- Coordinated with vendors to perform simulations optimizing pre-existing designs
- Designed mechanical solutions to achieve simulation results
- Optimized the maintenance department by providing them with updated tools, techniques, and a new task prioritization order
- Trained employees on equipment functionality
- Reviewed standard operating procedures as the mechanical subject matter expert

**Merck & Co. (AllSource PPS), Harrisonburg, VA**

*Associate Specialist Engineering (Operations Engineer) V590, V591, MK7110 (Covid-19 vaccines and therapeutic projects)*

**July 2020 – May 2021**

- Researched, authored, and peer-reviewed standard operating procedures (SOP) for factory equipment and facilities operation
- Conducted a Personal Protective Equipment (PPE) hazard analysis for the MK7110 manufacturing process
- Contributed to facility and equipment commissioning and qualification walk-downs for factory preparation
- Analyzed numerous Plumbing and Instrument Diagrams (P&ID) for equipment and facility tracing
- Studied and presented process descriptions to team members after project changes
- Instructed and trained team members on equipment use
- Handled hazardous chemicals and responded to hazardous chemical spills
- Troubleshoot and corrected issues in real time on the factory floor
- Diagnosed, recorded, and reported defects on equipment in a clean room
- Executed published documents on the factory floor to aid in process development

**University of Pennsylvania School of Medicine, Philadelphia, PA**

*Research Assistant for the Penn PET Explorer (First Full-Body PET Scanner)*

**June 2019 – August 2019**

**December 2018 – March 2019**

- Assembled and wired an entire PET scanner from the ground up to learn about the system and build a product
- Diagnosed and repaired unknown defects in components through trouble shooting and testing using Linux
- Developed procedures and produced documentation for manufacturing and testing the Explorer
- Instructed others on manufacturing procedures, defined tasks, and delegated work
- Engineered and manufactured a method for safely mixing radioactive materials in an artificial body using SolidWorks (CAD)

**Dartmouth College, Thayer School of Engineering, Hanover, NH**

*Research Assistant*

**March 2019 – June 2019**

- Researched alternative methods and materials to use in an artificial kidney system and preformed a cost-benefit analysis
- Created 3D models of kidney systems from CT scans using Mimics software
- Built parts of the artificial kidney system and wrote a procedure for building future parts

*Teaching Assistant*

**September 2019 – November 2019**

- Graded homework for Dartmouth's course in Applied Mechanics: Dynamics

**Kellogg, Hansen, Todd, Figel & Frederick, PLLC, Washington, DC**

*Intern for the Litigation Division*

**June 2017 – July 2017**

- Searched for evidence in up to 1,000 emails per day during the discovery phase of legal cases
- Wrote memoranda for Associates and Partners presenting findings and documentation on information found in discovery
- Attended case interviews with potential witnesses and took notes

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## HIGHLIGHTED SKILLS

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- Programming languages: ANSI C, MATLAB, and VHDL
- Computer-Aided Design Software: SolidWorks (CSWA Certified), xDesign, Product Data Management
- Distributed Control System: DeltaV
- Foreign languages: German (7 years in school and 6 weeks in Germany as an exchange student)

## ENGINEERING PROJECTS AT DARTMOUTH COLLEGE

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### Numerical Lifting Line Theory, Aerodynamics, individual

Fall 2022

- Wrote a MATLAB script to evaluate the performance of a wing with two propellers using numerical lifting line theory

### Panel Method, Aerodynamics, individual

Fall 2022

- Wrote a MATLAB script to calculate the angle of attack vs. coefficient of lift curve for symmetric and cambered thin airfoils
- Wrote a MATLAB script to calculate the lift generated by and the flow field around a system of symmetric thin airfoils

### Marine Chronometers, Computer-Aided Mechanical Engineering Design, group

Spring 2020

- Designed both a complete working marine chronometer and all its components in xDesign (CAD)
- 3D printed the marine chronometer using PLA, achieving  $\pm 1$  second precision over 10 seconds
- Voted group leader: communicated with TAs, divided work, assigned tasks, troubleshot issues, and managed overall assembly
- Created the overall design of the chronometer, building a modular aesthetically pleasing displayable product
- Earned an award for designing a chronometer with the “most risky, cutting edge, and out of the box design innovations”

### Microplate Gripper, Engineering and Design Methodology, group

Fall 2019

- Designed and hand built a gripping mechanism to pick up microplates from a drone with a 5mm sphere of uncertainty
- Designed two test stands to simulate drone flight to test the gripping mechanism
- Created parts in SolidWorks (CAD), modified them with Finite Element Analysis (FEA), and improved upon testing failures
- Presented progress of project to board of advisors and sponsoring company

### Robot Project, Mechanical Design, group

Fall 2019

- Designed a robot to pick up rings and paper balls, cross a bridge, and dump collected items into 15” tall receptacle
- Created custom parts in SolidWorks (CAD), created drawings of the parts, and manufactured the parts by hand
- Tested individual and combined systems, improving upon failures

### Atari Pong Project, Digital Electronics, partnered

Summer 2018

- Designed a circuit for Atari Pong, and coded the game in a Digital Hardware Language (VHDL)
- Donated the game on a Field-Programmable Gate Array to the professor, per his request, to display to prospective students

### Stirling Engine Project, Thermodynamics, individual

Summer 2018

- Machined, built, and optimized a Stirling Engine by hand
- Acquired experience with 2-D lathing, 3-D milling, and brazing

## LEADERSHIP

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### Dartmouth College Football (Division I), Hanover, NH

August 2016 - November 2019

- 2020 National Football Foundation College Football Hall of Fame Hampshire Honor Society inductee
- Applied rigorous time management skills to succeed as a student and an athlete, completing a five-year program in four years
- Took courses while spending 24+ hours per week practicing and training in season and 6 hours per week out of season
- 2019 Ivy League Co-Champions