MARSHALL T. GRAYBILL

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Boulder, CO, USA

EDUCATION

UNIVERSITY OF COLORADO BOULDER
Ph.D. in Mechanical Engineering, *research in Marine-Inspired Robotics (Xu Lab)* *Present*
M.S. in Mechanical Engineering, *focus on fluids, controls, and mechanism design* | **GPA: 3.97/4.00** *December 2025*
B.S. in Mechanical Engineering, *Summa Cum Laude with Honors* | **GPA: 3.99/4.00** *May 2021*
Scholarships/Awards: CU Esteemed Scholars (2017), Regent Scholarship (2018), and Dean's List (2017-2021)
Fellowships: Dean's Fellowship for Excellence (2023)

PUBLICATIONS AND PATENTS

- **Marshall T Graybill**, Nicole W Xu, Penguin-Inspired Flexible Flapping Fins Enhance Low-Amplitude Thrust and Efficiency [Submitted to Advanced Intelligent Systems, July 2026]
- **Marshall T Graybill**, Nicole W Xu, Experimental Studies of Bioinspired Shark Denticles for Drag Reduction, *Integrative and Comparative Biology*, Volume 64, Issue 3, September 2024, Pages 742-752, https://doi.org/10.1093/icb/icae086
- Automated Wellness Water Faucet System, U.S. Application No. 19/727,280 (pending).
- Systems and Methods for Transferring Free Flowing Material and Facilitating the Reaction Thereof, U.S. Patent Application Publication No. US 2024/0416532 A1 (pending).

PRESENTATIONS

- **Marshall T Graybill** and Nicole W Xu, 2025. Evaluating Shark Skin-Inspired Denticles and Riblets for Thrust Generation in Flapping Fins, Session: Biological Fluid Dynamics: Flapping, APS DFD, Nov. 23-25, Houston, TX.
- **Marshall T Graybill** and Nicole W Xu, 2024. Shark Skin-Inspired Surface Features to Enhance the Hydrodynamic Performance of Flapping Fin Propulsion, Session: Drag Reduction II, APS DFD, Nov. 24-26, Salt Lake City, UT.

RESEARCH EXPERIENCE

UNIVERSITY OF COLORADO BOULDER – PhD Candidate *August 2023 - Present*
Investigated how soft materials, compliant structures, and surface textures influence flapping-fin propulsion efficiency and control of bioinspired uncrewed underwater vehicles (UUVs).

- Designed and built a 4-axis gantry system for repeatable evaluation of robotic fin propulsion in a 2-meter-long tank.
- Developed shark-inspired sub-mm surface textures using SLA printing to reduce drag and delay flow separation.
- Prototyped and tested silicone fins to quantify efficiency and thrust tradeoffs between soft and rigid propulsors.
- Led a senior design team to build a fin-propelled robot for testing fin propulsion and autonomous swimming control.
- Built a low cost (<$500), penguin-inspired UUV capable of agile maneuvers using only two control surfaces.

TEACHING EXPERIENCE

UNIVERSITY OF COLORADO BOULDER
Teaching Assistant, Heat Transfer *August 2025 - December 2025*
- Graded homework and hosted office hours for a senior-level class.

Teaching Assistant, Manufacturing *August 2024 - December 2024*
- Graded homework, led labs, and hosted office hours for a junior-level class.

Teaching Assistant, Data Analysis and Experimental Methods *August 2020 - December 2020*
- Made grading rubrics and graded homework assignments for a junior-level class.

PROFESSIONAL EXPERIENCE

CHEMBOTIX LLC. *January 2021 - August 2023*

Lead Mechanical Engineer

Robotics research startup driving 16x improvement of lab automation to accelerate pharmaceutical development. Led R&D process for automated mechanisms and managed a team of mechanical engineers.

- Developed the first chemical reactor that enables mixing chemicals as they are added in real-time.
- Designed eight novel mechanical systems and inventor on a pending patent.
- Owned system engineering of the product and led cross-functional teams to meet company deliverables.
- **Awards:** New Venture Challenge (1st place, $45,000) and Lab Venture Challenge (Finalist $125,000)

KOHLER CO. *May 2019 - August 2019*

Mechanical Engineering Intern

Selected to be one of two engineers in a small startup Water Filtration business in a $7B multinational company.

- Worked with overseas CMs in the early stage development of four consumer-orientated filtration products.
- Developed a countertop pumped filtration system, reducing filtration time while meeting NSF standards.
- Used PDM software to store revisions of CAD files and access other company projects.

PROJECTS

TRIMBLE AUTONOMOUS SOLUTIONS (Senior Project) *August 2020 - May 2021*

CAD Engineer

Part of a year-long industry senior project. Led design of a LiDAR sensor enclosure for autonomous construction and agriculture vehicles.

- Iterated rapidly through design concepts to evaluate the viability of various approaches.
- Constructed sealed aluminum enclosure with a polycarbonate window and thermal peltier system to protect LiDAR.
- Worked with machinists to fabricate tight tolerance metal and plastic components for IP69K.

SPENT INNOVATIONS (Advanced Product Design) *August 2020 - December 2020*

Mechanical Engineer

For a graduate design class, sought ways to create more sustainable, backyard compostable takeout packaging.

- Developed a rapidly biodegradable material made of brewers' spent grain for sustainable food packaging.
- Designed tapered hexagonal containers for ease of stacking, gripping, and compression molding.
- 3D Printed mold and prototyped a line of products for usability and wear testing.

HAND SANITATION STATION (Summer Design Intensive) *June 2020 - August 2020*

Product Design Engineer

Created an elegant hand sanitation solution that was visually appealing, touchless, and messless.

- Focused on DFA by minimizing components, incorporating snap fittings, and creating alignment features.
- Applied DFM concepts to model plastic components for injection molding and ease of assembly.
- Continued evolution of design for a graduate Design for Manufacturability and Assembly class.

PROFESSIONAL AFFILIATIONS

- American Physical Society, Division of Fluid Dynamics (APS DFD)

CERTIFICATIONS

- **2021** - Licensed Engineering Intern (EI)
- **2018** - Solidworks Associate