

Education

Massachusetts Institute of Technology

Candidate for B.S in Mechanical Engineering and Creative Writing, GPA: 5.0

- 2A concentration in machine design
- Writing thesis: 1st and 2nd draft of fantasy novel *Pelagic*, intend to publish

Class of 2023
Cambridge, MA

Research Experience

Mediated Matter Group, MIT Media Lab

Supervisor: Nicolas Lee

Jan. 2020 - Present
Cambridge, MA

My research focuses on the 3D printing of biopolymers, renewable and biodegradable materials with applications in sustainable construction, architecture, and medicine. My goal is to improve the fabrication methods of these materials and to explore their potential to replace plastic in packaging and rapid prototyping. Working at the intersection of mechanical engineering, materials science, and art, I intend to refine methods that lead to more widespread use of multi-material printing and biopolymers in industry.

- Currently developing a multi-material printer to print vertical biopolymer structures with material gradients. So far, the gantry has been assembled from extrusions, and I've fabricated an end effector with a static mixer to blend materials. With this printer, we'll be able to explore how we can tune part properties through gradients, use biodegradable material to create support structures, and use viscous biopolymers to mimic plastic filament of traditional FDM printers.
- Conducted biodegradability tests involving topsoil degradation, worm chamber burial, and water dissociation tests. These tests have illustrated that biodegradability rates can be tuned by varying biopolymer ingredient ratios, and we're currently developing a paper exploring this phenomenon.
- Designed & printed biopolymer mandalas to refine printing parameters and to explore material properties. I developed a script in Grasshopper and Rhinoceros to create spirograph toolpaths, and as I printed, recorded the pressure and print speed required to achieve continuous extrusion.
- See p. 4 for Conferences, Publications, and Exhibitions

MIT Culpepper Lab

Supervisor: Martin Culpepper

Promoting Student Agency in Makerspaces

My goal is to develop a series of projects across various themes that will appeal to students with different passions, hopefully encouraging enthusiasm for making and an increased desire to continue in a STEM field after graduation. This project is focused on all students, with a special emphasis on first-years and underrepresented groups. My work takes place in collaboration with Professor Maria Yang and the University of Michigan, with the overall project funded by the NSF.

- Currently developing a lightsaber training project for the upcoming EHS Solar Makerspace, in which I'm developing prototypes, writing training guidelines and instructions, and trialing the project with students.

Sept. 2022 - Present
Cambridge, MA

**Research
(Cont.)**Promoting Student Agency in Makerspaces (Cont.)

- Interviewed students across MIT's makerspaces to record current and potential project interests and to learn about the making community.

Design of Non-linear Compliant Transmissions for Prosthetic Actuators

Feb. 2022 - May 2022

For this project, I developed computational models for a bistable mechanism that would optimize the power pulse of a magnetic lead screw ankle actuator.

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There exist few actuation-transmission systems that can deliver the right amount of power to flex and lift a foot; the results of this project could lead to new advances in prosthetics, as well as exoskeletons, for rehabilitation, physical therapy, and for reducing physical labor.

Projects**3 Roll Mill**

Sept. 2021 - Present

- Designed a tabletop 3 roll mill with flexure-based roller adjustment mechanism for making watercolor paint
- Calculated ideal dimensions for flexures to prevent bending, buckling, and yield
- Turned pieces on a lathe and milled components to precise dimensions for press-fits
- Designed, milled, and soldered circuit board to operate machine and to control motor

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The Lathe-Inator

Feb. 2023 - Present

- Designed, modeled, and constructed components for a tabletop lathe on a team in 2.72: Elements of Mechanical Design
- Turned spindle shaft, using dial indicating and live-centering to ensure concentricity and prevent runout. Created press-fits for bearings and threads for a chuck and nut to add bearing preload
- Designed flexure cross-slide using FEA to prevent yielding and control deformation

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SandStill

Sept 2022 - Dec. 2022

- Collaborated with a team of 16 students to develop a safe disc sander through 2.009: The Product Engineering Process
- Demonstrated as a team that the sander prevents injuries by detecting human touch through capacitive sensing and halting rotation of the disc in 80 ms, less than human reaction time
- Designed and machined the sander's ribbed disc to be lightweight to halt quickly, but rigid to prevent deformation
- Constructed the internal frame of the sander, integrated components, and refined the external housing
- Enhanced teamwork, communication, and morale by serving as a team "Yoda" officer; organized social and working sessions, offered support to teammates, and assisted in organizing weekly meetings

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Work Experience	<p>Wren In Flight, LLC (Personal Art Business)</p> <ul style="list-style-type: none"> ● Produced traditional and digital artwork to sell via Etsy, Redbubble, and local stores ● Manufactured watercolor paint by hand from pigment and natural ingredients. Ran three-point bending tests and spectroscopy analysis on dried watercolor paint to identify ideal formula in 2.671: Measurement and Instrumentation ● Commissioned by Chief of Marketing for Silverstein Properties for illustrations of the architecture and community of The World Trade Center; 8 works currently exhibited on 80th floor of 3 WTC 	July 2017 - Present Shrewsbury, NJ
	<p>MechE Intern for SLS R&D at Formlabs, Inc.</p> <ul style="list-style-type: none"> ● Designed and prototyped testbeds and ran experiments to develop a novel SLS 3D printing process ● Collaborated on a team to develop process while personally researching a specific technology path ● Documented and shared design process and experimental findings through reports and presentations ● Developed design concepts as participant of a focus group for printing lightsabers for Disney 	June - Aug. 2022 Somerville, MA
Mentorship	<p>MIT Edgerton Center Mentor</p> <ul style="list-style-type: none"> ● Instructed classes on making watercolor paint by hand over IAP 2023, with participants from the overall MIT community ● Taught a class for high school students on the intersection of Engineering and Art as a mentor for the 2020 virtual Engineering Design Workshop ● Hosted mentor hours to assist students with projects in 2019 ● Assisted with K-12 and international outreach events 	Sept. 2019 - Present Cambridge, MA
	<p>Simmons Hall House Government</p> <ul style="list-style-type: none"> ● Currently serving as a Resident Peer Mentor to provide access to support resources, offer advice, and host study breaks for a group of 12 first-years ● Hosted movie sessions, a dorm-wide ice cream study break, and maintained audio-visual equipment as Entertainment Chair; hosted a book club as Library Chair ● Participated in house meetings to discuss and vote on dorm events and funding 	Sept. 2019 - Present Cambridge, MA
	<p>Mechanical Engineering Department</p> <ul style="list-style-type: none"> ● Currently serving as a mentor for the Mechanical Engineering Student Society (MESS) ● Answered questions from first-years as a panelist for 2.000: Explorations in Mechanical Engineering in spring 2022 ● Provided advice to and discussed opportunities with prospective MechEs as a panelist for the fall 2021 MechE Pizza Party 	Oct. 2021 - Present Cambridge, MA

Extra-Curriculars (Cont.)	<p>Kill Your Darlings Creative Writing Group</p> <ul style="list-style-type: none"> • Founding member of writing group for MIT students and graduates • Provided constructive feedback on peers' writing in weekly meetings <p>MIT Solar Electric Vehicle Team (SEVT)</p> <ul style="list-style-type: none"> • Machined chassis components, thermoformed polycarbonate covers for car lights, and constructed with carbon fiber and epoxy as part of Aerodynamics and Composites subteam • Promoted SEVT by presenting projects and goals to public at Roslindale Parade and MIT Museum Energy Night • Prepared car for wind tunnel testing at Ford Driveability Test Facility 	<p>June 2020 - Present Cambridge, MA</p> <p>Sept. 2019 - May 2020 Cambridge, MA</p>
Conferences/ Publications	<p>Materials Research Society Conference (2022)</p> <p>Nicolas Lee, Sabrina Shen, Hannah Gazdus, and Markus J. Buehler. <i>Biopolymer Composites with Tunable Biodegradation Rates</i>. Paper in preparation.</p> <p>Sabrina Shen, Nicolas Lee, Aliai D'Acuil, Hannah Gazdus, Branden Spitzer, and Markus J. Buehler. <i>The Impact of Mycelium Inoculation on 3D Printed Structural Composites</i>. Paper in preparation.</p> <p>International Conference on Materials for Humanity (2022)</p> <p>Nicolas Lee, Sabrina Shen, Aliai D'Acuil, Hannah Gazdus, Branden Spitzer, and Markus J. Buehler. <i>A 3D Printable Biocomposite Scaffold for Mycelium Structural Materials</i>.</p> <p>Meet the Stars of 3D Printing: Construction Panelist (2021)</p> <p>Discussed biopolymer research in an international virtual panel hosted by Women in 3D Printing</p>	
Exhibitions	<p>MoMA Nature X Humanity Exhibition (2021)</p> <p>Printed biopolymer artwork for <i>Aguaboja III</i> sculpture with Nicolas Lee, in collaboration with Neri Oxman</p>	
Awards	<p>MIT Ilona Karmel Writing Awards (2022)</p> <p>First Place King Prize for Writing Science Fiction for short story <i>That Must Have Been One Killer Croissant</i></p>	
Honor Societies	<p>Tau Beta Pi Engineering Honor Society</p> <p>Organized lecture featuring Professor Irmgard Bischofberger for the Da Vinci Lecture Series</p> <p>Pi Tau Sigma Mechanical Engineering Honor Society</p>	
Interests	<p>Machine design, 3D printing, sustainability, production and movie design, product design, writing fantasy novels, art, playing piano and transcribing music, molding and casting</p>	
Website	<p>hannahgazdus.com</p>	