



WASHINGTON STATE
UNIVERSITY

Welcome to MME Fall Mentoring 2022!



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John McCloy

MME Director



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Soumik Banerjee

Graduate Studies Director



Graduate Programs

Dr. Soumik Banerjee

Associate Professor

Chair, MME Graduate Studies Committee

**Mechanical and Materials Engineering,
Washington State University, Washington**

Degrees Offered by the School of Mechanical and Materials Engineering

- **BS/MS Program (4+1)**
- **NonThesis MS Program**
- **Thesis MS Program**
- **PhD Program**

Degrees Offered by the School of Mechanical and Materials Engineering

BS/MS Program (4+1)

- 9 graded courses to complete
- Can be completed within a year
- 3 courses can be taken during BS
- Courses taken during BS must be reserved
- No course can be used in both BS & MS

Degrees Offered by the School of Mechanical and Materials Engineering

MS Program (Non-Thesis)

- 9 graded courses to complete
- Can be completed within a year and half
- 3 courses can be at 300 or 400 level
- No research experience/credit is needed

Degrees Offered by the School of Mechanical and Materials Engineering

MS Program (Thesis)

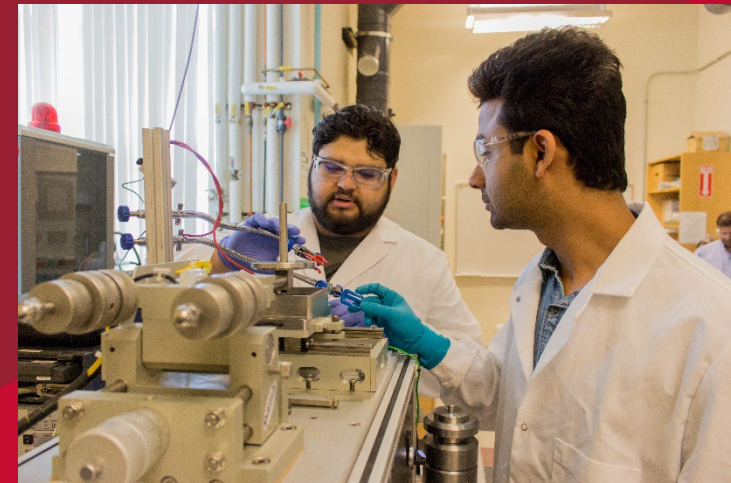
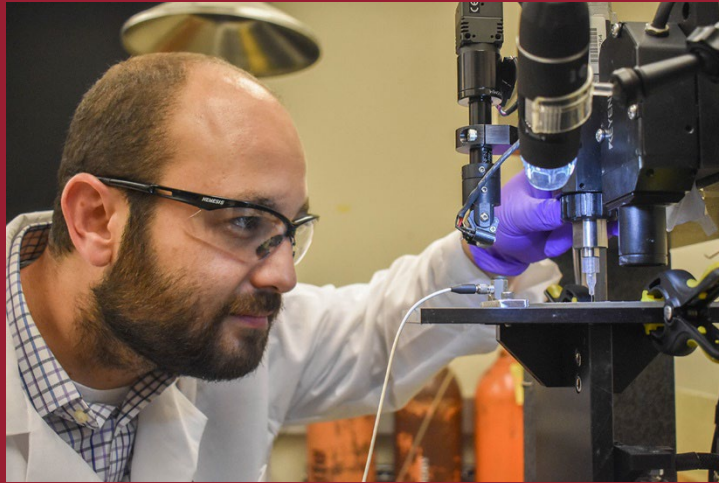
- 7 graded courses and 1 seminar course
- Can be completed within two years
- 3 courses can be at 300 or 400 level
- Need to work on research and write thesis
- Can be paid to work on a research project!

Degrees Offered by the School of Mechanical and Materials Engineering

PhD Program

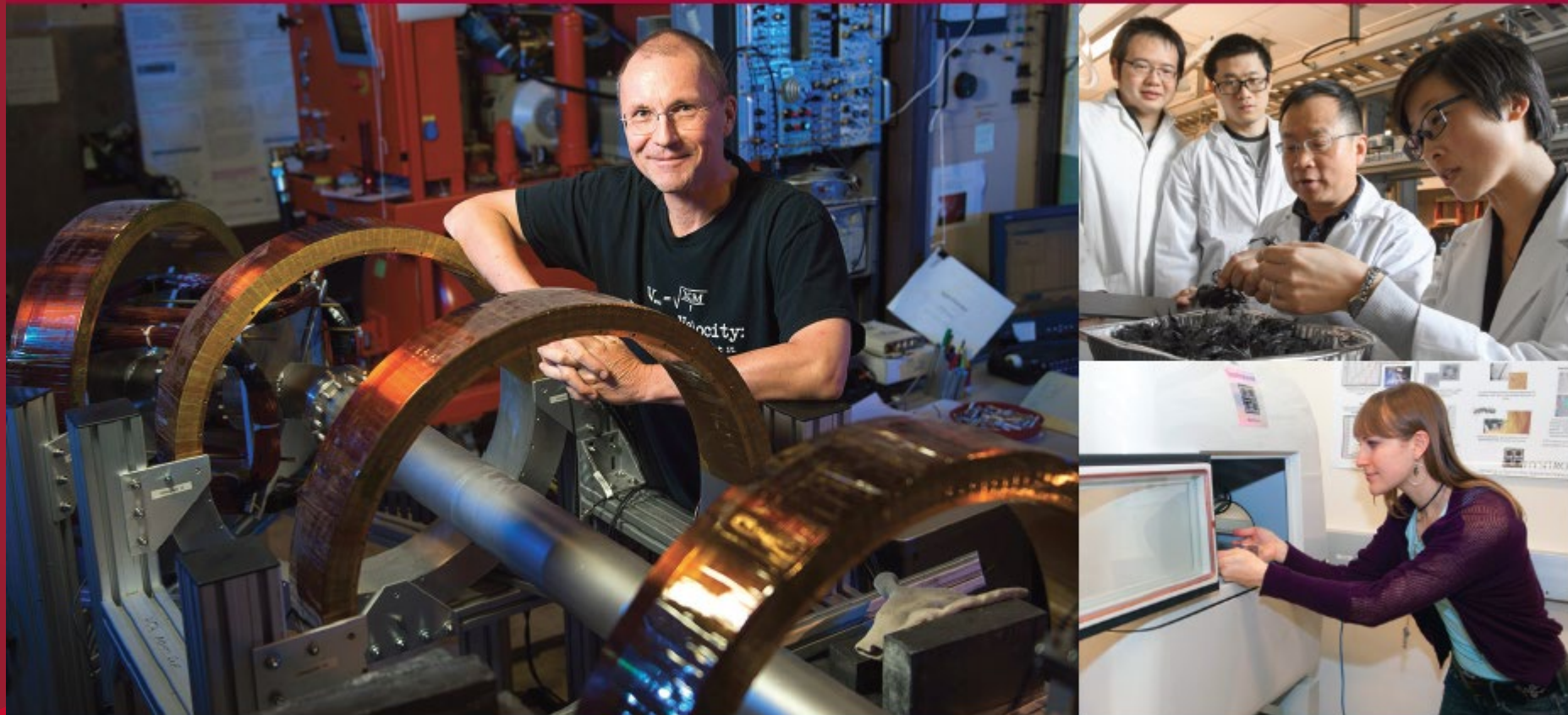
- 8 graded courses and 2 seminar courses
- Can be completed within four years
- 2 courses can be at 300 or 400 level
- Need to work on significant research
- Must write and defend dissertation
- Can be paid to work on a research project!

Selected MME Research Programs



Research Programs

Graduate Degree and Research Opportunities in **MECHANICAL AND MATERIALS ENGINEERING**





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Graduate Student Research



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Justin Allen

Graduate Student Research



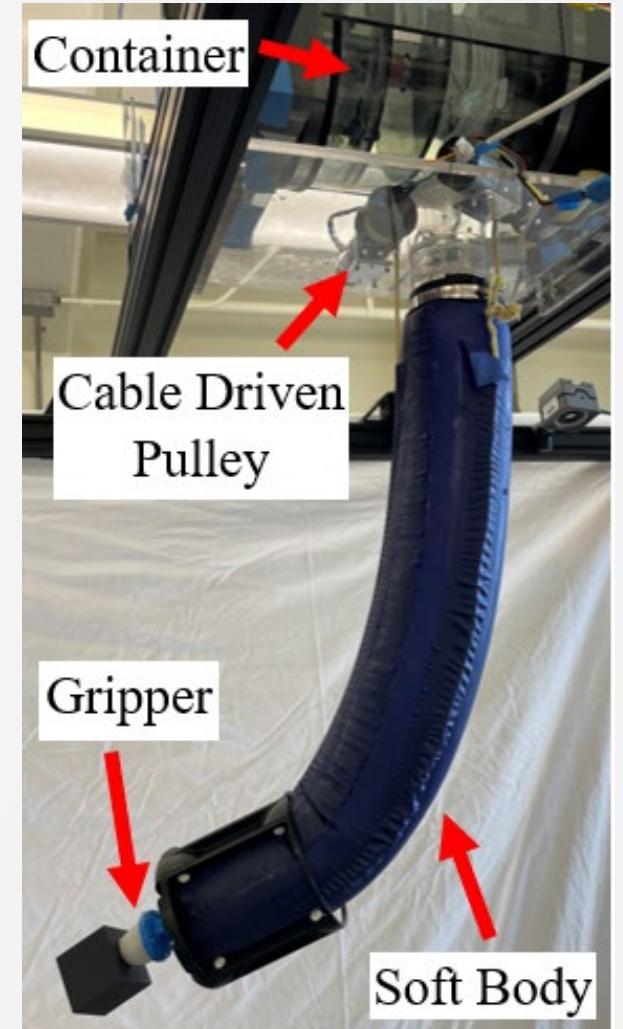
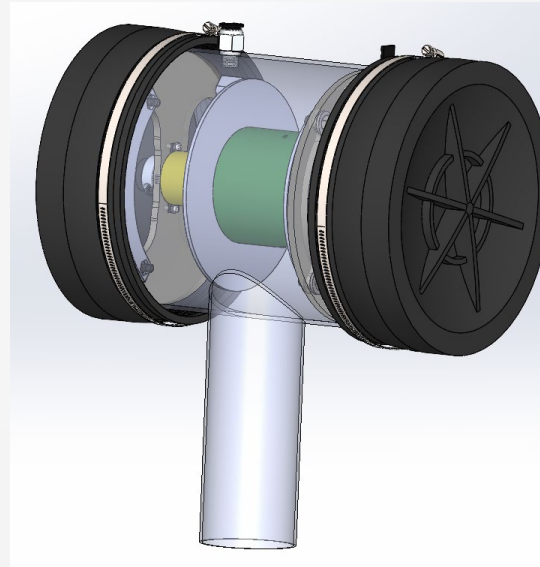
Soft Growing Manipulator

MIAR Lab

Justin Allen

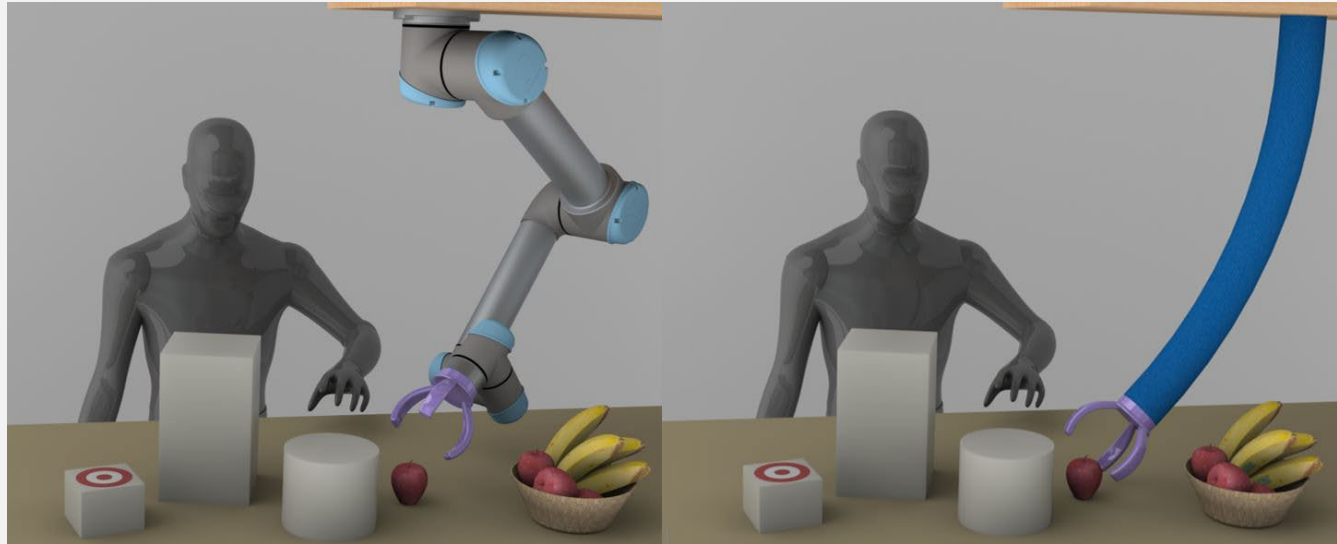
Research during 1st year

- Solidworks CAD Design
- Electrical system

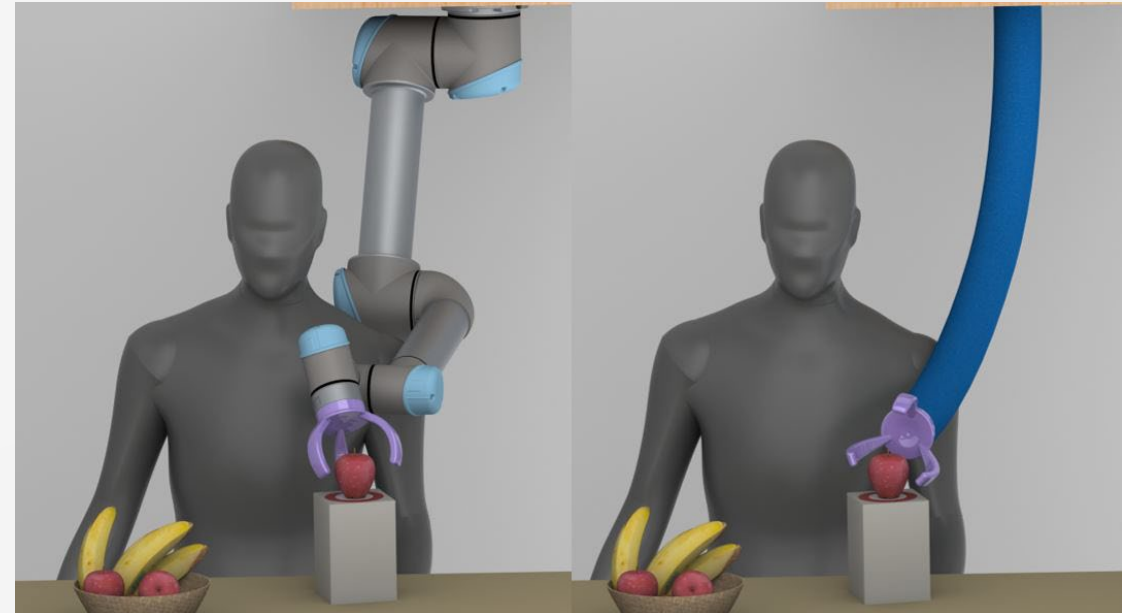


Research during 2nd year

- Finishing design work
- Controlling and steering the soft robot
- Coding and motion capture



Compare soft vs rigid manipulators





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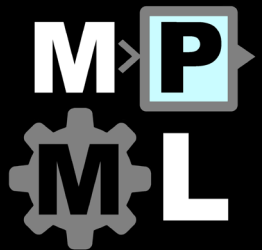
Kimberly Hughes

Graduate Student Research

3D Printed Soft Material Composites with Tunable Mechanical Properties

KIMBERLEE HUGHES – PHD STUDENT

MANUFACTURING PROCESSES AND MACHINERY LAB – DR. ARDA GOZEN



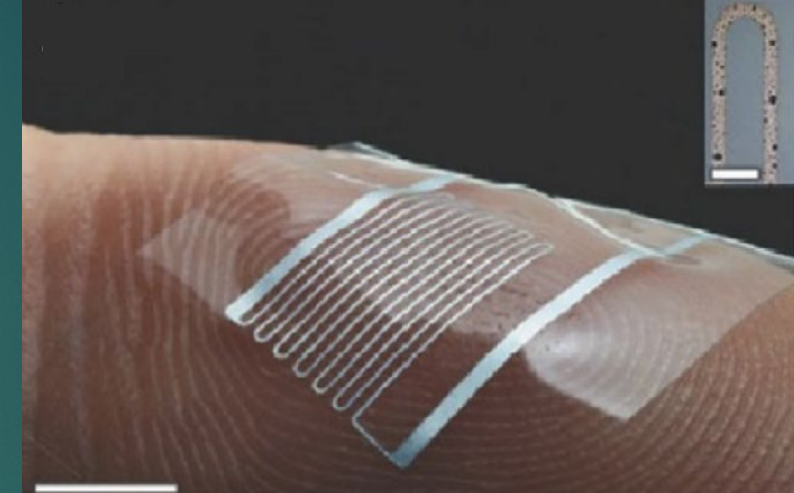
Motivation

Soft materials such as silicones are highly useful in applications where high compliance is desired:

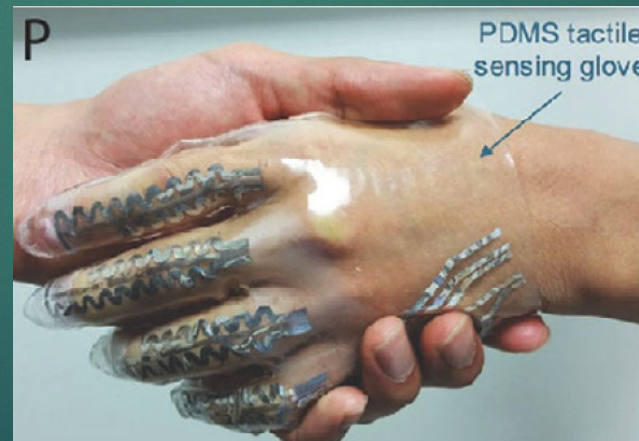
- ▶ Soft robotics
- ▶ Flexible Electronics/Wearable technology
- ▶ Tissue-mimicking phantoms



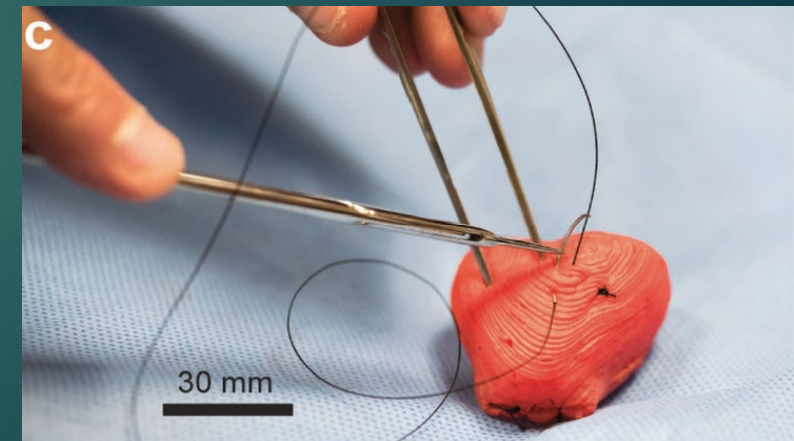
Shepherd et al. (2016)



Style et al. (2020)



Style et al. (2020)



Qiu et al. (2019)

Motivation

Often other properties are desired that are not offered by silicones alone, such as

- ▶ High strength
- ▶ Electrical conductivity

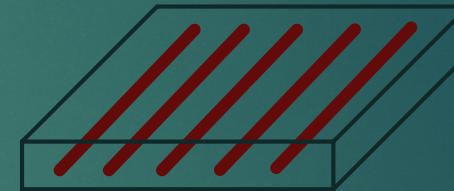
In order to maintain high compliance while improving other material properties, we turn to composites

- ▶ Two or more distinct and dissimilar materials combined to create a new material



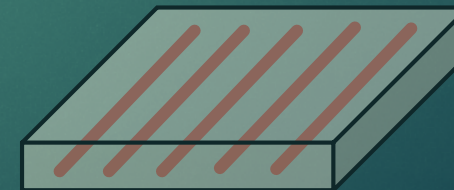
Matrix

+



Reinforcements

=



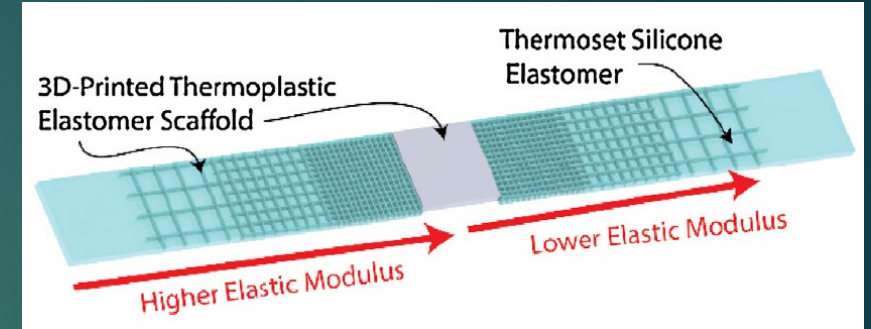
Composite

Motivation

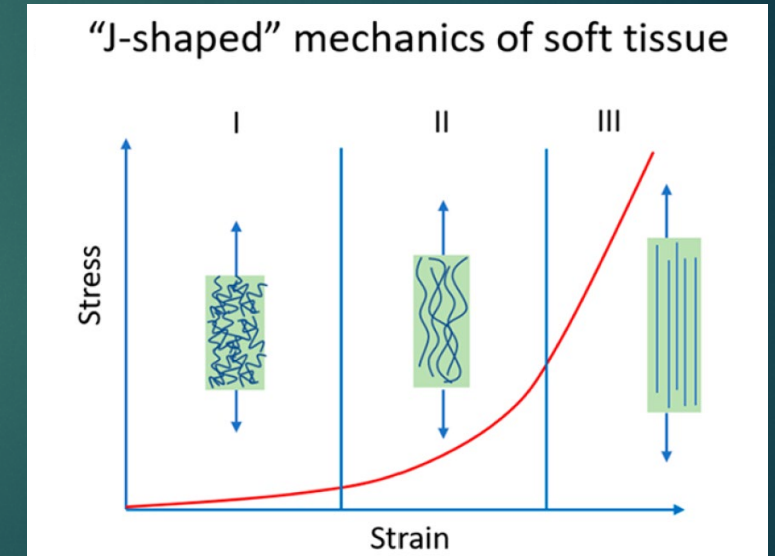
- ▶ Varying the reinforcement and matrix materials results in different mechanical properties
- ▶ Can also vary the geometry of the reinforcement for an additional degree of freedom
 - ▶ Property gradients
 - ▶ Strain stiffening/limiting

Variation of the constituent materials and reinforcement geometry can allow us to “tune” the mechanical properties of these composites

3D printing these composites allows for more complex reinforcement geometries as well as better control over properties



Estelle et al. (2017)

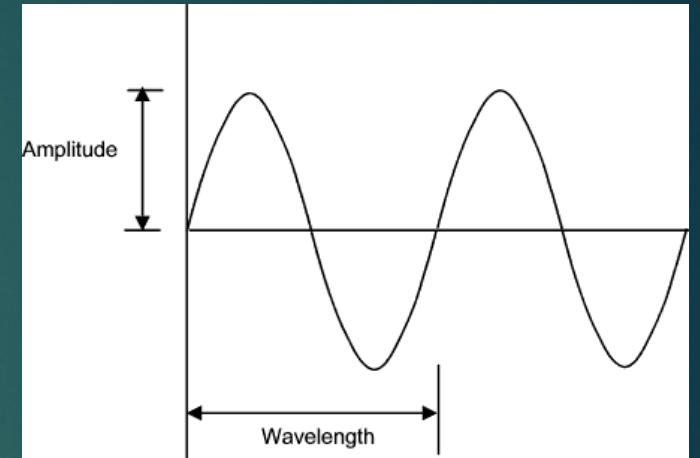
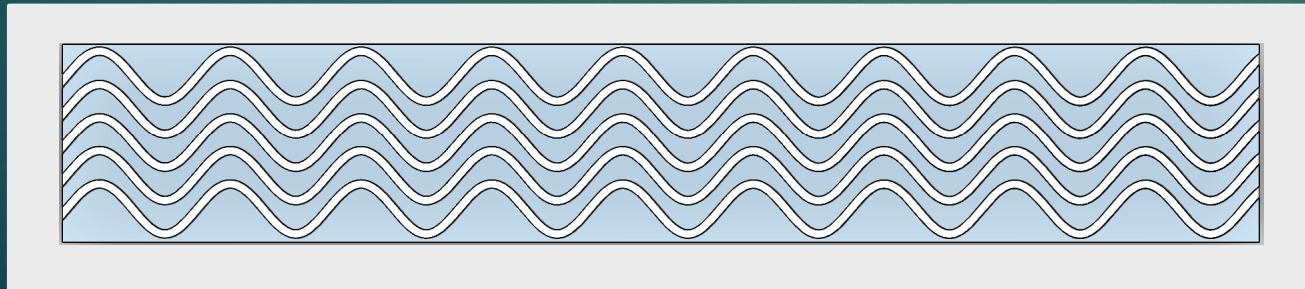


(Ma et al., 2017)

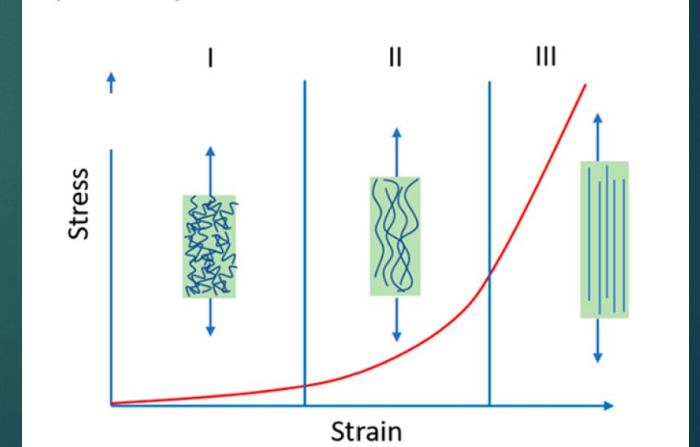
Overview

My project: 3D printing soft composites with a sinusoidal reinforcement geometry (TPE) and silicone matrix

- ▶ Varying wavelength and amplitude of sine waves
 - ▶ Strain stiffening/limiting
- ▶ 3D Printing both silicone and reinforcement simultaneously
 - ▶ Direct Ink Writing (silicone matrix) and FDM (TPE reinforcement)



A) “J-shaped” mechanics of soft tissue

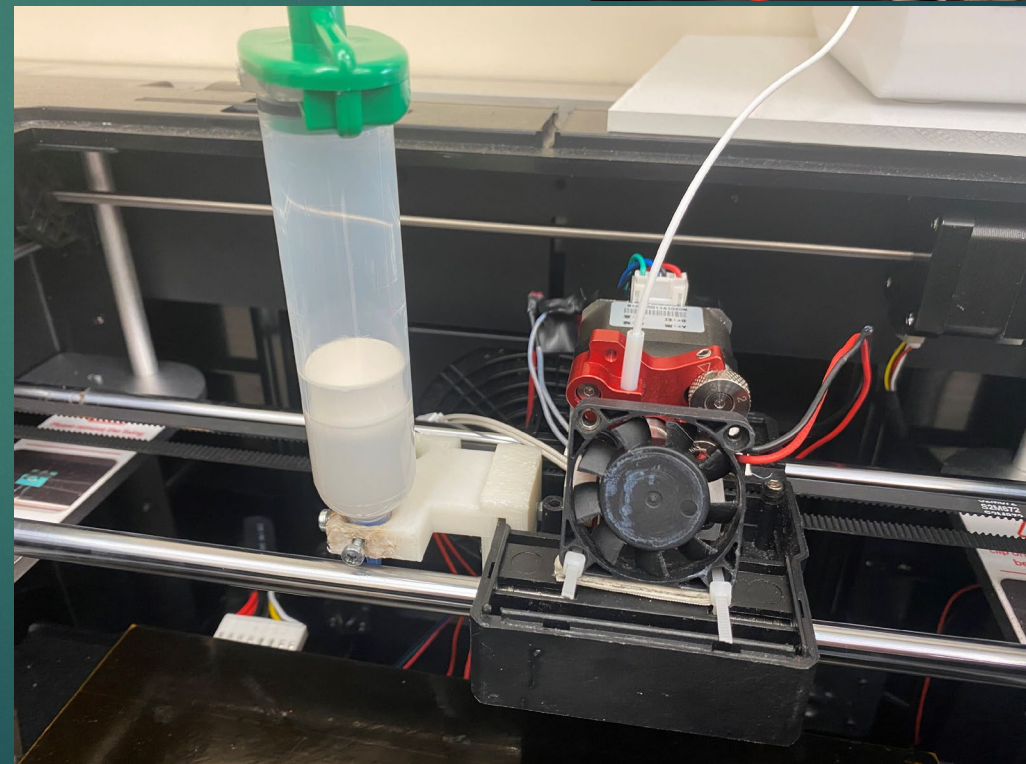
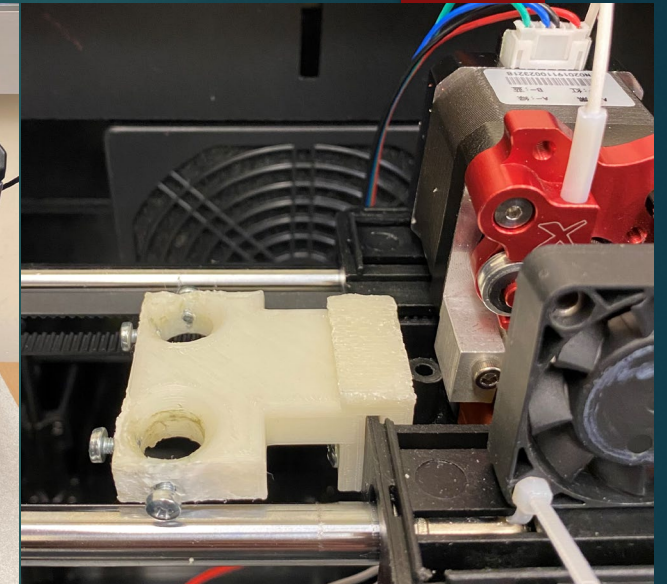


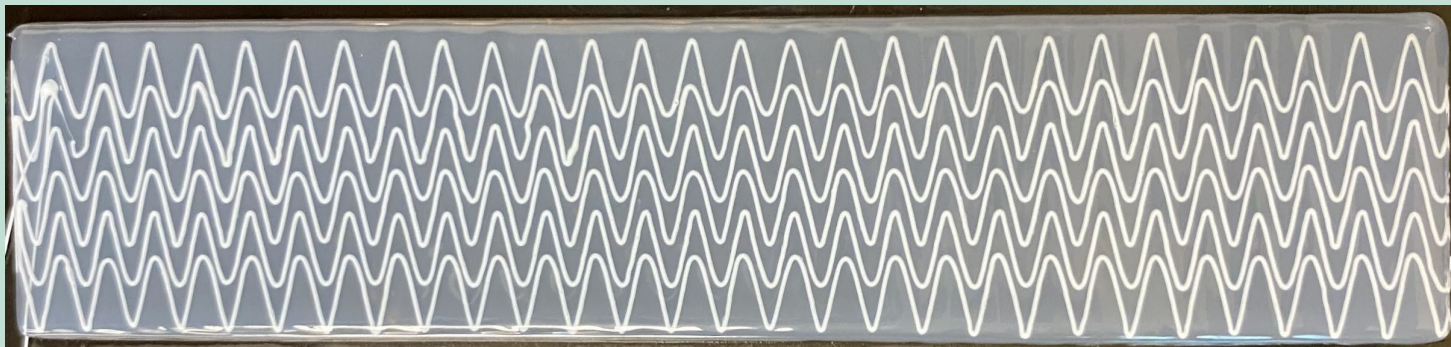
(Ma et al., 2017)

Overview

Combining DIW and FDM printing methods for this project required a custom printer

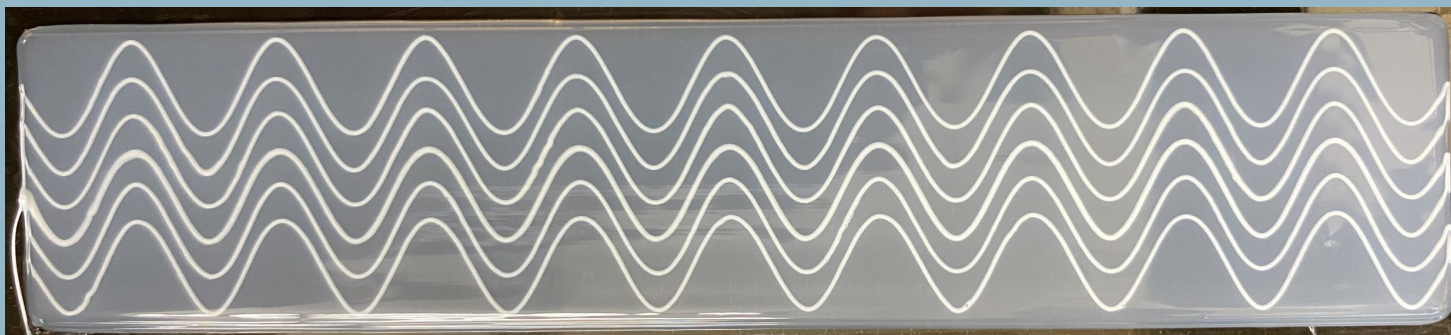
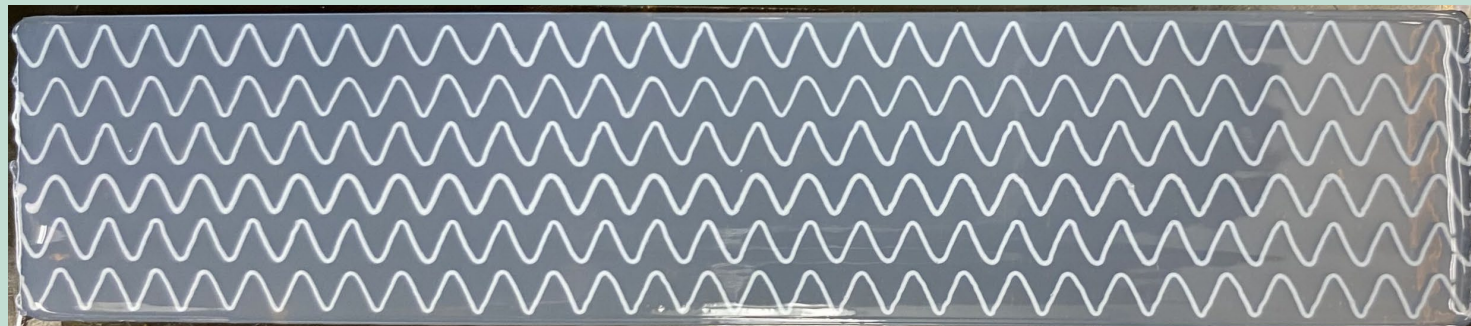
- ▶ Modified a commercial FDM printer to include DIW capability
- ▶ Designed mounting system for a pressure-controlled syringe extruder





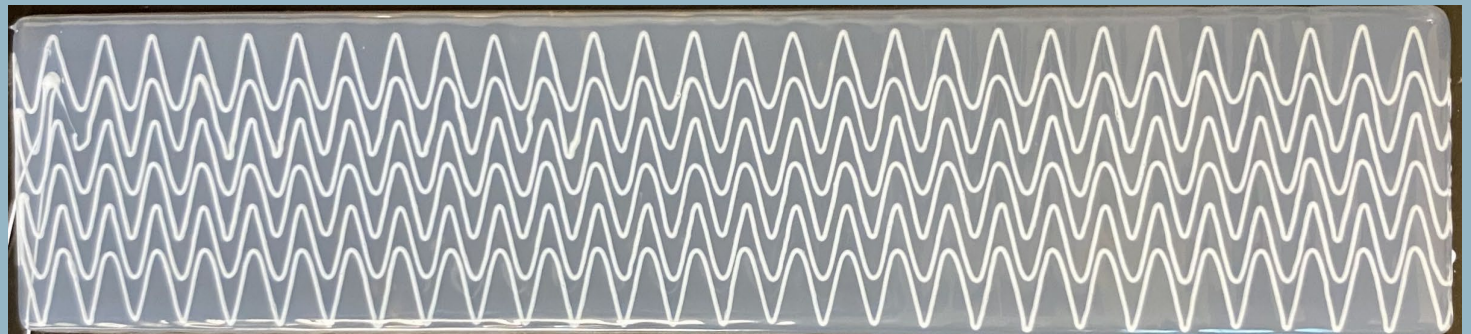
WL0.67_A3

WL0.67_A1.5

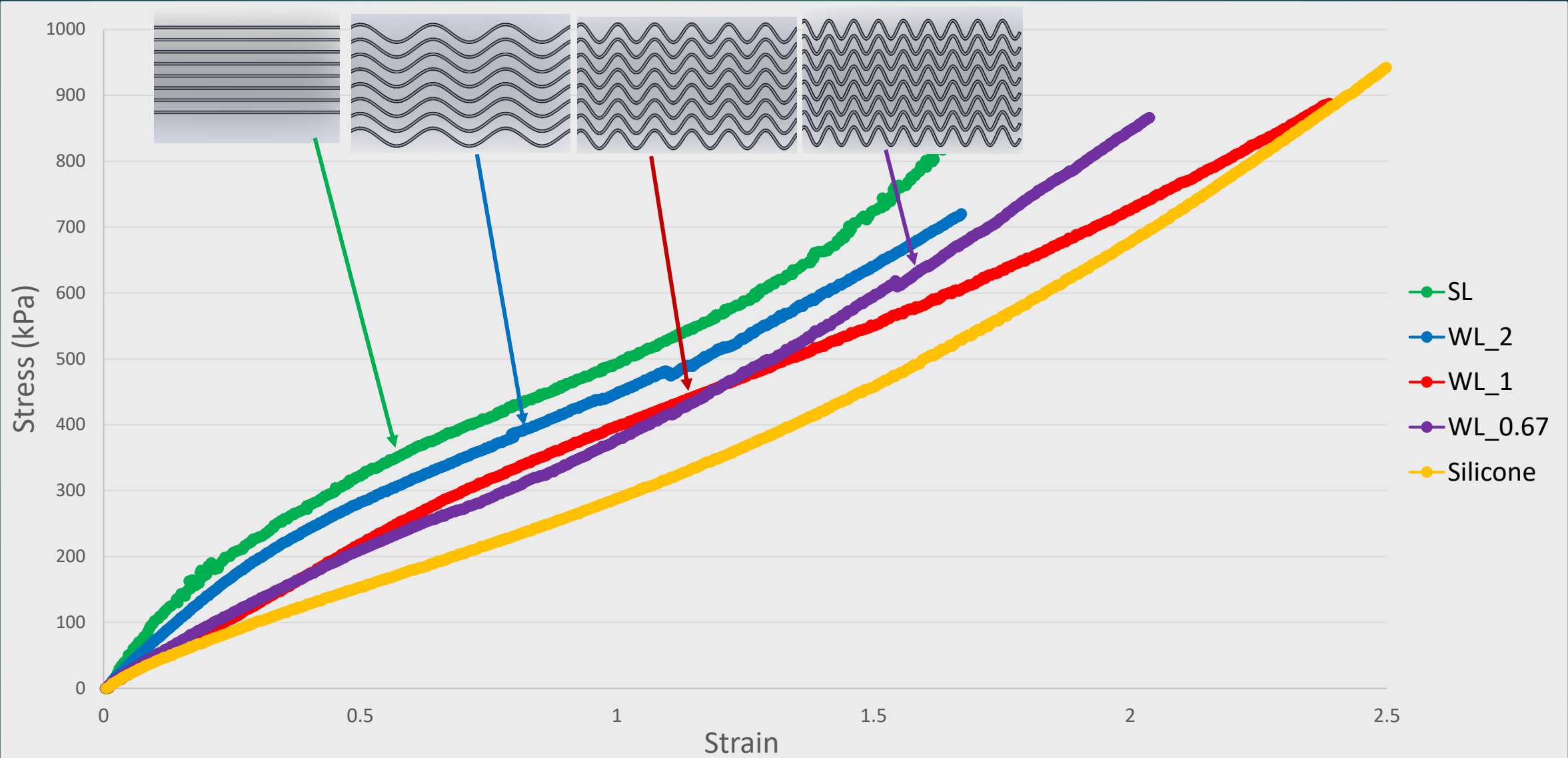


WL2_A3

WL0.67_A3



Results





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Francis Dunne

Graduate Student Research



Cryogenic Fuel-Bladders for In-Space Propellant Storage

In this Presentation:

1. Introduction
2. HYPER Lab Overview
3. Origami Fuel Bladders

Francis Dunne
Washington State University



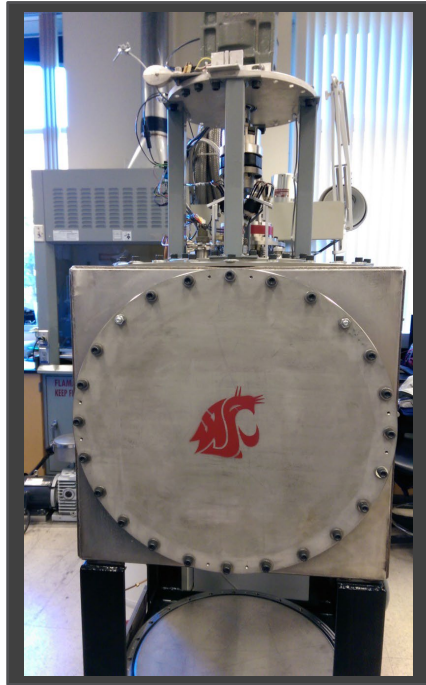
H
H
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drogen
properties for
energy
research *Lab*

HYPER Lab Overview

- Only liquid hydrogen lab in United States
- Emphasis on aerospace and clean energy applications
- Interdisciplinary research
- Many governmental and private company partnerships
- Emphasis on undergraduate involvement



CRAFT



CCC



CHEF



ScanEagle3



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R

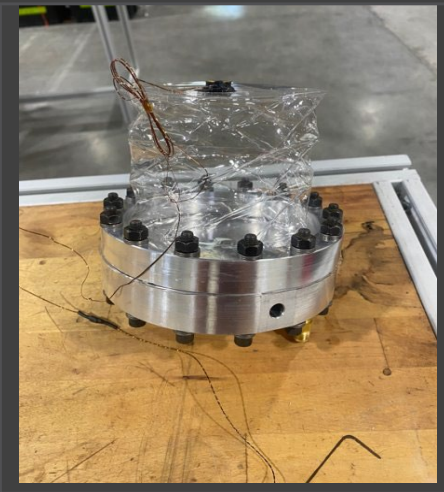
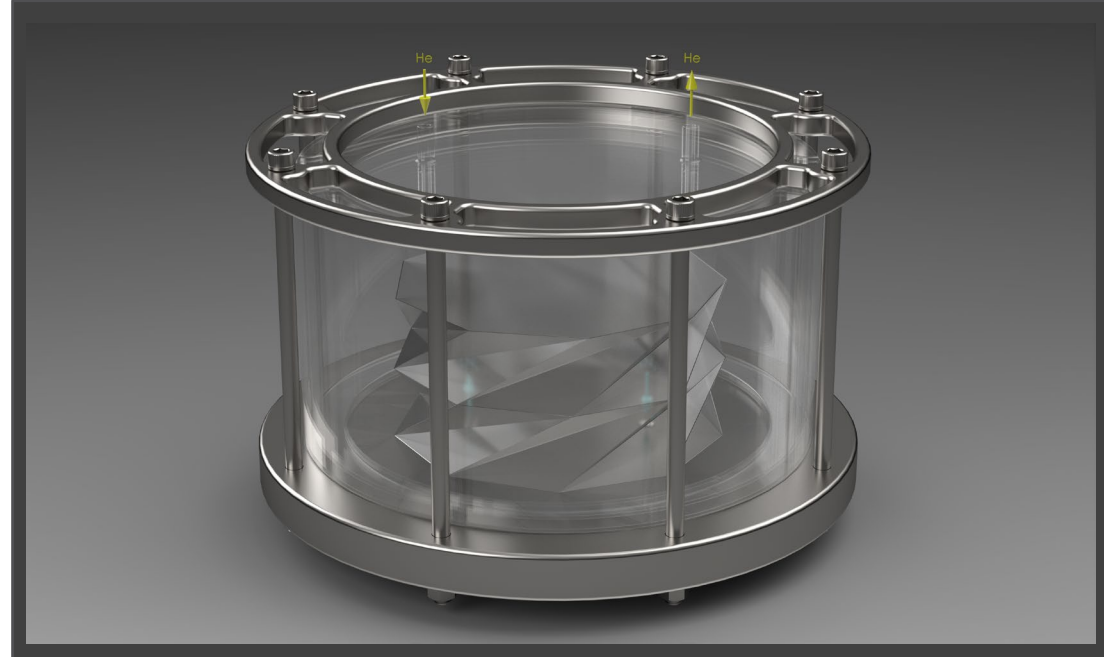
Origami Fuel Bladder

Technology Overview

- Collaboration with Blue Origin, NASA, and Honeybee Robotics
- Use for propellant management and debris shielding
- Manage cryogenics in microgravity environments
- First successful cryogen bladder
- Expels fluids using a pressure gradient



HONEYBEE ROBOTICS



H
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P
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R





Thank you!

H
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Anna Yurkin

MME Alumni



WASHINGTON STATE
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Sandi Brabb

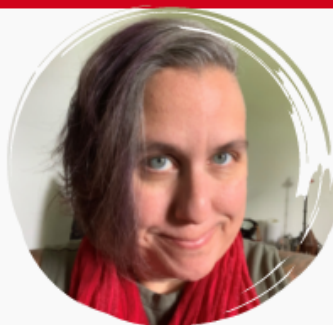
VCEA Career Services

Voiland College Internships & Career Services

Staff



Sandi Brabb,
Director



Koda Hendrickson
Career Coach



Austin Erkers
ME/MSE Peer Career Coach

CONNECT WITH US:



@VCEAInternships



@WSUVoilandPPEL



@Voiland.PPEL



vcea.wsu.edu/student-resources



vcea.internships@wsu.edu



(509) 335-8762



INTERNSHIP PARTICIPATION

58%

Civil

36%

Mechanical &
Material
Science Engr

39%

BioE

61%

Electrical

55%

Chemical

42%

Computer
Science

SERVICES

- Résumés/ Cover Letters
- Interviewing
- Internships
- Job Search
- Industry Tours
- ePortfolios
- Employer Connections
- Career Events
- Technical Career Fair
- & more!

At Graduation



79% Employed



21% Seeking
Employment



amazon.com

facebook

SPACEX



syngenta



usbank

Google



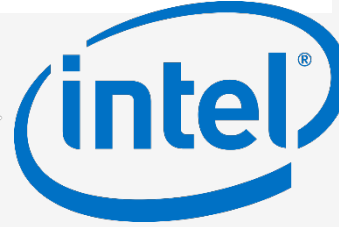
Simplot

The Walt Disney Company

COUGHLIN
PORTER
LUNDEEN



ch2m



AVISTA



PACCAR



Kiewit

LOCKHEED MARTIN



stryker



Pacific Northwest
NATIONAL LABORATORY



Handouts

Resources

Career Information

- Bulletin Board: EEME 2nd Floor
- Fliers & social media
- Job Hunt Resources:



Weekly Internship/Jobs E-mail
Online Job listings:

[Lnk.bio/vceainternships](https://lnk.bio/vceainternships)

CAREER EVENTS

- Career Fair: **October 3-4**



Virtual: Handshake

In-Person: Beasley

- Industry Tours
- Information Sessions/Tech Talks
- Career Development Workshops
- On-Campus Interviews



WORKSHOPS & EMPLOYER EVENTS

(provided in handouts)



V O I L A N D
INTERNSHIPS & CAREER SERVICES

Internships | Co-ops | Jobs | Dreams

Dana Hall 138
(509) 335-8726
VCEA.Internships@wsu.edu

PROPEL WORKSHOPS & EVENTS CALENDAR

FALL 2022

*ProPEL=Professional Practice & Experiential Learning



ProPEL Workshops

Find event detail, locations & register on Handshake.

Resume 101: Translating your WSU Experience Mon, 9/26, 4:00-5:00 pm (All Majors) Todd Hall 120

Career Fair Prep Learn how to research employer opportunities, connect with recruiters, and land that interview! (All Majors) Tue, 9/27, 4:00-5:00 Sign up in Handshake

Maximize Online Career Fair

Wed, 9/28, 4:00-5:00 pm (All Majors) Sign up in Handshake

Post Career Fairs: Interviewing & Building your Network

Thu, 9/29, 4:00-5:00 pm (All Majors) Sign up in Handshake

Optimizing LinkedIn and Networking (All Majors)

Thu, 9/29, 5:00-6:00 pm, CUE 319

ProPEL Intern Peer Panel

Wed, 11/2, 4:00-5:00, Spark Atrium



Open Resume Reviews

Dana 138 & 140, September 26 – 29, 9 am- 4 pm

No appointment required



Student Success Career Events – Sept/Oct

SophoMORE September: The Handshake App for Career Success Tue, 9/06 5:00-6:00 pm (All Majors) Carpenter 102

Marathon Petroleum BBQ Wed, 9/07 2:30-6:30 pm (ChE, ME, EE) Reaney Park, Pullman

Microsoft Devices Info Session (Virtual) Wed, 9/07 5:30-6:30 pm (ME, MSE, EE) Sign up on Handshake

Boeing Careers Speaker Series (All Majors) Resumes & Interviewing Thu, 9/08 5:00-6:00 pm Sign up on Handshake

SophoMORE September: "INs" and "OUTs" of Internships (All Majors) Tue, 9/13, 5:00-6:00 pm Carpenter 102

Dive into Disney: Career Panel for All WSU Majors (All Majors) Thu, 9/15, 4:00-5:00 pm, Spark 212 Sign up on Handshake

Micron Info Session with Alum Matt Shaul (EE, ME, MSE, ChE, CptS) Thu, 9/15, 8:00-9:30 pm, Spark 335 Sign up on Handshake

Wanapum Dam Career Trek Fri, 9/16, All Day (EE, ME, CE, CptS) Advance Registration Required

J2 Building Consultants Resume Review with Ryan Gilmore Mon, 9/19 4:00-5:30 pm (CM, CE, EE, ME) Dana Hall 142

SophoMORE September: Networking Know-How (All Majors) Tue, 9/20, 5:00-6:00 pm Carpenter 102

Boost Up with BOEING (All Majors)

- Info Session Wed, 9/21 4:30-6:30 pm, Spark 327
- Resume Review & Mock Interview, Thu, 9/22, All Day
- Sign up on Handshake

Career Fair Prep: Learn from a CEO – Interviewing & Career Talk by Mark Michaelis, CEO, IntelliTect Tue, 9/27, 5:00-6:00 pm (All Majors) Carpenter 102

Practical Guide to Launching Your Career Wed, 9/28, 5:00-6:00 pm (All Majors) Hybrid. Sign up on Handshake



2022 Virtual Career Expo & Technical Fair (All Majors) Mon, 10/3, 3:00-6:00 pm Register on Handshake

SWE Evening with Industry Mon, 10/3, 5:30-8:00 pm Floyd Cultural Center



2022 Fall Career Expo & Technical Career Fair (All Majors) Tue, 10/4, Beasley, 12-4 pm Register on Handshake

Pearl Harbor Naval Shipyard Thu, 10/4, 4:15-5:15 pm (All Majors) Johnson Hall 105

NAVAIR Info Session Thu, 10/4, 5:00-6:30 pm (CptS, SoftEngr, CptE, EE, ME), CUE 114

POWER Engineers Info Session Thu, 10/4, 6:00-7:00 pm (EE), CUE 316

Manson Construction Info Session Tue, 10/4 6:00-7:00 pm (CE, CM, ConE) Sloan 150

bp Information Session Tue, 10/4 7:00-8:00 pm (ChE, EE, ME) See Handshake for location

CO-OP / INTERNSHIP

ADVANTAGES FOR YOU

- Earn \$16-40/hour (based on experience)
- Build an impressive resume
- More likely to have a permanent job offer by graduation
- Put classroom knowledge into practice and learn by doing
- Contribute knowledge and ideas to the workplace
- Demonstrate abilities to an employer
- Build a professional network of people who will be able to help you find a job after graduation

Voiland College ProPEL Internship Program

- On-the-job work experience
- Paid
- 420 Hours or up to 12-months (or alternate periods of school and work 3 work terms)
- Tech elective credit
- Maintain full-time student status
- Income not counted on the FAFSA



JOB SEARCH STRATEGIES

What **skills** will you acquire in your major?

What **industries** and **employer types** can you work in with these type of skills?

What **countries, states, and cities** are you planning to search?

What are **typical job/internship title(s)** of the type of opportunity you are searching for?

What kind of **environment** do you want to work in?

Consider the people, organizational structure, and physical environment of the workplace

JOB SEARCH

Handshake

(wsu.joinhandshake.com)

CareerShift

(Voiland.Careershift.com)

USAJobs

(usajobs.gov)

Washington WorkSource

(worksourcewa.com)

GoinGlobal

(ascc.wsu.edu)

Stop by **Dana 140** for more options or help

NEXT STEPS...

- Make an appointment or drop by the **Voiland College Internships and Career Service Office** to get your résumé reviewed
- Research dream companies – small, medium, & large
- Set up and **DO** an **informational interview** and/or a job shadow
- Participate in a **Mock Interview**
- **NETWORK** – whenever and wherever possible
- **Get Experience!**

VOILAND COLLEGE INTERNSHIPS & CAREER SERVICES

Dana Hall 140

Drop-in this week: M-F 9 am – 4 pm

or by Appointment

vcea.wsu.edu/student-success

(509) 335-8762

VCEA.Internships@wsu.edu



VCEAInternships



@Voiland.ppel



@WSUVoilandPPEL



MS Teams



MS Teams Appointments

Thank you

V O I L A N D
INTERNSHIPS & CAREER SERVICES

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Wrap-up / Questions
