Shivani Tuli

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EDUCATION

Cornell University, Ithaca, NY — August 2021- May 2022
Master of Engineering in Biomedical Engineering (**3.9** GPA)

University of Pittsburgh, Pittsburgh, PA — August 2016 – May 2021
Bachelor of Science in Bioengineering; minor in Economics, Industrial Engineering, Chemistry

PUBLICATIONS

1. **Tuli, S**, Blank, M, Antaki, J "Mechanical Breast Tissue Analog Using Poly (vinyl alcohol) with Chaotropic Salt Inclusions" *(To be submitted)*, 2024

2. **Tuli, S,** Gau, D "A Versatile Microfluidic Chip System for Modeling Disease Pathways Involving Shear Stress and Cellular Interactions" *ASCB Conference Poster Presentation*, 2024

3. He, W, Ibrahim, A.M, Karmakar, A., **Tuli, S**; Butcher, J.T, Antaki, J.F "Computational Fluid Dynamic Optimization of Micropatterned Surfaces: Towards Biofunctionalization of Artificial Organs" *Bioengineering 2024, 11, 1092* [Link]

4. **Tuli, S**, Afaq, M, Asrani, M, Bassi, R, Malasevskaia, I, Jayashankar, M, Shah, K, Desai, S, Badran, M, Gau, D "Acute Pain Management in Non-Labor and Delivery OB-GYN Procedures - A Narrative Review" *(submitted to Pain Physician)* 2024

5. Kuang, X, Shen,Y, Pena, E.J, **Tuli, S**, Zhang, Y.S "Advances in Vascular Bioprinting: Methodologies, Materials for Applications" *(To be submitted)*, 2024

6. **Tuli, S,** Burgess, R.C and Uttam,S "Deciphering the Combinatorial Role of Histone Modifications in Site-Specific Chromatin Environments" *BMES Conference Poster Presentation*, 2020 [Link]

RESEARCH EXPERIENCE

University of Pittsburgh — August 2024- Present
Research Associate

- Engineered a novel microfluidic platform incorporating multiple shear stress modalities to investigate HMVEC, and HUVEC cell responses to develop a physiologically relevant model for cardiovascular disease.
- Used organoid models to study gene expression, and protein interaction of Survivin, Sirtuin3 and Pfn1 on MDA-MB-231s, Renka Cells, as well as the specific impact of a novel Pfn1 inhibitor on both cancer cell lines.
- Developed ultrasound-responsive microbubble-liposome complexes for targeted siRNA delivery to solid tumors in mice.
- Engineered a Blood Brain Barrier-on-chip model incorporating endothelial cells, pericytes, astrocytes, and neurons, to study cancer extravization across the blood brain barrier.

Harvard University — May 2024- Present
Research Intern

Project: Organ on a Chip Model and Tissue Engineered Blood Vessel (PI: Yu Shrike Zhang, PhD)

- Developed and implemented a computational model for bidirectional flow dynamics and automated image processing algorithms to characterize cellular responses in a **blood vessel-on-chip platform.**
- Printing and testing implantable Tissue Engineered Blood Vessels using two-phase materials.

Cornell University — April 2023 – May 2024
Research Associate

Project I: Breast Palpation Device for At-Home Tumor Monitoring (PI: James Antaki, PhD)

- Engineered a handheld palpation device prototype incorporating optimized optical components and shape-from-shading algorithms, while developing an integrated mobile application under IEC 62304 medical device software standards
- Led successful **SBIR Phase-I and BRCP** grant proposal, while adhering to **DOE and DoD** application guidelines.
- Conducted extensive customer discovery through the NSF I-Corps program, performing 40+ stakeholder interviews to validate clinical needs and identify key product features for market adoption.

Project II: IoT-Based Intra-Uterine Drug Delivery System (PI: David Erickson, PhD)

- Engineered a novel intra-uterine drug delivery platform incorporating precision flow control mechanisms and biocompatible materials, while optimizing drug release kinetics for sustained local therapeutic delivery, with a companion mobile application for real time device control.

UPMC Hillman Cancer Center — June 2020 – October 2020
Undergraduate Researcher, University of Pittsburgh (PI: S. Uttam)

- Developed a novel clustering approach using Non-Negative Matrix Factorization to analyze twelve histone modifications at forty genomic loci in Saccharomyces cerevisiae, enabling precise identification of site-specific chromatin signatures and their role in DNA damage response.

Johns Hopkins University September 2019 – December 2019

Laboratory Technician

- Investigated therapeutic efficacy of RK-33, a novel drug, an inhibitor of the DDX3 pathway, to see its impact on through comprehensive molecular analysis, including cell viability assays, protein expression profiling via Bradford Assay, Western blots, and single-cell RNA sequencing analysis.

University of Pittsburgh February 2017 - April 2018

Undergraduate Researcherw

- Engineered polysaccharide hydrogel scaffolds and validated their bone regeneration efficacy through *in vivo* studies using a mice skull defect model.
- Investigated bone decellularization processes and analyzed oxaloacetate ions' effects on breast cancer metastasis, while developing standardized protocols for histological sample preparation.

RELEVANT EXPERIENCE

Deka Research and Development August 2022 – March 2023

Systems Engineer

- Engineered automated workflows for stem cell manufacturing in a tissue foundry setting, optimizing bioprocess parameters and validation protocols for cell isolation, expansion, and tissue maturation while ensuring compliance with medical device standards and GMP guidelines.
- Developed an anatomically-precise kidney phantom with targeted mechanical and imaging properties for interventional radiology training, while leading DFMEA and human factors validation studies for a Class II medical device system.

West Pharmaceuticals September 2021 – May 2022

Masters of Engineering Project, Cornell University

- Engineered a self-orienting robotic delivery platform for oral biologics, incorporating pH-responsive actuation and tissue-adhesive properties to enhance therapeutic protein absorption across the intestinal epithelium (Non Disclosure Agreement).

Bayer Pharmaceuticals February 2020 – May 2020

Systems Engineering Co-op

- Led comprehensive validation testing and process optimization for next-generation CT injector systems, implementing design improvements and quality control measures while ensuring FDA Class II, ISO 13485:2016, and GMP guidelines.
- Developed a comprehensive data sheet of injectable dyes **incorporated into the Bayer Radiology appendix**.

Matthews' International May 2020 – August 2020

Project Manager: Class Collaboration

- Led foundry automation project development and financial modeling, creating comprehensive ROI and DCF analyses for a **$1.5M** capital investment proposal, **resulting in successful Board of Directors approval**.
- Designed an automation process flow, achieving a **28% improved** foundry efficiency through stakeholder alignment.

HONORS & AWARDS

Elxo Incorporated Graduate Student Scholarship ($3,000) 2024

American Society of Artificial Internal Organs: Most Innovative Technologies Award:

The Smart Bioprinter: Incorporating real time cell viability assessment for Extrusion-based bioprinting 2024

REV Hardware Prototyping Incubator, **Cornell University** ($2500) 2023

1st Position: Animal Health Hackathon **Cornell University** ($6,000) 2022

3rd Position in Senior Design Capstone Project 2021

Finalist: **Rice University** International **Global Health Design** Competition 2019

2nd Position **Randall Family Big Idea Competition ($15,000**) 2019

SKILLS & CERTIFICATIONS

Computational Proficiencies: Python, R, Single Cell RNA Seq analysis, Bulk RNA Seq analysis, AlphaFold3, Machine Learning and Data Analytics, FDA device classification, ISO 13475, ISO 14971

Lab skills: Organ on a chip, Organoids, 3D Cell Culture (Matrigel-on-top), Eukaryotic and Prokaryotic culture, Cell Metabolic Analysis, Confocal Microscopy, STORM, Fluorescence Microscopy, Live/Dead Cell Imaging, Western blot, SDS-PAGE, Immunoprecipitation, RT-PCR, Lateral Flow Assays, Cell Proliferation Assays, RNA/Protein Extraction, Tissue Decellularization, Stem Cell Isolation from Biopsies, Freeze Drying, Lentiviral Transduction, siRNA Transfection, F-Actin Staining, 3D Bio-Printing (FRESH, and Extrusion), Microbubble Formulation, Photomask design, photo-lithography (SU-8)

Certifications: Harvard Core (in progress), AIM Photonics (Fabless Design of Photonic)