Zachary Swain
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EDUCATION

University of Delaware, Newark DE
• PhD, Materials Science and Engineering — *June 2019 - Dec. 2024*
• Bachelor of Mechanical Engineering — *Sept. 2015 - June 2019*
Aerospace Engineering Concentration, Mathematics Minor

EXPERIENCE

Graduate Researcher — *June 2019 - Dec. 2024*
University of Delaware, Materials Science and Engineering, Newark DE
• Inventor of 3 intellectual properties now under patenting process in US and EU
• Selected as inaugural Innovation Delaware Fellow with financial award from US SBA
• Lead researcher of NIH clinical trial for haptic materials conducted with participants at NFB Baltimore
• Responsible over efforts for $5M grant to efficiently accelerate innovation in technology development to translate laboratory research to consumer-ready products in emerging and underserved markets
• Investigated surface chemistry for interface mechanics of haptics, design for touch perception, adhesion and friction dynamics for human factors, surface wear and fouling mechanisms for durability, advanced additive manufacturing systems for high performance, rheological modeling for property prediction
• Developed novel surface modification for time-tunable haptic information on everyday surfaces, novel advanced 3D printing systems for manufacturing of new composite materials with localized properties

Undergraduate Researcher — *Nov. 2015 - June 2019*
University of Delaware, Materials Science and Engineering, Newark DE
• Managed undergraduate team, process line restructuring, equipment design, prototyping & production
• Investigated mechanical & thermal design, flow modeling, additive manufacturing, polymer processing
• Developed models for generalizable extruder performance and thermorheological melt process

SKILLS

• Demonstrated ability in technology innovation & translation, commercialization strategy, development / prototyping / production, lean deployment, orienting strategic objectives, team building & management
• Proficient in report & proposal writing, programming (Python, Matlab, Fortran), CAD (slicers, Inventor, Solidworks), simulation (FEA, CFD, FVM), machine design, image analysis, class 100 cleanroom trained

Materials Characterization

• Mechanical testing	• Thermogravimetric analysis (TGA)	• Differential scanning calorimetry (DSC)
• Capillary & rotational rheology	• Dynamic mechanical analysis (DMA)	• Scanning electron microscopy (SEM)
• Spectroscopic ellipsometry	• Atomic force microscopy (AFM)	• Energy dispersive X-ray spec. (EDX)
• X-ray reflectometry (XRR)	• X-ray photoelectron spec. (XPS)	• Fourier-transform infrared spec. (FTIR)

PUBLICATIONS

• Swain, "Mechanics at material interfaces for translational engineering design" — In Preparation — *Dec. 2024*
• Swain et al. "Self-assembled thin films as alternative surface textures..." — *RSC Materials Chemistry B* — *Sept. 2024*
• Nguyen et al. "One pot photomediated ... conductive hydrogels" — *ACS Polymers Au* — *Oct. 2023*
• "*Positive displacement pump material delivery system...*" — U.S. Patent App. 18/131,669 — *Aug. 2023*
• Naqi et al. "Dual material fused filament fabrication..." — *ACS Applied Polymer Materials* — *Feb. 2023*
• Phan et al. "Computational fluid dynamics simulation..." — *Additive Manufacturing* — *May 2020*
• Edwards et al. "Maximal 3D printing extrusion rates" — *IMA Journal of Applied Mathematics* — *Oct. 2019*
• Phan et al. "Rheological and heat transfer effects..." — *Journal of Rheology* — *Sept. 2018*
• Mackay et al. "The performance of the hot end in a plasticating 3D printer" — *Journal of Rheology* — *Mar. 2017*

CONFERENCE PRESENTATION

• *Extrudate instabilities in fused filament fabrication...* — Society of Rheology 92nd Annual Meeting — *Oct. 2021*

ACTIVITIES

• Adhesion Society - Alexandria, VA — *Jan. 2023 - Present*
• NSF Innovation Corps - National Science Foundation, Northeast Region — *June 2021 - Present*
• Intramural Basketball - University of Delaware — *Sept. 2015 - Present*

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