Zachary Swain

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<https://udel.edu/~zswain/home.html>

**EDUCATION**

**University of Delaware**,Newark DE

• Materials Science and Engineering PhD *June 2019 - Present*

• Bachelor of Mechanical Engineering *Sept. 2015 - June 2019*

Aerospace Engineering Concentration, Mathematics Minor

**EXPERIENCE**

**Graduate Researcher -** Material Mechanisms at Interfaces and Surfaces *June 2019 - Present*

*University of Delaware, Materials Science and Engineering, Newark DE*

• Inventor of 3 manufacturing intellectual properties now under patenting process by UD

• Experienced founder/lead of multiple startups and spinout for products and teams in technical markets

• Selected to join inaugural Innovation Delaware Fellows with scholarship award from US Small Business Administration, UD College of Engineering, and Delaware BioScience Association

• Responsible for leading efforts for $5 million grant to efficiently accelerate innovation in technology development in order to translate laboratory research to consumer-ready products in underserved markets

• Lead researcher of clinical trial conducted at National Federation of the Blind in Baltimore, MD

• Investigating self-assembled monolayers, block copolymer nanopatterning, wear & fouling at interfaces, friction & adhesion mesomechanics, flow boundary slip, upstream & exit flow instabilities, nonisothermal heat transfer, advanced & hybrid manufacturing systems, in-line composite additive manufacturing

• Developed novel pellet extrusion system, axial coextruder for thermoplastic composite 3D printing, frictionally tunable surface chemistries for human factors, functional orthoses for accelerated healing

• Funding from Chemours, Army Research Lab, Center for Plastics Innovation DOE EFRC, NIH R01

**Undergraduate Researcher -** Additive Manufacturing, Polymer Processing *Nov. 2015 - June 2019*

*University of Delaware, Materials Science and Engineering, Newark DE*

• Managed process line restructuring, capital equipment expenditure, undergraduate team, and qtr reports

• Investigated insulated conductive 3D printing, extrusion power-pressure profile, 3D printing of exotic materials, thermorheological melt, flow-induced molecular orientation, computational fluid dynamics

• Developed mathematical model for generalized extruder performance, dynamically structured filter membranes, several desktop 3D printing extrusion systems, real-time g-code modification feedback

• Funding from Army Research Lab, National Science Foundation, National Institute of Standards & Tech.

**SKILLS**

• Demonstrated ability in technology translation & transfer, market analysis, customer discovery, commercialization strategy, product development, production, root cause analysis, and lean deployment

• Proficient at process improvement, establishing and adhering to standardized processes & regulations, orienting strategic objectives, team building & management, and securing funding & external investment

• Experienced in report and proposal writing, programming (Python, Matlab, Fortran), CAD (Solidworks, slicers), simulation (FEA, CFD, FVM), mechanical design, image analysis, and materials characterization

**PUBLICATIONS**

• Nguyen et al. "One pot photomediated ... conductive hydrogels” [(10.1021/acspolymersau.3c00031)](https://doi.org/10.1021/acspolymersau.3c00031) *Dec. 2023*

• "Positive displacement pump material delivery system for additive..." [(U.S. Patent App. 18/131,669)](https://patentcenter.uspto.gov/applications/18131669) *Aug. 2023*

• Naqi et al. "Dual material fused filament fabrication via core–shell...” [(10.1021/acsapm.2c02152)](https://doi.org/10.1021/acsapm.2c02152) *Feb. 2023*

• Phan et al. "Computational fluid dynamics simulation in fused...” [(10.1016/j.addma.2020.101161)](https://doi.org/10.1016/j.addma.2020.101161) *May 2020*

• Edwards et al. "Maximal 3D printing extrusion rates" [(10.1093/imamat/hxz024)](https://doi.org/10.1093/imamat/hxz024) *Oct. 2019*

• Phan et al. “Rheological and heat transfer effects in fused filament fabrication” [(10.1122/1.5022982)](https://doi.org/10.1122/1.5022982) *Sept. 2018*

• Mackay et al. “The performance of the hot end in a plasticating 3D printer” [(10.1122/1.4973852)](https://doi.org/10.1122/1.4973852) *Mar. 2017*

**CONFERENCE PRESENTATION**

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

**ACTIVITIES**

• College of Engineering Leadership & Policy - University of Delaware *Jan. 2023 - Present*

• NSF Innovation Corps - Northeast Region *June 2021 - Present*

• SAMPE Member - Society for the Advancement of Material and Process Engineering *Sept. 2016 - Present*

• Intramural Basketball - University of Delaware *Feb. 2016 - Present*

[Coursework](https://udel.edu/~zswain/Coursework.html) [Research Updates](https://udel.edu/~zswain/home.html#research) [Google Scholar](https://scholar.google.com/citations?user=wbKNR3gAAAAJ) [Linkedin](https://www.linkedin.com/in/zachary-swain)