Maddison Segal

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EDUCATION

Doctor of Philosophy (Ph.D.) in Mechanical Engineering & Materials Science *Durham, NC* | Anticipated May '26
Pratt School of Engineering, Duke University, GPA 4.0/4.0

Bachelor of Science (B.S.) in Biomedical Engineering *Akron, OH* | May '22
College of Engineering & Polymer Science, University of Akron, GPA 4.0/4.0

SKILLS

3D Printing: DLP, CLIP, FFF, DIW, resin formulation, resin analysis, support design, resolution analysis
Software Packages: nTopology, Autodesk Inventor, SolidWorks, MATLAB, MS Office

WORK EXPERIENCE & RESEARCH

PhD Researcher: High Resolution DLP/CLIP 3D Printing of Medical Implants, Duke University *Durham, NC* | Aug '22 – Present

- Pioneered the synthesis of a novel polymer (PAGES) and scaled resin production to kg-scale to enable solvent free DLP and CLIP printing, achieving 97% reduction in part shrinkage and 57% improvement in mechanical strength
- Published two papers and filed three patents/disclosures using novel PAGES polymer system
- Designed medical devices using CAD software including designing supports to improve resolution of experimental resins
- Developed SOPs for new 3D printers, trained lab personnel, and maintained Carbon M2 (CLIP) and ETEC D4K Pro (DLP) systems
- Developed models for predicting print success based on printer and resin parameters such as build speed, tray size, and viscosity
- Collaborated with academic and industry partners to troubleshoot resin resolution issues
- Recognized for innovation and communication, including 2025 RadLaunch Award and 2024 Duke 3 Minute Thesis First Place

Medical Device Consultant & Developer, Self Employed *Durham, NC* | April '25 – Present

- Engaged physician stakeholders to identify unmet clinical needs and translated them into innovative medical device designs
- Rapidly iterated prototypes using FFF 3D printing and incorporated feedback for functional improvements
- Delivered several prototypes to physicians at Duke University Hospital that are now under clinical evaluation

Graduate Teaching Assistant (TA) in Polymer Science, Duke University *Durham, NC* | Aug '23 – Dec '24

- Delivered lectures on 3D printing of polymers and supported student success through office hours and review sessions
- Honored with the Best TA Award for exceptional mentorship and leadership

Undergraduate Researcher: New Materials for DIW 3D Printing, University of Akron *Akron, OH* | Jun '21 – May '22

- Investigated DIW printing of scaffolds and a human ear model using customized crosslinking strategies and rheological analysis
- Authored G-code for DIW processes and developed SOPs for scaffold resolution analysis using ImageJ
- Recognized with awards for research and presentation excellence and published one paper

Undergraduate Engineering Capstone Team Captain: Hands Free Shoe, University of Akron *Akron, OH* | Aug '21 – May '22

- Led a team of senior engineering students through the FDA waterfall medical device design process and phase-gate system, including concept development, prototyping, verification, and validation
- Organized and facilitated team meetings, ensuring effective communication and task delegation, and presented regular progress updates to faculty mentors and external stakeholders
- Maintained a comprehensive design history file (DHF) documenting design iterations, testing protocols, and risk analyses

PUBLICATIONS

- **Segal, M.,** Bahnick, A.J. et al. (2024) "Synthesis and Solvent Free DLP 3D Printing of Degradable Poly(Allyl Glycidyl Ether Succinate)" Angewandte Chemie 10.1002/anie.202414016
- Poon, K., **Segal, M.** et al. (2024) "Digital Light Processing to Afford High Resolution and Degradable CO_2 Derived Copolymer Elastomers" Angewandte Chemie 10.1002/anie.202407794
- Bahnick, A.J. et al. (2024) "Controlled Transdermal Delivery of Dexamethasone for Pain Management via Photochemically 3D-Printed Bioresorbable Microneedle Arrays" Advanced Healthcare Materials 10.1002/adhm.202402113
- Full list available upon request

PATENTS & INVENTION DISCLOSURES

- **Segal, M.,** Becker, M.L. "Solvent Free Resorbable Resin for 3D Printing"
- **Segal, M.,** Augustine, E., Becker, M.L., "Degradable Silyl Ether Based Thiol Crosslinkers for Photochemical Printing"
- **Segal, M.,** Thompson, R.E., Becker, M.L. "Self-Polymerizing, Radiopaque Resin for Percutaneous Vertebroplasty"