MADDISON SEGAL

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EDUCATION:

Duke University, Durham, NC *Aug '22 to Current*
Ph.D. Candidate, Mechanical Engineering & Materials Science GPA: 4.0/4.0
Advisor: Dr. Matthew Becker
Dissertation: Low Viscosity Degradable Poly(Ally Glycidyl Ether Succinate) for Biomedical Applications

University of Akron, Akron, OH *Aug '18 to May '22*
B.S. in Biomedical Engineering with Honors GPA: 4.0/4.0, *Summa Cum Laude*
Minor in chemistry, specialization in biomaterials & tissue engineering

TECHNICAL SKILLS:

Polymer synthesis: Schlenk line, cannulation, distillation, sublimation, precipitation, liquid-liquid extraction, rotary evaporation, column chromatography, dialysis
Polymer characterization: nuclear magnetic resonance (NMR), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), gel permeation chromatography (GPC)/size exclusion chromatography (SEC), matrix assisted laser desorption/ionization time of flight (MALDI TOF), Fourier transform infrared (FT-IR) spectroscopy, rheology, tensile testing, compression testing, mylar loop testing, dynamic mechanical analysis (DMA), micro computed tomography (μCT), degradation testing, histological analysis of *in vivo* explants
Polymer processing: digital light processing (DLP) 3D printing, continuous liquid interface production (CLIP) 3D printing, fused filament fabrication (FFF) 3D printing, direct ink write (DIW) 3D printing, compression molding, film casting
Software: nTop, SOLIDWORKS**,** Autodesk Inventor, MestReNova, TRIOS, Prism Graphpad, Envison One RP, Carbon, Zotero, EndNote, MATLAB, Markdown, Microsoft Excel, Microsoft Word, Microsoft PowerPoint

PUBLICATIONS:

R.E. Thompson, **M.I. Segal**, S. Sipics, N.G. Judge, A. Bensoussan, B. Keshavarz, M.L. Becker, Injectable Solvent Free Strontium Carbonate Poly (Allyl Glycidyl Ether Succinate) Composite Networks for Vertebral Augmentation, *Advanced Healthcare Materials*, 2025, DOI: 10.1002/adhm.202501633

A.P. Dhand, R.H. Bean, V. Chiaradia, A.J. Commisso, D. Dranseike, H.E. Fowler, J.M. Fraser, H. Howard, T. Kaneko, J. Kim, J.M. Kronenfeld, K.S. Mason, C.J. O'Dea, F. Pashley-Johnson, D.H. Porcincula, **M.I. Segal**, S.Yu, M.A. Saccone, Advances in vat photopolymerization: early-career researchers shine light on a path forward, *RSC Applied Polymers*, 2025, DOI: 10.1039/D5LP00010F

N.G. Judge, **M. Segal**, R.O. Silzer, C.S. Dziewior, Y.M. Chan, S.J. Grovogel, M.L. Becker, Semiaromatic Polyester-Ethers with Tunable Degradation Profiles, *ACS Macro Lett.,* 2024, DOI: 10.1021/acsmacrolett.4c00617

M. Segal, A.J. Bahnick, N. Judge, M.L. Becker, Synthesis and Solvent Free DLP 3D Printing of Degradable Poly(Allyl Glycidyl Ether Succinate), *Angew Chem. Int. Ed.*, 2024, DOI: 10.1002/anie.202414016

A.J. Bahnick, C.S. Dziewior, Y. Li, A. Chou, **M. Segal**, E.K. Augustine, R. Ji, M.L. Becker, Controlled Transdermal Delivery of Dexamethasone for Pain Management via Photochemically 3D-Printed Bioresorbable Microneedle Arrays, *Advanced Healthcare Materials*, 2024, DOI: 10.1002/adhm.202402113

G. Pacheco, J.A.Gomes, K. Cho, D.L. Morris, **M. Segal**, K.R. Adkins-Travis, E. Stancliffe, G.J. Patti, C.J. Ziegler, L.P. Shriver, Iron Accumulation and Metabolic Alterations in Aneurysmal Subarachnoid Hemorrhage, *Stroke: Vascular and Interventional Neurology*, 2024, DOI: 10.1161/SVIN.123.000848

K. Poon, **M. Segal**, A. Bahnick, Y.M. Chan, B. Gao, M.L. Becker, C.K. Williams, Digital Light Processing to Afford High Resolution and Degradable CO2-Derived Copolymer Elastomers, *Angew Chem. Int. Ed.,* 2024, DOI: 10.1002/anie.202407794

D. Ortiz-Ortiz, A.H. Mokarizadeh, **M. Segal**, F. Dang, M. Zafari, M. Tsige, A. Joy, Synergistic Effect of Physical and Chemical Crosslinkers Enhances Shape Fidelity and Mechanical Properties of 3D Printable Low Modulus Polyesters, *Biomacromolecules,* 2023, DOI: 10.1021/acs.biomac.3c00684

PATENTS:

M. Segal, M.L. Becker, E. Augustine, Degradable Silyl Ether Based Thiol Crosslinkers for Photochemical Printing. Filed June 2025
M. Segal, M.L. Becker, R. Thompson, Self-Polymerizing, Radiopaque Resin for Percutaneous Vertebroplasty. Filed August 2024
M. Segal, M.L. Becker, Solvent Free Resorbable Resin for 3D Printing. Filed July 2023

PRESENTATIONS:

Invited Guest Lectures

Additive Manufacturing Lecture in Duke Polymer Synthesis & Processing Class	*Oct '25*
Additive Manufacturing Lecture in Duke Characterization of Polymeric Materials Class	*Sept '25*
Additive Manufacturing Lecture in Duke Polymer Synthesis & Processing Class	*Oct '24*
Pathways to Careers in Research Lecture for Duke STEM Academy	*June '24*
Additive Manufacturing Lecture in Duke Characterization of Polymeric Materials Class	*Sept '23*
Careers in Medical Research Lecture for University of Akron Phi Delta Epsilon	*Feb '23*

Oral Presentations

National Association of Printing Ink Manufacturers (NAPIM) 2025 Annual Conference	*Sept '25*
RadTech UV & EB Technology Conference	*May '25*
Duke GradX Symposium	*Apr '25*
3 Minute Thesis (3MT) Competition at the Conference of Southern Graduate Schools	*Mar '25*
Carolina Science Symposium	*Nov '24*
Duke 3 Minute Thesis (3MT) Final Competition	*Aug '24*
Duke 3 Minute Thesis (3MT) Preliminary Competition	*July '24*
Duke Mechanical Engineering & Materials Science 2024 Research Symposium	*Feb '24*
Duke Materials Research Society Symposium	*Nov '23*

Poster Presentations

Triangle Student Research Competition	*Sept '25*
Duke Mechanical Engineering & Materials Science Fall 2025 Research Symposium	*Aug '25*
Polymers Gordon Research Conference	*June '25*
Duke BASF Research Day	*May '25*
Duke 2025 Chemistry PhD Recruitment Weekend	*Feb '25*
Duke Mechanical Engineering & Materials Science Spring 2025 Research Symposium	*Feb '25*
Duke Materials Initiative Signature Lecture Poster Session	*Sept '24*
Additive Manufacturing of Soft Materials Gordon Research Conference	*Aug '24*
University of Akron BME Research Day 2022	*Feb '22*
University of Akron NSF REU Poster Session 2021	*Aug '21*

AWARDS AND RECOGNITIONS:

External Awards

RadLaunch Award from RadTech UV & EB Association for innovative applications of UV technology	*Apr '25*
NSF Graduate Research Fellowship Program (GRFP) Honorable Mention for an outstanding application	*Mar '24*
Carolina Science Symposium Oral Presentation First Place	*Nov '24*

Duke University

Best Teaching Assistant	*Dec '24*
3 Minute Thesis (3MT) First Place	*Aug '24*
Pratt Gardner Fellowship for an outstanding PhD application	*Aug '22*

University of Akron

Buckingham Orr full undergraduate scholarship	*May '18*
Summa Cum Laude and Honors College graduate	*May '22*
Student Commencement Speaker	*May '22*
Outstanding BME Student	*May '22*
Top Ten Senior	*May '22*
President's List for 4.0 GPA for 10 semesters	*May '22*
Best Senior Capstone Project	*May '22*
Karen M. Mudry Achievement Award for outstanding undergraduate research	*Feb '22*
Best Design Award for BME Design course	*Dec '18*

Early Awards

Summa Cum Laude High School Graduate	*May '18*
Valedictorian High School Graduate	*May '18*
Student Commencement Speaker for High School Graduation	*May '18*

RESEARCH EXPERIENCE:

Graduate Research Assistant *Aug '22 to Current*

Duke University, Mechanical Engineering & Materials Science Department

- Developed degradable, 3D printable polymers for biomedical applications
- Authored/co-authored 6 publications and 3 patents
- Mentored 3 undergraduate students and 2 early career graduate students
- Collaborated across interdisciplinary teams for synthesis, characterization, and *in vivo* testing of novel polymers

Undergraduate Research Assistant *Aug '19 to May '22*

University of Akron, Departments of Biomedical Engineering & Polymer Science

- Developed a 3D printable polymer for drug delivery applications in an NSF REU research project resulting in 1 publication and an award for outstanding undergraduate research
- Analyzed neural cell responses to iron to simulate brain bleeds resulting in 1 publication
- Lead senior capstone project as team captain to design a hands-free shoe for mobility impaired users using FDA waterfall design process and phase-gate system resulting in the Best Senior Capstone Project Award

TEACHING EXPERIENCE:

Graduate Teaching Assistant, Polymer Science *Aug '23 to Dec '24*

Duke University, Mechanical Engineering & Materials Science Department

- Lectured on polymer architecture, molecular weight distribution, and 3D printing
- Designed exam review lectures and practice guides for over 50 students
- Assisted students with homework assignments in weekly office hours
- Graded all homework assignments and assisted with exam grading
- Awarded Best Teaching Assistant

Organic Chemistry Learning Assistant *Jun '20 to May '22*

University of Akron, Department of Chemistry

- Led weekly reviews for over 80 students
- Developed video lectures and problem sets for remote learning during COVID-19

STEM Tutor *Jan '19 to May '21*

University of Akron, Department of Student Success

- Tutored individuals and small groups in algebra, calculus, physics, biology, anatomy, chemistry, and organic chemistry

LEADERSHIP & SERVICE:

Communications Director, Duke MEMS Graduate Student Committee	*Aug '22 to Current*
Communications Liaison, Duke Engineering Graduate Ambassadors	*Aug '23 to May '25*
Project Management Trainee, Duke DEVELPMNT Program	Jan *'25 to May '25*
Mentoring Lead, Duke MEMS Mentoring Network	Aug *'22 to May '23*
President, Secretary, Risk Management Officer, University of Akron Phi Delta Epsilon	Jan *'19 to May '22*
Volunteer, Cleveland Clinic Akron General Hospital (165+ hours completed)	*Sept '18 to Mar '20*

OTHER:

MCAT Score: 522 (99^{th} percentile) *Jan '21*