Nicole E. Friend, PhD

nicole.friend-1@colorado.edu
www.linkedin.com/in/nicole-friend

Education

Postdoctoral Associate, Chemical and Biological Engineering — **09/2023 – Present**
BioFrontiers Institute, University of Colorado — Boulder, CO
Advisor: Kristi Anseth

Ph.D., Biomedical Engineering — **08/2023**
University of Michigan — Ann Arbor, MI
Thesis: Cell-encapsulating microbeads for therapeutic vascularization of ischemic tissues
Advisors: Andrew Putnam, Jan Stegemann

M.S.E, Biomedical Engineering — **04/2019**
University of Michigan — Ann Arbor, MI
Advisors: Andrew Putnam, Jan Stegemann

B.S., Bioengineering: BioSystems — **06/2017**
University of California San Diego — La Jolla, CA
Advisors: Karen Christman, Adam Engler, Robert Sah

Awards and Honors

RoosterBio Development Award, RoosterBio — 2024
F32 NRSA Individual Postdoctoral Fellowship, National Institutes of Health (3 years) — 2024
CPMR T32 Training Grant, University of Colorado – Boulder (not accepted) — 2024
Glenn V. Edmonson Scholarship, University of Michigan — 2022
Rackham Research Exchange Grant, University of Michigan — 2020
SFB STAR Award, Society for Biomaterials — 2019
TEAM T32 Training Grant, University of Michigan (2 years) — 2018
Rackham Merit Fellowship, University of Michigan (2.5 years) — 2017
SFB Cato T. Laurencin Award, Society for Biomaterials — 2017
NACME Scholar, University of California – San Diego — 2016
Genentech Scholar, University of California – San Diego — 2015
Provost's Honors, University of California – San Diego — 2014-2016

Peer-reviewed Journal Publications

*13 total, 5 as first/co-first author; *indicates authors contributed equally*

1. Zhang, I. W., Choi, L. S., **Friend, N. E.,** McCoy, A. J., Midekssa, F. S., Alsberg, E., Lesher-Pérez, S. C., Stegemann, J. P., Baker, B. M., & Putnam, A. J. (2025). Clickable PEG-norbornene microgels support suspension bioprinting and microvascular assembly. *Acta Biomater.* (link)
2. **Friend, N. E.,** Zhang, I. W., McCoy, A.J., Hu, M., Kent, R. N., DePalma, S. L., Baker, B. M., Lesher-Pérez, S. C., Stegemann, J. P., & Putnam, A. J. (2025) Biofabrication and characterization of vascularizing PEG-norbornene microgels. *JBMR-A*, 113(4), e37900. (link)
3. Skillin, N. P., Kirkpatrick, B. E., **Friend, N. E.,** Perry, A. R., McCracken, J. M., Colorado Escobar, M., Nelson, B. R., Day, N. L., Hume, P. S., Konrad Rajab, T., Anseth, K. S., & White, T. J. (2025) In vivo photothermal reconfiguration of liquid crystalline elastomer nanocomposite. *Cell Biomaterials*. (link)
4. Midekssa, F. S., Davidson, C. D., Wieger, M. E., Kamen, J. L., Hanna, K. M., Jayco, D. K. P., **Friend, N. E.,** Putnam, A. J., Helms, A. S., Shikanov, A. & Baker, B. M. (2025) Semi-synthetic fibrous fibrin composites promote 3d microvascular assembly, survival, and host integration of endothelial cells without mesenchymal cell support. *Bioactive Materials,* 49, 652-669. (link)
5. Margolis, E. A., Choi, L. S., **Friend, N. E.**, & Putnam, A. J. (2024) Engineering primitive multiscale chimeric vasculature by combining human microvessels with explanted murine vessels. *Sci Rep*, 14(1), 4036. (link)
6. **Friend, N. E.*,** McCoy, A. J.*, Stegemann, J. P., & Putnam, A. J. (2023). A combination of matrix stiffness and degradability dictate microvascular network assembly and remodeling in cell-laden poly (ethylene glycol) hydrogels. *Biomaterials,* 295, 122050. (link)
7. **Friend, N. E.**, Beamish, J. A., Margolis, E. A., Schott, N. G., Stegemann, J. P., & Putnam, A. J. (2023). Pre-cultured, cell-encapsulating fibrin microbeads for the vascularization of ischemic tissues. *J Biomed Mater Res* A, 1-13. (link)

8. Margolis, E. A., **Friend, N. E.**, Rolle, M. W., Alsberg, E., & Putnam, A. J. (2023) Manufacturing the multiscale vascular hierarchy: Progress towards solving tissue engineering's grand challenge. *Trends Biotechnol*, 41(11), 1400-1416. (link)
9. Hobson, E. C., Li, W., **Friend, N. E.**, Putnam, A. J, Stegemann, J. P., & Deng, C. X. (2023). Crossover of surface waves and the capillary-viscous-elastic transition in soft biomaterials detected by resonant acoustic rheometry. *Biomaterials*, 122282. (link)
10. Ky, A., McCoy, A. J., Flesher, C. G. **Friend, N. E.**, Li, J., Akinleye, K., Patsalis, C., Lumeng, C. N., Putnam, A. J., & O'Rourke, R. W. (2023). Matrix density regulates adipocyte phenotype. *Adipocyte*, 12 (1), 2268261. (link)
11. **Friend, N. E.***, Rioja, A. Y.*, Kong, Y. P., Beamish, J. A., Hong, X., Habif, J. C., Bezenah, J. B., Deng, C. X., Stegemann, J. P., & Putnam, A. J. (2020). Injectable pre-cultured tissue modules catalyze the formation of extensive functional microvasculature in vivo. *Sci Rep*, 10(1), 1-16. (link)
12. Schott, N. G.*, **Friend, N. E.***, & Stegemann, J. P. (2020). Coupling osteogenesis and vasculogenesis in engineered orthopedic tissues. *Tiss Eng Part B Rev*, *27*(3), 199-214. (link)
13. Bezenah, J. R., Rioja, A. Y., Juliar, B., **Friend, N.**, & Putnam, A. J. (2019). Assessing the ability of human endothelial cells derived from induced-pluripotent stem cells to form functional microvasculature in vivo. *Biotechnol Bioeng,* 116(2), 415-426. (link)

Peer-reviewed Conference Publications

*2 total, 2 as first/co-first author; *indicates authors contributed equally*

1. **Friend, N. E.***, Woodcock, C. S. E.*, & Huang-Saad, A. (2021). Low-barrier strategies to increase student-centered learning. Paper presented at 2021 ASEE Annual Conference & Exposition held virtually. https://peer.asee.org/low-barrier-strategies-to-increase-student-centered-learning
2. Woodcock, C. S. E.*, **Friend, N. E.***, & Huang-Saad, A. (2019). Exploratory examination of an interdisciplinary engineering field: Tissue engineering and regenerative medicine. Paper presented at 2019 ASEE Annual Conference & Exposition, Tampa, Florida. https://peer.asee.org/32801

Grantsmanship

NIH F32 Postdoctoral Fellowship (NIAMS): "Granular hydrogels for the controlled delivery of immunomodulatory and angiogenic extracellular vesicles to enhance bone tissue regeneration" (PI: Nicole Friend) 2024-2027

Research Presentations

1. **Friend, N. E.**, Young, M. Y., Shockley, K. E., Saeb, D., & Anseth, K. A. Photoresponsive granular hydrogels for spatiotemporal control of material properties. Oral Presentation. Society for Biomaterials 2026 Annual Meeting & Exposition in Atlanta, Georgia.
2. **Friend, N. E.**, Stegemann, J. P., & Putnam, A. J. Cell-encapsulating PEG microbeads support prevascularization in vitro and angiogenic sprouting in vivo. Poster Presentation. Society for Biomaterials 2023 Annual Meeting & Exposition in San Diego, California.
3. **Friend, N. E.**, Stegemann, J. P., & Putnam, A. J. Development of modular, cell-laden PEG microbeads for vascularization. Poster Presentation. Glenn V. Edmonson Lecture and 2022 Biomedical Engineering Symposium in Ann Arbor, Michigan.
4. **Friend, N. E.**, Stegemann, J. P., & Putnam, A. J. Development of modular, cell-laden PEG microbeads for vascularization. Rapid Fire Oral & Poster Presentation. Society for Biomaterials 2022 Annual Meeting & Exposition in Baltimore, Maryland.
5. **Friend, N. E.**, Stegemann, J. P., & Putnam, A. J. Vascularization of degradable PEGNB hydrogels via coculture of endothelial and stromal cells. Oral Presentation. Society for Biomaterials 2021 Annual Meeting & Exposition held virtually.
6. **Friend, N. E.**, Beamish, J. A., Stegemann, J. P., & Putnam, A. J. Evaluating pre-vascularized microtissues in a mouse model of hindlimb ischemia. Poster Presentation. Society for Biomaterials 2019 Annual Meeting & Exposition in Seattle, Washington.

7. **Friend, N. E.**, Woodcock, C. S. E., Stegemann, J. P., & Huang-Saad, A. Y. An exploration of faculty perceptions of tissue engineering and regenerative medicine to inform biomedical engineering curriculum development. Poster Presentation. Society for Biomaterials 2019 Annual Meeting & Exposition in Seattle, Washington.

8. **Friend, N. E.**, Ungerleider, J. L., & Christman, K. L. Myoblast response to tissue specific extracellular matrix environments. Poster Presentation. Biomedical Engineering Society 2016 Annual Meeting & Exposition in Minneapolis, Minnesota.

Research Experience

Postdoctoral Research, University of Colorado 09/2023 - Present
Principle Investigator: Kristi Anseth

- Fabrication of photo-responsive granular materials for controlled softening and patterning to study cell response to dynamic matrix environments.
- Analysis of the effect of granular hydrogel physicochemical properties on mesenchymal stem cell secretion of anti-inflammatory and pro-angiogenic extracellular vesicles.

Doctoral Research, University of Michigan 09/2017 - 07/2023
Principle Investigators: Andrew Putnam, Jan Stegemann

- Developed cell-encapsulating, vascularizing microgels utilizing natural (fibrin) and synthetic (PEG) matrices via multiple biofabrication techniques.
- Analyzed vascularization potential of various cell-laden biomaterials *in vitro* and *in vivo* in subcutaneous and hindlimb ischemia murine models (immune-compromised).
- Contributed significantly to several other collaborative projects related to my work through their use of biomaterials to study material properties and their effect on cell behavior as well as to create hierarchical vascular constructs *in vitro*.

Engineering Education Research, University of Michigan 09/2017 - 07/2021
Principle Investigator: Aileen Huang-Saad

- Identified low-barrier strategies to increase student-centered learning.
- Examined how members of the tissue engineering and regenerative medicine community define the field, core concepts, and fundamental techniques.

Bioengineering: BioSystems Senior Design, University of California San Diego 09/2016 - 06/2017
Principle Investigator: Adam Engler

- Developed a microvasculature on-a-chip model to simulate physiological flow in human blood vessels to analyze how gene mutations on the chromosome 9p21 may lead to pathological alterations in lumen structure that could be correlated to plaque buildup and coronary artery disease development.

Bioengineering NSF-REU Supported Research, University of California San Diego 06/2016 - 06/2017
Principle Investigator: Karen Christman

- Investigated myoblast response to decellularized ECM scaffolds derived from skeletal muscle, heart, and lung tissue to determine the importance of matching hydrogel scaffolds to cells' native tissue and improve cell delivery techniques.
- Fully designed and optimized a liver tissue decellularization process, expanding the lab's decellularized ECM scaffold repertoire.

Genentech Supported Research, University of California San Diego 06/2015 - 06/2016
Principle Investigator: Robert Sah

- Characterized differences between healthy and osteoarthritic synovial fluid composition and its effect on lubrication properties to better understand disease progression and inform potential directions to engineer synthetic synovial fluid to prevent joint degradation.

Clinical Research, University of California San Diego 01/2015 - 06/2015
Principle Investigators: Gary Vilke, Edward Castillo

- Conducted clinical research analyzing the trends common among psychiatric medication adherence and emergency room utilization.
- Interacted with patients in the emergency department to enroll patients in studies used for current and future clinical research (160+ hours).

Teaching Experience

Postdoctoral Teaching Fellow, Systems Analysis of Cells and Tissues, University of Colorado Spring 2025

Graduate Student Instructor, Introduction to Tissue Engineering (lab course), University of Michigan Fall 2022

Graduate Student Teaching Apprentice, Engineering the Cellular Microenvironment: An Introduction to Tissue Engineering Module (lab course), University of Michigan — Winter 2019

Teaching Assistant, Introduction to Bioengineering (lab course), University of California San Diego — Winter 2017

Leadership and Outreach

BioFrontiers Postdoctoral Association, *Board Member* — 2024 - present
- Work with other board members to plan events that provide community, professional, scientific, and financial support to the diverse group of postdocs housed within the BioFrontiers Institute.
- Wrote proposal to achieve funding from BioFrontiers leadership.

Científico Latino Graduate Student Mentorship Initiative (CL GSMI), *Mentor* — 2020 - present
- Mentor senior undergraduates from underrepresented backgrounds through the process of applying for graduate school, including reviewing and providing feedback on application materials.
- Conduct mock interviews with prospective graduate students to help prepare them for interview visits.

Postdoctoral Association of Colorado (PAC) Boulder, *Communications Officer* — 2024 - 2025
- Worked with other board members to facilitate professional development and community building opportunities for the broader postdoc community.
- Managed social media accounts and was responsible for handling communications between the board and postdocs community.

UM BME Graduate Application Assistance Program (BME GAAP), *Mentor* — 2022 - 2023
- Mentored prospective graduate school applicants from non-traditional paths or historically disadvantaged backgrounds by reviewing application materials throughout the process of applying to BME PhD programs.

UM Science Education & Engagement for Kids (UM-SEEK), *Volunteer Educator* — 2019 - 2020
- Helped 3rd- 5th grade students develop science competency at Estabrook Elementary School in Ypsilanti, Michigan through implementation of curriculum and hands-on activities to prepare them for the state-mandated M-STEP Exam.

UM Discover Engineering, *Volunteer* — 2018 - 2019
- Helped with annual Discover Engineering event by leading lab tours to introduce middle school students to various types of tissue engineering research.

UCSD Jacobs Undergraduate Mentor Program (JUMP), *Peer Mentor*
- Mentored underclassman students majoring in bioengineering, providing professional guidance throughout the year. — 2015 - 2017

UCSD Society of Women Engineers (SWE), *Envision Coordinator, Peer Mentor* — 2013 - 2017
- Envision Planning Committee Member – Worked with a team to plan the logistics behind UCSD SWE Chapter's largest outreach event for high school girls.
- Peer Engineering Program Committee Member and Peer Mentor – Helped plan and implement a new outreach program at UC San Diego to mentor high school students in carrying out engineering design projects.

Organizations and Memberships

Society for Biomaterials (SFB)	2017 - Present
California Louis Stokes Alliance for Minority Participation (LSAMP/CAMP) Science Program	2015 - 2017
Society of Women Engineers (SWE)	2013 - 2017
Association for Women in Science (AWIS)	2015 - 2016

Mentorship

Graduate Students
- Colorado: Ashbey Manning, ChemE PhD student, 2024-present
- Colorado: Nolan Petrich, ChemE PhD student, 2024-present
- Michigan: Atticus McCoy, BME PhD student, 2021-2023
- Michigan: Irene Zhang, BME PhD student, 2021-2023
- Michigan: Huy Vu, BME MS student, 2021

Undergraduate Students

- Colorado: Daniel Saeb, ChBE, September 2025-present
- Colorado: Kara Shockley, MCDB, June 2024-December 2025
- Colorado (NSF YSSRP-Funded): Magaly Luna, Electrical Engineering, Summer 2024; 1st place poster winner
- Michigan: Emmet Springer, BME, Summer 2019

Reviewing and Service Activities

Peer-reviewed Journals:

- *Advanced Materials* (with mentor)
- *Advanced Functional Materials* (with mentor)
- *Acta Biomaterialia* (with mentor)
- *Biomacromolecules*
- *International Journal of Biological Macromolecules*

Conference Abstracts/Papers:

- *ASEE New Engineering Educators (NEE) Division*
- *ASEE Student Division*