GARRETT FARRELL BEEGHLY

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EDUCATION AND TRAINING

University of Toronto Institute of Biomedical Engineering — **Toronto, ON**
Postdoctoral Research Fellow — 2025 – Present

Cornell University College of Engineering — **Ithaca, NY**
PhD in Biomedical Engineering, — 2018 – 2024
Minor in Stem Cell Biology

University of Cambridge Department of Engineering — **Cambridge, UK**
Whitaker Research Fellow — 2017 – 2018

University of Virginia School of Engineering and Applied Science — **Charlottesville, VA**
BS in Biomedical Engineering, — 2013 – 2017
Minor in Business

SELECTED AWARDS AND HONORS

Research Expertise Advancement Program Weill Institute for Cell Biology — 2024
Kirschstein National Research Service Award (F31) National Cancer Institute — 2023
Teaching Assistant of the Year Meinig School of Biomedical Engineering — 2021
Center for Teaching Innovation Fellowship Cornell University — 2021
NSF Graduate Research Fellowship National Science Foundation — 2019
Presidential Life Science Fellowship Cornell University — 2018
Tau Beta Pi Fellowship Tau Beta Pi National Engineering Honor Society — 2018
Whitaker Research Fellowship Institute of International Education — 2017
Harrison Undergraduate Research Award University of Virginia — 2016
Rodman Honors Scholarship University of Virginia — 2013

RESEARCH EXPERIENCE

University of Toronto Postdoctoral Research Fellow — **Toronto, ON**
Advisor: Milica Radisic, PhD — Jul 2025 – Present
Project: Stem cell-mediated fabrication of functional cardiac microtissues

Cornell University Postdoctoral Research Associate — **Ithaca, NY**
Advisor: Claudia Fischbach, PhD — Jan 2025 – Jun 2025
Project: Regulation of membrane tension in primary adipocytes

Cornell University Graduate Research Assistant — **Ithaca, NY**
Advisor: Claudia Fischbach, PhD — Aug 2018 – Dec 2024
Project: Adipose tissue as a biophysical mediator of breast cancer invasion

Max Planck Institute for the Science of Light Visiting Scientist — **Erlangen, DE**
Advisor: Jochen Guck, PhD — Jun 2023 – Jul 2023
Project: Contact-free measurements of adipose tissue mechanics

New York – Presbyterian Hospital NIH T35 Trainee — **New York, NY**
Advisor: Jason Spector, MD — Jun 2019 – Jul 2019
Project: Characterization and decellularization of human adipose tissue

University of Cambridge Whitaker Research Fellow — **Cambridge, UK**
Advisors: Jacqueline Shields, PhD and Yan Yan Shery Huang, PhD — Aug 2017 – Jul 2018
Project: Microfabricated models of the tumor-draining lymph node

University of Virginia Undergraduate Research Assistant — **Charlottesville, VA**
Advisor: Jennifer Munson, PhD — Mar 2015 – May 2017
Project: Patient-informed models of the glioblastoma microenvironment

TEACHING EXPERIENCE

Cornell University Center for Teaching Innovation Fellow — **Ithaca, NY**
Advisor: Derina Samuel, PhD — Fall 2021 – Spring 2023
Courses: University-Wide Teaching Conference, GET SET Workshops

Yale University Guest Lecturer — **New Haven, CT**
Instructor: Corey O'Hern, PhD — Fall 2021 – Fall 2023
Course: Physical Biology Integrated Workshop (MBB 591)

Cornell University Graduate Teaching Assistant — **Ithaca, NY**
Instructors: Shivaun Archer, PhD and Claudia Fischbach, PhD — Fall 2020
Course: Lab Techniques for Molecular, Cellular, and Systems Engineering (BME 4190)

University of Virginia Undergraduate Teaching Assistant — **Charlottesville, VA**
Instructor: Timothy Allen, PhD — Summer 2016
Course: Integrative Design and Experimental Analysis Lab (BME 3080)

PUBLICATIONS

GF Beeghly,* A Shakeri,* F Mirzapour-Shafiyi, C Dikyol, N Offen, A Alsaafin, UA Nuber, M Radisic. Guiding the spatial organization of engineered heart tissues. *In revision at Advanced Drug Delivery Reviews.* (2026).

GF Beeghly, MI Pincus, R Varshney, DJ Falcone, MC Rudolph, MA Antonyak, NM Iyengar, C Fischbach. Large adipocytes increase vesicle-mediated lipid release and promote breast cancer malignancy. *In revision at Cell Reports, preprint available on bioRxiv*. 645549 (2026). DOI.

BK Knode, **GF Beeghly**, BE Schutrum, D Wang, Y Zheng, A Battistella, R Goswami, CY Eom, A Bozec, J Guck, N Nishimura, S Girardo, CS O'Hern, C Fischbach. Adipose-mimetic granular hydrogels uncover biophysical cues driving breast cancer invasion. *In revision at Cell Biomaterials, preprint available on bioRxiv*. 684224. (2026). DOI.

ND Sempertegui, Y Yan, MA Whitman, **GF Beeghly**, S Choi, AD Miller, LA Estroff, C Fischbach. Mineralized bone matrix attenuates breast cancer malignancy by altering MSC mechanoregulation. *Biomaterials*. 123763 (2025). DOI.

GF Beeghly, J Deng, C Fischbach. Protocol to fabricate elastomer microwells for three-dimensional culture of primary adipocytes. *STAR Protocols*. 5, 103264 (2024). DOI.

Y Zheng, D Wang, **GF Beeghly**, C Fischbach, MD Shattuck, CS O'Hern. Computational modeling of the physical features that influence breast cancer invasion into adipose tissue. *APL Bioengineering*. 8, 036104 (2024). DOI.

GF Beeghly,* AA Shimpi,* RN Riter, C Fischbach. Measuring and modelling tumour heterogeneity across scales. *Nature Reviews Bioengineering*. 1, 712–730 (2023). DOI. *Denotes equal contribution

RC Cornelison,* JX Yuan,* KM Tate, A Petrosky, **GF Beeghly**, M Bloomfield, SC Schwager, AL Berr, D Cimini, FF Bafakih, JW Mandell, BW Purow, BJ Horton, JM Munson. A patient-designed tissue-engineered model of the infiltrative glioblastoma microenvironment. *npj Precision Oncology*. 6, 54 (2022). DOI. *Denotes equal contribution

GF Beeghly,* K Amofa,* C Fischbach, S Kumar. Regulation of tumor invasion by the physical microenvironment: Lessons from breast and brain cancer. *Annual Review of Biomedical Engineering*. 24, 29–59 (2022). DOI. *Denotes equal contribution

GF Beeghly, CF Thomas, JX Yuan, AR Harris, JM Munson. Designing patient-driven, tissue-engineered models of primary and metastatic breast cancer. *Bioengineering*. 9, 44 (2022). DOI.

L Ling, JA Mulligan, Y Ouyang, AA Shimpi, RM Williams, **GF Beeghly**, BD Hopkins, JA Spector, SG Adie, C Fischbach. Obesity-associated adipose stromal cells promote breast cancer invasion through direct cell contact and matrix remodeling. *Advanced Functional Materials*. 30, 1910650 (2020). DOI.

DK Logsdon, **GF Beeghly**, JM Munson. Chemoprotection across the tumor border: Cancer cell response to doxorubicin depends on stromal fibroblast ratios and interstitial therapeutic transport. *Cellular and Molecular Bioengineering*. 10, 463–481 (2017). DOI.

CONFERENCE PRESENTATIONS

Invited Presentations

GF Beeghly, C Fischbach. Engineering biomimetic adipose tissue models to dissect microenvironmental regulation of breast cancer. *Terrence Donnelly Centre for Cellular and Biomolecular Research, Toronto, Ontario, May 2025. Invited podium.*

GF Beeghly, C Fischbach. Adipose tissue as a biophysical regulator of tumor cell migration. *American Physical Society Global Physics Summit, Anaheim, California, March 2025. Invited podium.*

GF Beeghly, AA Shimpi, C Fischbach. Biophysical contributions of adipose tissue to breast cancer invasion. *Annual Physics of Cancer Symposium, Leipzig, Germany, September 2022. Invited podium.*

External Presentations

GF Beeghly, MI Pincus, B Cho, DJ Falcone, R Varshney, MC Rudolph, NM Iyengar, C Fischbach. Hypertrophic adipocytes shift from lipase- to vesicle-mediated lipid transfer to promote obesity-associated breast cancer progression. *Biomedical Engineering Society Annual Meeting, Baltimore, Maryland, October 2024. Podium.*

GF Beeghly, D Wang, Y Zheng, NM Iyengar, CS O'Hern, C Fischbach. The role of hypertrophic adipocytes in obesity-associated breast cancer progression. *Biomedical Engineering Society Annual Meeting, Seattle, Washington, October 2023. Podium.*

MI Pincus, **GF Beeghly**, C Fischbach. Examining cortical actin remodeling in adipogenesis and adipocyte hypertrophy. *Biomedical Engineering Society Annual Meeting, Seattle, Washington, October 2023. Poster.*

GF Beeghly, D Wang, Y Zheng, JD Treado, J Druso, NM Iyengar, CS O'Hern, C Fischbach. Biophysical contributions of adipose tissue to breast cancer invasion. *Gordon Research Conference on the Physical Science of Cancer, Galveston, Texas, February 2023. Poster.*

D Wang, JD Treado, **GF Beeghly**, F Arceri, M Murrell, C Fischbach, M Shattuck, CS O'Hern. Mechanical properties of adipose tissue mediate breast cancer invasion. *American Physical Society Meeting, Chicago, Illinois, March 2022. Podium.*

SL Esparza, **GF Beeghly**, JM Munson, SS Verbridge. Agent-based model of spatial fibroblast chemoprotection in the breast cancer microenvironment. *Biomedical Engineering Society Annual Meeting, Orlando, Florida, October 2021. Poster.*

GF Beeghly, BR Seo, JD Treado, D Wang, BD Hopkins, B Cho, AJ Dannenberg, NM Iyengar, JA Spector, CS O'Hern, C Fischbach. Engineered platforms to interrogate and model the impact of adipose tissue biophysical parameters on obesity-associated breast cancer. *National Cancer Institute Physical Sciences Oncology Network Annual Investigators Meeting, August 2021*. *Poster*.

GF Beeghly, H Munir, M Gerigk, YYS Huang, JD Shields. Engineering model systems to examine tumor-mediated immune dysfunction. *Gordon Research Conference on the Physical Science of Cancer, Galveston, Texas, February 2019. Poster.*

RC Cornelison, JX Yuan, **GF Beeghly**, KM Tate, JM Munson. The impact of interstitial fluid flow on cell motility and the tumor microenvironment. *Gordon Research Conference on the Physical Science of Cancer, Galveston, Texas, February 2019. Poster.*

GF Beeghly, H Munir, M Gerigk, YYS Huang, JD Shields. Engineering a microfluidic system to examine tumor-draining lymph node transformation. *Biomedical Engineering Society Annual Meeting, Atlanta, Georgia, October 2018. Poster.*

GF Beeghly*, DN Tavakol.* Understanding the role of international research experiences on developing integrative and collaborative practices in science. *Biomedical Engineering Society Annual Meeting, Atlanta, Georgia, October 2018. Poster.* *Denotes equal contribution

GF Beeghly, CF Thomas, JX Yuan, AR Harris, JM Munson. Engineering patient-driven models to examine breast cancer behavior after metastasis to the brain. *Biomedical Engineering Society Annual Meeting, Phoenix, Arizona, October 2017. Poster.*

Internal Presentations

GF Beeghly, JA Spector, NM Iyengar, C Fischbach. Combining engineered systems and patient-derived samples to model the tumor microenvironment. *Meinig School of Biomedical Engineering Annual Research Symposium, Ithaca, New York, August 2023. Podium.*

GF Beeghly, BR Seo, JD Treado, D Wang, BD Hopkins, JA Spector, B Cho, AJ Dannenberg, NM Iyengar, CS O'Hern, C Fischbach. Hypertrophic adipocytes as mediators of breast cancer progression. *Cornell Intercampus Cancer Research Symposium, Ithaca, New York, May 2022. Poster.*

GF Beeghly, BR Seo, JD Treado, D Wang, BD Hopkins, JA Spector, B Cho, AJ Dannenberg, NM Iyengar, CS O'Hern, C Fischbach. Hypertrophic adipocytes as mediators of breast cancer progression. *Cornell Annual Stem Cell Retreat, Ithaca, New York, May 2022. Poster.*

GF Beeghly, H Munir, M Gerigk, YYS Huang, JD Shields. Designing a microfluidic platform to monitor immune reprogramming in tumor-draining lymph nodes. *Whitaker International Program Annual Meeting, Budapest, Hungary, April 2018. Podium.*

GF Beeghly, H Munir, M Gerigk, YYS Huang, JD Shields. Microfluidic approaches to modeling lymphatic-mediated interactions in the tumor-immune microenvironment. *Medical Research Council Annual Retreat, Cambridge, United Kingdom, October 2017*. *Poster*.

GF Beeghly, CF Thomas, JX Yuan, AR Harris, JM Munson. Quantitative analysis of the cellular microenvironment of metastatic breast cancer patient resections. *University of Virginia Undergraduate Research Symposium, Charlottesville, Virginia, April 2017. Poster.*

PROFESSIONAL DEVELOPMENT

Single-Cell Analysis Learning Enrichment Course Participant — **New York, NY**
Memorial Sloan Kettering Cancer Center — Dec 2024

Ivy Plus Teaching Transformations Graduate Summit Participant — **New York, NY**
Center for Teaching and Learning, Columbia University — Apr 2023

AIMBE Public Policy Institute for Rising Leaders Participant — **Washington, DC**
American Institute for Medical and Biological Engineering — Oct 2019

SERVICE AND OUTREACH

Cornell Community Cancer Partnership Volunteer — **Ithaca, NY**
Cancer Resource Center of the Finger Lakes — Fall 2018 – Fall 2024

Undergraduate Research Mentor — **Ithaca, NY**
Meinig School of Biomedical Engineering, Cornell University — Fall 2021 – Spring 2024

Session on Engineering and Physical Sciences in Oncology Organizer — **Seattle, WA**
Biomedical Engineering Society Annual Meeting — Oct 2023

Diversity, Equity, and Inclusion Committee Founding Member — **Ithaca, NY**
Meinig School of Biomedical Engineering, Cornell University — Fall 2021 – Spring 2023

Girl Scout Engineering Day Volunteer — **Ithaca, NY**
Cornell Graduate Chapter of the Biomedical Engineering Society — Spring 2019 – Fall 2019

Graduate Student Outreach Program Volunteer — **Enfield, NY**
Cornell University Public Service Center — Spring 2019

SKILLS AND KNOWLEDGE

Laboratory techniques
Aseptic cell culture, 3D cell culture, spheroid culture, primary cell isolation, mouse handling and care, rheology, natural biomaterials, atomic force microscopy (AFM), confocal microscopy, fluorescence lifetime imaging microscopy (FLIM), immunofluorescence, immunohistochemistry, flow cytometry, fluorescence-activated cell sorting (FACS), magnetic-activated cell sorting (MACS), ELISA, RNA isolation, RT-qPCR, bulk and single-cell transcriptomics, Western blotting, extracellular vesicle purification, microfluidics, Seahorse metabolic flux assays.

Languages and software
R, Bash, Python, HTML, Java, MATLAB, ImageJ, FlowJo, GraphPad Prism, Adobe Illustrator.