GARRETT FARRELL BEEGHLY

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EDUCATION AND TRAINING

Cornell University College of Engineering — **Ithaca, NY**
Ph.D. in Biomedical Engineering — 2018 – Present
M.S. in Biomedical Engineering — 2018 – 2021

University of Cambridge Medical Research Council Cancer Unit — **Cambridge, UK**
Whitaker Research Fellow — 2017 – 2018

University of Virginia School of Engineering and Applied Science — **Charlottesville, VA**
B.S. in Biomedical Engineering, GPA: 3.99 of 4.00 — 2013 – 2017

AWARDS AND HONORS

Teaching Assistant of the Year Cornell School of Biomedical Engineering — August 2021
Center for Teaching Innovation Fellowship Cornell University — June 2021
NSF Graduate Research Fellowship National Science Foundation — May 2019
Presidential Life Science Fellowship Cornell University — August 2018
Fischell Graduate Bioengineering Scholarship Cornell University — August 2018
Tau Beta Pi Fellowship Tau Beta Pi National Engineering Honor Society — May 2018
Whitaker Research Fellowship Institute of International Education — March 2017
Harrison Undergraduate Research Award University of Virginia — March 2016
Rodman Honors Scholarship University of Virginia — August 2013

RESEARCH EXPERIENCE

Cornell University Graduate Research Assistant — **Ithaca, NY**
Advisor: Claudia Fischbach, Ph.D. — August 2018 – Present

- Developed protocols to isolate, culture, and analyze populations of primary adipocytes stratified by cell volume from human or mouse donors
- Examined how adipocyte hypertrophy influences breast cancer progression and tumor cell behavior independently of donor body mass index

New York – Presbyterian Hospital NIH-T35 Trainee — **New York, NY**
Advisor: Jason Spector, M.D. — June 2019 – July 2019

- Compared the extracellular matrix composition of human mammary adipose tissue across demographics including age, race, body mass index, and menopause status
- Established a protocol for decellularizing human mammary adipose tissue to isolate extracellular matrix components for inclusion in tissue-engineered models of breast cancer

University of Cambridge Whitaker Research Fellow — **Cambridge, UK**
Advisor: Jacqueline Shields, Ph.D. — August 2017 – July 2018

- Developed an organotypic microfluidic system to model the tumor-draining lymph node

- Monitored changes in lymph node immune cell composition, localization, and activation status via immunofluorescence, live imaging, and flow cytometry

University of Virginia Undergraduate Research Assistant **Charlottesville, VA**
Advisor: Jennifer Munson, Ph.D. March 2015 – May 2017

- Assessed stromal heterogeneity across glioblastoma and breast cancer patient resections via immunohistochemistry and correlated the quantified metrics with clinical outcomes
- Developed a 3D tissue-engineered model of metastatic breast cancer to investigate how tumor cell behavior is modulated by microenvironmental cues after metastasis to the brain

TEACHING EXPERIENCE

Yale University Guest Lecturer **New Haven, CT**
Instructor: Corey O'Hern, Ph.D. Fall 2021, 2022
Course: Physical Biology Integrated Workshop (MBB 591)

- Lecture provided first-year graduate students with an overview of cancer classification, pathogenesis, and clinical management with a specific focus on breast cancer
- Students subsequently used this information to simulate tumor invasion dynamics via discrete element method (DEM) models

Cornell University Graduate Teaching Assistant **Ithaca, NY**
Instructors: Claudia Fischbach, Ph.D. & Shivaun Archer, Ph.D. Fall 2020
Course: Laboratory Techniques for Molecular, Cellular, & Systems Engineering (BME 4190)

- Course introduced students to laboratory techniques including cell culture, flow cytometry, stem cell differentiation, RT-qPCR, viral transfection, hydrogel fabrication, transcriptomics, chromogenic and immunofluorescence staining, spheroid culture, and confocal microscopy
- Responsibilities included updating protocols, preparing reagents, demonstrating lab techniques, holding office hours, grading lab reports, writing and grading exams

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

- Course introduced students to common biomedical laboratory techniques including cell culture, immunofluorescence, Western blotting, and RT-qPCR
- Responsibilities included preparing reagents for lab, leading and instructing students, demonstrating proper lab technique, holding office hours, and grading exams

PUBLICATIONS

Beeghly, G. F.*, Shimpi, A. A.*, Riter, R. N., Fischbach, C. (2022). Measuring and modeling tumor heterogeneity across scales. Under review at *Nature Reviews Bioengineering*. DOI.

Cornelison, R. C.*, Yuan, J. X.*, Tate, K. M., Petrosky, A., **Beeghly, G. F.**, Bloomfield, M., Schwager, S. C., Berr, A. L., Cimini, D., Bafakih, F. F., Mandell, J. W., Purow, B. W., Horton, B. J., & Munson, J. M. (2022). A patient-designed tissue-engineered model of the infiltrative glioblastoma microenvironment. *npj Precision Oncology*. DOI.

Beeghly, G. F.*, Amofa, K.*, Fischbach, C., & Kumar, S. (2022). Regulation of tumor invasion by the physical microenvironment: Lessons from breast and brain cancer. *Annual Review of Biomedical Engineering*. DOI.

Beeghly, G. F., Thomas, C. F., Yuan, J. X., Harris, A. R., & Munson, J. M. (2022). Designing patient-driven, tissue-engineered models of primary and metastatic breast cancer. *Bioengineering*. DOI.

Ling, L., Mulligan, J. A., Ouyang, Y., Shimpi, A. A., Williams, R. M., **Beeghly, G. F.**, Hopkins, B. D., Spector, J. A., Adie, S. G., & Fischbach, C. (2020). Obesity-associated adipose stromal cells promote breast cancer invasion through direct cell contact and matrix remodeling. *Advanced Functional Materials*. DOI.

Logsdon, D. K., **Beeghly, G. F.**, & Munson, J. M. (2017). Chemoprotection across the tumor border: Cancer cell response to doxorubicin depends on stromal fibroblast ratios and interstitial therapeutic transport. *Cellular and Molecular Bioengineering*. DOI.

CONFERENCE PRESENTATIONS

Beeghly, G. F., Shimpi, A. A., & Fischbach, C. Biophysical contributions of adipose tissue to breast cancer invasion. *13th Annual Physics of Cancer Symposium, Leipzig, Germany, September 2022. Podium.*

Beeghly, G. F., Seo, B. R., Treado, J. D., Wang, D., Hopkins, B. D., Spector, J. A., Cho, B., Dannenberg, A. J., Iyengar, N. M., O'Hern, C. S., & Fischbach, C. Hypertrophic adipocytes as mediators of breast cancer progression. *Cornell Intercampus Cancer Research Symposium, Ithaca, New York, May 2022. Poster.*

Beeghly, G. F., Seo, B. R., Treado, J. D., Wang, D., Hopkins, B. D., Spector, J. A., Cho, B., Dannenberg, A. J., Iyengar, N. M., O'Hern, C. S., & Fischbach, C. Hypertrophic adipocytes as mediators of breast cancer progression. *Cornell Annual Stem Cell Retreat, Ithaca, New York, May 2022. Poster.*

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

Esparza, S. L., **Beeghly, G. F.**, Munson, J. M., Verbridge, S. S. Agent-based model of spatial fibroblast chemoprotection in the breast cancer microenvironment. *Biomedical Engineering Society Annual Meeting, Orlando, Florida, October 2021. Poster.*

Beeghly, G. F., Seo, B. R., Treado, J. D., Wang, D., Hopkins, B. D., Cho, B., Dannenberg, A. J., Iyengar, N. M., Spector, J. A., O'Hern, C. S., & Fischbach, C. 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*.

Beeghly, G. F., Munir, H., Gerigk, M., Huang, Y. Y. S., & Shields, J. D. Engineering model systems to examine tumor-mediated immune dysfunction. *Gordon Research Conference on the Physical Science of Cancer, Galveston, Texas, February 2019. Poster.*

Cornelison, R. C., Yuan, J. X., **Beeghly, G. F.**, Tate, K. M., & Munson, J. M. 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.*

Beeghly, G. F., Munir, H., Gerigk, M., Huang, Y. Y. S., & Shields, J. D. Engineering a microfluidic system to examine tumor-draining lymph node transformation. *Biomedical Engineering Society Annual Meeting, Atlanta, Georgia, October 2018. Poster.*

Beeghly, G. F.* & Tavakol, D. N.* 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

Beeghly, G. F., Munir, H., Gerigk, M., Huang, Y. Y. S., & Shields, J. D. Designing a microfluidic platform to monitor immune reprogramming in tumor-draining lymph nodes. *Whitaker International Program Annual Meeting, Budapest, Hungary, April 2018. Podium.*

Beeghly, G. F., Munir, H., Gerigk, M., Huang, Y. Y. S., & Shields, J. D. Microfluidic approaches to modeling lymphatic-mediated interactions in the tumor-immune microenvironment. *Medical Research Council Annual Retreat, Cambridge, United Kingdom, October 2017*. *Poster*.

Beeghly, G. F., Thomas, C. F., Yuan, J. X., Harris, A. R., & Munson, J. M. Engineering patient-driven models to examine breast cancer behavior after metastasis to the brain. *Biomedical Engineering Society Annual Meeting, Phoenix, Arizona, October 2017. Poster.*

Beeghly, G. F., Thomas, C. F., Yuan, J. X., Harris, A. R., & Munson, J. M. Quantitative analysis of the cellular microenvironment of metastatic breast cancer patient resections. *University of Virginia Undergraduate Research Symposium, Charlottesville, Virginia, April 2017. Poster.*

INVITED TALKS

Beeghly, G. F. Pursuing interdisciplinary cancer research in graduate school. *Cancer Systems Biology Consortium and Physical Sciences Oncology Network Summer Undergraduate Research Program, National Cancer Institute, July 2021*. Invited panelist.

Beeghly, G. F. Primer for the Distinguished Lecture in Cancer Biology given by Dr. Mina J. Bissell. Why don't we get more cancer? The critical role of extracellular matrix and microenvironment in malignancy and dormancy. Life Sciences Lecture Series. *Cornell College of Veterinary Medicine, Ithaca, New York, November 2019.* Invited speaker.

Beeghly, G. F., Aird, J. A., & Wang, Y. How to write a successful application for the National Science Foundation Graduate Research Fellowship Program. *Cornell Graduate School, Ithaca, New York, September 2019.* Invited panelist.

Beeghly, G. F. Let's put cancer in context. What is the tumor microenvironment? Cancer Research Education Day for Patients and Survivors. *Cornell Community Cancer Partnership, Ithaca, New York, September 2019*. Invited speaker.

INVOLVEMENT AND OUTREACH

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

- Delivered the first presentation for the inaugural Cancer Research Education Day which attracted over 40 cancer patients and survivors from around the Finger Lakes. In the news.
- Delivered a primer lecture for community members and non-scientists to explain key concepts prior to the Distinguished Lecture in Cancer Biology given by Dr. Mina Bissell.
- Participated in seminars between cancer patients, survivors, and researchers designed to promote dialogue between these communities.

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

- Developed and led a learning activity about imaging modalities for over 100 Girls Scouts from NY and PA where we used blacklights to remove hidden tumors in gelatin brains. On Twitter.
- Developed and led a learning activity about ocean acidification for over 100 Girls Scouts from NY and PA where we measured the pH change in water from CO_2 released by dry ice.

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

- Developed and taught four classes about health and medicine with a kindergarten class at Enfield Elementary. Activities included coloring traces of students with labeled organs, measuring student heartrates with stethoscopes after exercise, and looking at red blood cells on a microscope.

MRC Cancer Unit Open House **Cambridge, UK**
Medical Research Council Summer 2018

- Led interactive lab demonstrations for visiting sixth-form students interested in pursuing careers in science. Activities included handling and hands-on visualization of tumor cells via microscopy

Cambridge Science Festival **Cambridge, UK**
University of Cambridge Spring 2018

- Set up life-size network of bungee cord "extracellular matrix proteins" for children to navigate and learn about cell migration by acting as the cells themselves

UVA Engineering Open House **Charlottesville, VA**
UVA School of Engineering and Applied Science Spring 2016

- Modified activities first developed for the High School Visitation Program (see below) to provide a hands-on experience of university lab facilities for prospective students.

High School Visitation Program **Charlottesville, VA**
UVA Chapter of the Society of Women Engineers Fall 2015 – Spring 2017

- Adapted course material from BME 3080 for participants. Activities included building circuits to monitor student ECGs and Instron-based tensile testing of common household materials.