


# Hyun Woo Sung

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## EDUCATION

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**Johns Hopkins University** **Sep. 2017 – Oct. 2024**  
*Doctor of Philosophy (PhD) in Chemical and Biomolecular Engineering* *Baltimore, MD*

**University of Massachusetts Amherst** **Sep. 2013 – May 2017**  
*Bachelor of Science (BS) in Chemical Engineering* *Amherst, MA*  
*Dean's List 2013-2017; Cumulative GPA: 3.86*

## TECHNICAL SKILLS

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**Cell Work:** Primary/Secondary Mammalian Cell Culture, Patient-Derived Cell Culture, Bacteria Culture, Cell Transfection Methods (Electroporation, Lipofection, Viral Transduction), Lentivirus Production and Purification, 3D Cell Culture, Cell Stretching Systems

**Molecular Biology:** DNA/RNA Purification and Quantification, UV-Vis Spectroscopy, Traditional Molecular Cloning, Bacteria Transformation and Screening, Gel Electrophoresis, In Vitro Transcription, Run-Off Transcription, Polymerase Chain Reaction (PCR), Real-Time PCR, Site-Directed Mutagenesis, Western Blot, Immunoprecipitation, Immunofluorescence, Enzyme-Linked Immunosorbent Assay (ELISA)

**Software:** ImageJ/Fiji, GraphPad Prism, Maple, MATLAB, Python, LaTeX, Spyder, AutoCAD, Microsoft Office Package, Adobe Creative Cloud

## WORK EXPERIENCE

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**Department of Mechanical Engineering** **May 2019 – Present**  
*Graduate Student Researcher, Johns Hopkins University* *Baltimore, MD*

- Engineered a high-throughput microfluidic system integrating cell purification and electroporation into a single platform for multimolecular delivery
- Tuned electroporation conditions to achieve a 40-fold increase in plasmid expression from baseline conditions and a 76% mRNA transfection efficiency into difficult-to-transfect primary cells
- Developed a clinically translatable biomolecule delivery application enabling combinatorial drug screening to resensitize therapeutic-resistant cancer cells from blood
- Led a collaboration to design a workflow for gene delivery into circulating tumor cell from clinical liquid biopsy samples using the system
- Managed a centralized dashboard for reagent procurement and expense tracking, streamlining laboratory resource inventory over a 4-year period

**Department of Anesthesiology and Critical Care Medicine** **Jan. 2018 – May 2019**  
*Graduate Student Researcher, Johns Hopkins School of Medicine* *Baltimore, MD*

- Clarified a molecular mechanism in how endothelial cells respond to inflammatory stimuli, leading to the identification of a new intervention strategy for vascular dysfunction
- Quantified the effects from a nuclear protein knockdown onto extracellular matrix assembly in fibroblasts to identify implications towards fetal lung development disorders
- Developed assays to characterize cell behavior on biomimetic gelatin scaffolds designed to mimic anatomical curvature

**Department of Chemical Engineering** **Sep. 2015 – May 2017**  
*Undergraduate Researcher, University of Massachusetts Amherst* *Amherst, MA*

- Designed and built an affordable cyclic compression cell culture platform for well plates to simulate mechanical stimuli of human bone environment with a total cost under \$50

**Korea Electronics Technology Institute** **June 2015 – Aug. 2015**  
*Data Analyst Internship, IT Materials & Components R&D Division* *Seongnam, Republic of Korea*

- Optimized a differential dynamic microscopy algorithm for high-speed optical nanoparticle analysis, reducing total image processing time by 80% with minor accuracy deviations of only 2.4%

## LEADERSHIP AND TEACHING EXPERIENCE

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### Undergraduate Mentor

May 2019 – August 2024

Johns Hopkins University

Baltimore, MD

- Mentored 4 undergraduate students on laboratory techniques and experimental methods to support their research projects

### Graduate Teaching Assistant

Spring 2020, Fall 2021

Johns Hopkins University

Baltimore, MD

- Enhanced course content to align with evolving industry standards and increased student engagement opportunities by 50% from the previous year, yielding a 22% improvement in course evaluation ratings
- Led recitations and guided computational assignments for a group of 11 undergraduates in a revamped engineering course, contributing to an overall course evaluation rating of 4.5 out of 5

## PUBLICATIONS

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1. Jin, Q., Pandey, D., Thompson, C. B., Lewis, S., **Sung, H. W.**, Nguyen, T. D., [...] & Romer, L. H. (2023). Acute downregulation of emerin alters actomyosin cytoskeleton connectivity and function. *Biophysical Journal*, 122(18), 3690-3703
2. **Sung, H. W.**, Choi, S. E., Chu, C. H., Ouyang, M., Kalyan, S., Scott, N., & Hur, S. C. (2022). Sensitizing drug-resistant cancer cells from blood using microfluidic electroporator. *PloS One*, 17(3), e0264907.
3. Nomura, Y.\*, Nakano, M.\*, **Sung, H. W.\***, Han, M.\*, & Pandey, D. (2021). Inhibition of HDAC6 activity protects against endothelial dysfunction and atherogenesis in vivo: a role for HDAC6 neddylation. *Frontiers in Physiology*, 12, 675724. (\*Co-equal authorship)
4. Kalyan, S.\*, Torabi, C.\*, Khoo, H.\*, **Sung, H. W.**, Choi, S. E., Wang, W., [...] & Hur, S. C. (2021). Inertial microfluidics enabling clinical research. *Micromachines*, 12(3), 257. (\*Co-equal authorship)
5. **Sung, H. W.** & Hur, S. C. (2024). Vortex microscale electroporator for genetic modification of primary cells. (In Preparation)

## SELECTED CONFERENCE PRESENTATIONS

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1. **Sung, H. W.** & Hur, S. C. (2024). Vortex Microscale Electroporator for Genetic Modification of Primary Cells [Conference Poster]. MicroTAS 2024, Montreal, Canada
2. **Sung, H. W.** & Hur, S. C. (2023). A Microfluidic Platform for Transfecting Primary Cells in Personalized Medicine [Conference Poster]. SLAS 2023 Microscale Innovation in Life Sciences Symposium, San Diego, United States
3. Pandey, D., **Sung, H. W.**, Romer, L. H., & Berkowitz, D. (2019). Regulation of PCSK9 Levels by the Ubiquitin-Binding Domain of Histone Deacetylase 6 [Conference Abstract]. Experimental Biology 2019 Annual Meeting, Orlando, United States
4. Pahapale, G. J., **Sung, H. W.**, Sarkar, A., Romer, L. H., & Gracias, D. H. (2019). Assembly and Characterization of Curved and Folded Soft Hydrogel Cell Culture Platforms [Conference Poster]. 2019 Biomedical Engineering Society (BMES) Annual Meeting, Philadelphia, United States
5. **Sung, H. W.**, Kwak, J. G., Carpenter, R. & Lee, J. (2016). Applying Standardized Three-Dimensional Mechanoculture to Multi-Well Plates [Conference Poster]. AIChE 2016 Annual Meeting, San Francisco, United States

## AWARDS AND HONORS

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Johns Hopkins Healthcare Case Competition – 2nd Place

April 2024

Southeast Healthcare Case Competition – 3rd Place

April 2024

ChE Young Alumni Scholarship

July 2016

Tau Beta Pi/Phi Kappa Phi Honor Society

Dec. 2015

Chancellor's Scholarship

Sep. 2013

## PROFESSIONAL DEVELOPMENT

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Completed BioSciConcepts workshop on Cell Culture Techniques

April 2018