

Christopher J. Hatch, Ph.D.

Bioinformatician | Biomedical Engineer

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Passionate scientist, engineer, and bioinformatician with a strong focus on oncology bioinformatics and next-generation sequencing (NGS). Experienced in unraveling the intricate language of cellular communication, specializing in vascularized remodeling and organ-on-a-chip models. Committed to advancing precision medicine by decoding cellular disruptions caused by diseases and contributing to transformative healthcare solutions.

EXPERIENCE

Graduate Student Researcher

2020 – Present

University of California, Irvine

Advisor: Christopher C.W. Hughes, Ph.D.

- Conducted in-depth investigations into cell-cell communication in tissue-specific vasculature and disease states as part of a cross-functional R&D team using bulk and single-cell RNA sequencing, which led to 4 peer-reviewed publications and 8 manuscripts.
- Enhanced the accuracy and efficiency of microscopy image analysis by 50% through the development of a Jython based GUI for FIJI.
- Engineered vascularized organ-on-a-chip models using COMSOL and microfabricated models, tripling output and optimizing physiological relevance. Analyzed outcomes with qPCR, ELISAs, and IF.
- Mentored undergraduate students to enhance their technical skills, secure funding, lead their own projects, and receive admissions to top Ph.D. programs.

Senior Design Project

2019

MicroVention Inc. and California Polytechnic State University, San Luis Obispo

- Developed a portable microfluidic device to demonstrate a liquid embolic agent's efficacy in treating brain arteriovenous malformations.
- Documented the design process, including prototyping, cost breakdown, and IQ/OQ/PQ, earning commendation from the CEO for professional documentation and innovative design.

Lab Manager

2018 – 2019

California Polytechnic State University, San Luis Obispo

Microcirculation and Vascular Regeneration Lab

- Reduced monthly expenses by \$500 through implementing a mouse breeding program and improved lab efficiency by enhancing inventory management techniques.
- Trained 5 new undergraduate and 2 master's students on laboratory techniques, safety protocols, and animal husbandry, improving lab onboarding process.

Undergraduate Research Assistant

2016 – 2019

California Polytechnic State University, San Luis Obispo

Advisor: Trevor R. Cardinal, Ph.D.

- Investigated the role of sympathetic innervation, myogenic tone, and nitric oxide production in vascular remodeling using a murine femoral artery ligation model of arteriogenesis, resulting in a peer-reviewed publication.
- Analyzed patient micro-array datasets from two papers and sorted through thousands of genes to identify 35 genes that correlated with poor arteriogenic outcomes.
- Secured university funding to design and develop new instrumentation, increasing experimental efficiency by 400%.

Summer Undergraduate Researcher

2017

Texas A&M College Station

Advisors: Duncan Maitland, Ph.D. and Mary Beth Monroe, Ph.D.

- Designed and implemented an innovative *in vitro* gunshot wound model to evaluate the hemostatic effectiveness of shape memory polymer foams, culminating in a peer-reviewed publication.
- Developed a MATLAB GUI to automate aneurysm volume estimation from cross-sectional images, enhancing efficiency by 65%.

EDUCATION

Ph.D. Biomedical Engineering University of California, Irvine	2025
B.S. Biomedical Engineering California Polytechnic State University, San Luis Obispo	2019

SKILLS

- **Data Analysis:** PCA, clustering, regression, inferential statistics
- **Programming:** Python, bash, R (tidyverse, ggplot2, dplyr), MATLAB, Jython
- **Bioinformatics:** Micro-Array, Bulk/Single-cell seq, Sequence alignment, GWAS, samtools/bcftools, plink
- **Computing:** Linux/Unix command line, SLURM (HPC), git (version control), SQL, AWS
- **Engineering:** AutoCAD, COMSOL, Microfabrication
- **Experimental:** Tissue Engineering, *in vitro* model development

PUBLICATIONS

Jun Y, Nguyen-Ngoc KV, Sai S, Bender RHF, Gong W, Kravets V, Zhu H, **Hatch CJ**, Schlichting M, Gaetani R, Mallick M, Hachey SJ, Chrstman KL, George SC, Hughes CC, Sander M. "Engineered vasculature induces functional maturation of pluripotent stem cell-derived islet organoids." *Developmental Cell*. Accepted **2025**

Fang J, **Hatch CJ**, Andrejcsk J, Van Trigt W, Juat DJ, Chen YH, Matsumoto S, Lee AP, Hughes CC. "A Microphysiological HHT-on-a-Chip Platform Recapitulates Patient Vascular Lesions". *bioRxiv*. **2024**

Hatch CJ*, Piombo SD*, Fang JS, Gach JS, Ewald ML, Van Trigt WK, Coon BG, Tong JM, Forthal DN, Hughes CC. "SARS-CoV-2 infection of endothelial cells, dependent on flow-induced ACE2 expression, drives hypercytokinemia in a vascularized microphysiological system." *Frontiers in Cardiovascular Medicine*. **2024** *co-first authorship

Hachey SJ*, **Hatch CJ***, Gaebler D, Mocherla A, Nee K, Kessenbrock K, Hughes CC. "Targeting tumor–stromal interactions in triple-negative breast cancer using a human vascularized micro-tumor model." *Breast Cancer Research*. **2024** *co-first authorship

Looker EK, Aan FJ, **Hatch CJ**, Hughes CCW, Matter ML, Fang JS. "Cx40 Suppresses Sprouting Angiogenesis *In Vitro*." *Bioelectricity*. **2023**

Silva A, **Hatch CJ**, Chu MT, Cardinal TR. "Collateral Arteriogenesis Involves a Sympathetic Denervation That Is Associated With Abnormal α -Adrenergic Signaling and a Transient Loss of Vascular Tone." *Frontiers in Cardiovascular Medicine*. **2022**

Herting SM, Monroe MB, Weems AC, Briggs ST, Fletcher GK, Blair SE, **Hatch CJ**, Maitland DJ. "In vitro cytocompatibility testing of oxidative degradation products." *Journal of Bioactive and Compatible Polymers*. **2021**

Christmas N, Vakil AU, **Hatch CJ**, Dong S, Fikhman D, Beaman HT, Monroe MB. "Characterization of shape memory polymer foam hemostats in *in vitro* hemorrhagic wound models." *Journal of Biomedical Materials Research Part B: Applied Biomaterials*. **2021**

FELLOWSHIPS

Cardiovascular Applied Research and Entrepreneurship Graduate Fellow, NIH T32	2020-2022
Henry Samueli Endowed Fellowship	2022

HONORS

Semi-Finalist UC Irvine Stella Zhang New Venture Competition	2022
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