

# Christopher J. Hatch, Ph.D.

## Bioinformatician

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Passionate bioinformatician, scientist, and engineer with extensive experience in cardiovascular and neurobiology bioinformatics utilizing next-generation sequencing (NGS). Proven track record as a bioinformatics lead across nine projects, specializing in identifying key ligand-receptor pairs and upregulated pathways that contribute to tissue-specific and disease phenotypes, including the blood-brain-barrier. Skilled in developing automated pipelines and bioinformatics tools, with expertise in analyzing large genomic datasets using Python, R, and Linux-based systems. Dedicated to contributing to transformative biomedical discoveries that improve healthcare.

## EXPERIENCE

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### Graduate Student Researcher

2020 – Present

University of California, Irvine

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

- Led bioinformatics efforts in a cross-functional R&D team, conducting comprehensive analyses of large-scale genomic datasets, including bulk and single-cell RNA sequencing, resulting in 4 peer-reviewed publications and 8 manuscripts.
- Conducted scRNA-seq with Seurat and Monocle v2 on vascularized brain organ-on-a-chip models, comparing results to patient datasets to identify pathways contributing to blood-brain barrier development.
- Developed and implemented an automated Linux-based pipeline on an HPC for primer design, utilizing Primer3 and NCBI BLAST to optimize results, demonstrating expertise in modular software development.
- Enhanced the accuracy and efficiency of microscopy image analysis by 50% through the development of an automated Python-based GUI for FIJI.
- Engineered vascularized organ-on-a-chip models, tripling output and optimizing physiological relevance. Analyzed outcomes with qPCR, ELISAs, and IF.
- Mentored undergraduate students to enhance their technical skills, secure funding, and lead independent projects, fostering a collaborative and innovative research environment.

### Senior Design Project

2019

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

- Developed a portable microfluidic device to demonstrate the efficacy of a liquid embolic agent in treating brain arteriovenous malformations, highlighting its technical proficiency and innovation.
- 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

- Implemented a mouse breeding program, reducing monthly expenses by \$500 and enhancing lab efficiency through improved inventory management techniques.
- Trained 5 new undergraduate and 2 master's students on laboratory techniques, safety protocols, and animal husbandry, improving the 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 and myogenic tone 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 develop new instrumentation, increasing experimental efficiency by 400%.

### Summer Undergraduate Researcher

2017

Texas A&M University 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

2025

University of California, Irvine

### B.S. Biomedical Engineering

2019

California Polytechnic State University, San Luis Obispo

## SKILLS

- **Data Analysis:** PCA, clustering, regression, inferential statistics
- **Programming:** Python, bash, R (tidyverse, ggplot2, dplyr, Seurat, Monocle v2), MATLAB, Jython
- **Bioinformatics:** BLAST, Primer3, bulk/single-cell seq, sequence alignment, GWAS, samtools/bcftools, plink
- **Databases:** GenBank, NCBI GEO, Human Protein Atlas, UCSC Cell Browser
- **Computing:** Linux/Unix command line, SLURM (HPC), git (version control), SQL, AWS (EC2)
- **Engineering:** AutoCAD, COMSOL, microfabrication
- **Experimental:** Tissue engineering, *in vitro* model development, qPCR, microscopy, IF staining

## 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  $\alpha$ -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

2020-2022

Graduate Fellow, NIH T32