

DANIEL ALBER

EDUCATION

Princeton University, PhD Chemical and Biological Engineering 2019 – Present
Stanford University, B.S. Chemical Engineering with Honors 2015 – 2019

RESEARCH EXPERIENCE

Project title 2/20 – Present
Dr. Celeste Nelson's Lab, Princeton University Department of Chemical and Biological Engineering

- Project description

Precisely Characterized Microporous Membrane for Testicular Tissue Culture 9/17 – 6/19
Dr. Alex Dunn's Lab, Stanford University Department of Chemical Engineering

- Designed and built a thin, optically clear PDMS membrane with defined micropores to mimic *in vivo* membrane structures in *ex vivo* tissue and organoid culture. Additionally, the membrane can act as a point source for sharp multidimensional concentration gradients of morphogen for developmental studies.

Analyzing 3D Chromatin Morphology Throughout Epithelial Differentiation 3/17 – 9/17
Dr. Anthony Oro's Lab, Stanford University School of Medicine

- Applied and expanded upon various computational 1D and 2D segmentation algorithms to classify the interconnectivity of chromatin domains, discovering previously unknown long-range interactions. Used statistics and computational methods to justify assumptions made by algorithms and determined which were best suited for this application.
- Explored machine learning as an extension to existing chromatin domain classification algorithms, and proposed a revision to the standing perspective on chromatin domain hierarchy based on my results.
- Results used to design genetic knockout experiments in iPSCs and mouse studies. Results were also used in a grant application for a project examining long-range transcription factor interactions and were part of a paper published in *Nature Genetics*.

Visualizing the Role of Cell Cycle in Epithelial Differentiation 7/16 – 8/16
Dr. Anthony Oro's Lab, Stanford University School of Medicine

- Created a FUCCI-based genetic tool to make induced pluripotent stem cells fluoresce different colors at different stages in the cell cycle to permit sorting and comparison via FACS. The ultimate goal is to compare stem cell chromatin conformation at various points of the cell cycle to map the epigenetic landscape that leads to differentiated epithelial cells.

Optimizing a Bioinformatics Pipeline for Determining Chromatin Conformation 6/16 – 7/16
Dr. Anthony Oro's Lab, Stanford University School of Medicine

- Parallelized an analysis pipeline composed of modules written in Matlab, Perl, R, Python, and bash to work on the university's supercomputer cluster, speeding up processing time from ~10 days to ~2, allowing for new experiments to be conducted that otherwise would have taken too long.
- Results of analysis part of a paper published in *Nature Genetics*.

Development of a 3D Multiplexing Method for Multidimensional Imaging 6/15 – 8/15
Dr. Jeremiah Zartman's Lab, Notre Dame Department of Chemical and Biomolecular Engineering

- Independently conducted and designed a series of experiments on advanced multidimensional imaging methods for *Drosophila melanogaster* embryos and imaginal wing discs. Optical clearing subproject involved designing and comparing solutions to clear pigment from *Drosophila* embryos. Multiplexing subproject involved multidimensional (> 4 markers) immunostaining of both embryos and imaginal wing discs by staining the same tissue multiple times and using a quenching solution in between stains.

WORK EXPERIENCE

Next-Generation *In Vitro* Liver Models for Drug Metabolism Studies 6/18 – 9/18
Drug Metabolism and Pharmacokinetics In Vitro Group, Vertex Pharmaceuticals

- Independently designed and conducted pilot studies to comparatively evaluate 3D cocultured spheroids and 2D micropatterned monolayer cocultures by tracking basal activities of key enzymes related to drug metabolism and toxicology.
- Wrote a set of protocols to integrate the new models into standard assay panels used by the DMPK group.
- Results were presented in poster format, as well as in a dedicated meeting with a spheroid vendor, representatives from all groups in drug metabolism and pharmacokinetics, and some representatives from the toxicology department where next steps were discussed based off of my results.

HONORS AND AWARDS

- Francis Robbins Upton Fellowship, 2019
- Genentech Outstanding Student Award Runner-Up, 2017
- Bio-X Undergraduate Fellow, 2016

PAPERS AND PATENTS

- Pattison JM, Melo SP, Piekos SN, Torkelson JL, Bashkirova E, Mumbach MR, Rajasingh C, Zhen HH, Li L, Liaw E, **Alber D**, Rubin AJ, Shankar G, Bao X, Chang HY, Khavari PA, Oro AE. Retinoic acid and BMP4 cooperate with p63 to alter chromatin dynamics during surface epithelial commitment. *Nature Genetics*. November 2018:1. [doi:10.1038/s41588-018-0263-0](https://doi.org/10.1038/s41588-018-0263-0).
- Weigel KJ, Shen L, Thomas CL, **Alber D**, Drapalik L, Schafer ZT, Lee SW. Design and evaluation of a peptide-based immunotoxin for breast cancer therapeutics. *FEBS Open Bio*. 2015;5:202-208. [doi:10.1016/j.fob.2015.03.005](https://doi.org/10.1016/j.fob.2015.03.005).
- Lee, Shaun W., **D. Alber**, and C. Thomas. 2014. A Genetic Engineering Method for the Production of Peptide Therapeutics. U.S. Provisional Patent Application No. 61/985,312, filed April 28, 2014.

POSTERS

- **Alber D**, Moore A, Tsao H, Chothe P, Hariparsad N. Next-Generation Liver Models for Studying Long-Term Drug Metabolism. Poster presented at: Vertex Pharmaceuticals Summer Intern Capstone Presentation; 2018 Aug 16; Boston, MA.
- **Alber D**, Piekos S, Melo SP, Torkelson J, Li L, Shankar G, Oro A. Visualizing the Role of Cell Cycle in Epithelial Differentiation. Poster presented at: Stanford Bio-X Interdisciplinary Initiatives Seed Grants Symposium; 2016 Aug 24; Stanford, CA.

SKILLS

Wet Lab/Experimental

- Tissue culture (sterile conditions, cell passage, etc.)
- Soft lithography and associated machinery (cleanroom, plasma cleaning, silanizing, etc.)
- CNC Milling
- Cloning (primer design, PCR, ligation, gel electrophoresis, bacterial transformation, etc.)
- CRISPR/Cas9 primer design
- Basic microbiological techniques (e.g. inoculation, glycerol stocks, plasmid preparation)
- Immunohistochemistry
- RNA isolation and rtPCR
- qPCR
- Western blot
- Confocal and light microscopy
- GC-MS, LC-MS, and enzyme activity assays
- Organic chemistry techniques (e.g. chromatography, distillation, crystallization)
- Microdissection

Dry Lab/Computational

- AUTOCAD and CleWin drafting and modeling
- Written code in Python, Matlab, R, SQL, bash, C++, and Java
- Approaches to big data and machine learning (in SQL and Python)
- Data visualization using Excel, Matlab, R, and Tableau
- Image analysis using ImageJ/FIJI
- Basics of computational and statistical modeling (e.g. Hidden Markov Model, maximum likelihood estimation)
- LaTeX, Adobe Illustrator

NOTABLE EXTRACURRICULARS

Stanford Emergency Medical Services

6/17 – 6/19

Director of Logistics, Crew Chief Lead

As a licensed emergency medical technician (#E131912), I worked in and led teams of EMTs to provide emergency medical response for events and taught CPR to the greater Stanford community. My Director of Logistics position involved typical officer functions, establishing and maintaining a supply chain of reliable and high-quality medical equipment, and pursuing projects such as purchasing new vehicles and optimizing resource allocation to support an expanding range of medical coverage. Averaged 8 hours of shifts a week.

Stanford Society of Latino Engineers (SOLE)

9/17 – 6/19

Member

Some of my closest friends are from underrepresented minorities in engineering. I joined SOLE because I wanted to learn more about their experiences and help increase accessibility in engineering and graduate school. SOLE has been able to successfully establish itself as the only Latino student organization on campus dedicated to encouraging and aiding undergraduate Latino students in pursuing engineering and science degrees. In SOLE, I have advised underclassmen on how to reach out to faculty and get funding for research projects as well as facilitated conversations about applying for research-based graduate programs and fellowships.