

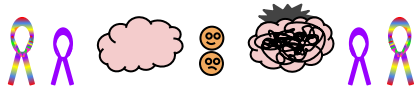
## Introduction

Professor Megan McCain lab's focus - fabrication of Microphysiological Systems to study diseases.

- Study neurological diseases: Alzheimer's, Schizophrenia, and Autism in organoids.

Applications - using PDMS and ABS mixtures to mold a bioreactor

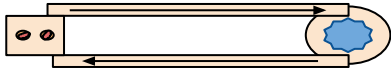
- Neurons extend to one another during incubation
- Create a device holder - better transportation.



## Objective & Impact of Professor's Research

### Objective

- Development in the study of the human brain
- Affordable and accessible device model assisting research of studying human neurological diseases/disorders/ and disability.
- Fabricate 3D bioreactors to improve current vitro model of cell culturing and test tubing models in the study of brain organoids.



### Impact

- Make PDMS devices to allow induced - pluripotent stem cells biomedically engineered as brain neurons, to interact and be analyzed.
- Drug target's effect on the neuron activity.
- Biomedical engineering devices used in the study of neurological disease is beneficial to the public service.
- Help advanced medicine/techniques test to treat neurological diseases, disorders, & disabilities.

## Skills Learned

In USC Viterbi biomedical engineering lab, I have learned numerous of skills.

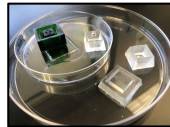
- Soft skill: collaboration and decision-making
- Presentations skills during our lab's whiteboard chalk talks.

Grown in:

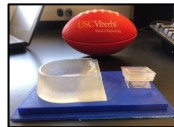
- My ability to teacher others in our cohort
- Accepting help from others.

Learning:

- Read and present scientific literature through scholarly articles
- Creative thinking and problem solving skills during software designing with Solidworks.



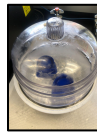
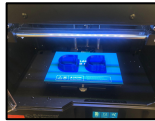
PDMS bioreactors



Organoid Holder and Pieces

In SHINE, I have learned to:

- follow a workflow plan and project management
- teamwork skills
- hard technical skills - laboratory techniques / imaging from microscopy.
- 3D printing device: light-processed printer and an extrusion printer + Vacuum Chamber
- Soft lithography - design mold in computer software (Autocad & Solidworks), printing resin mold, UV crosslink resin mold prints, fill devices with PDMS.
- Plasma bonding of glass coverslips and PDMS.
- vet lab techniques: Cell fixing; immunostaining
- Work ethic skills



## How This Relates to My STEM Coursework

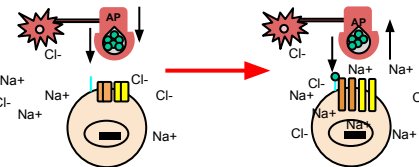
- Prepares background knowledge from my biomedical classwork.

\* ELISA - Immunostaining:

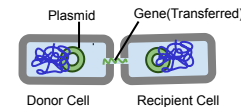
- bound substrate + mixture
- fluorescently dyed substrate.



\* Chemistry - Understanding balance of electron charge of a cell and its environment (muscle contraction)



\* Gene Transfer - In SynNotch, there was gene transduction we engineer our cell to activate the presence of GFP - GFP was made when plasmid GFP was transformed into the bacteria - (genes turn off or on through signaling pathway) - Transcription and Transfection (making neurons).



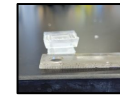
\* Literature analysis (especially in PubMed.gov)

\* Design, Build, and Test:

- Finding issue, solve, & test again.
- Prototype, Figurative Design (things come in stages to complete.)

Extensive learning in:

- Biology anatomy & physiology
- Neurology and Muscles
- Synthetic biology
- Cardiology and the Uterus



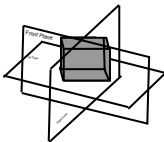
PDMS bioreactor



Picture of me in Megan McCain's lab demonstrating "Fight Out"

## Next Steps + Advice for Future SHINE Students

My next steps to further my work done at SHINE would be to carry my new knowledge and learning into my STEM courses in senior year. I will be applying to colleges that suit my interest and use SHINE as an important factor in representing my passion for medicine and for science. My advice for future SHINE students would be to take the opportunity to ask questions. The mentors are always willing to help out and answer any curious learning. "Ask your mentor(s) for advice or comments." Don't be afraid to keep learning!



## Acknowledgements

Special thank you's to Steve Dorfman, Professor Megan Laura McCain, James Eichenbaum, Stephanie Do, Michelle Ramirez, Dr. Katie Mills, Monica Lopez, Marcus Gutierrez, the Biomedical Engineering Lab, Mr. Tractenberg, Ms. Chavez, STEM Academy, Albina Lorenzo, and the Viterbi Incoming College Students of USC.