

CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Our first week of COSMOS 2019, has been GR8! We settled into our dorms and meet our Cluster 8 Resident Assistants, Sammy and Brandon. In the evenings we have spent time working with them on COSMOS Olympics and have had variety of programming activities, our favorite being volleyball and Frisbee! We are super excited for COSMOS Olympics on Friday night!

On Monday morning we began our day with two safety meetings as safety is our top priority. Then during the remainder of the week we have had lectures and discussions with our esteemed professors. Dr. Sah, who is a Professor in the Departments of Bioengineering and Orthopedic Surgery at the University of California-San Diego and a Professor at the Howard Hughes Medical Institute, and Dr. Gaetani who is an Assistant Research Scientist, Department of Bioengineering & Sanford Consortium Regenerative Medicine at the University of California-San Diego and an Assistant Professor in the Department of Molecular Medicine Sapienza at the University of Rome.

In the lab we were guided by our GR8 Cluster Assistants (CA). Shitian, who is getting a B.S with a double major in Bioengineering: Biotechnology and Mathematics: Applied Science, Veronica, who just graduated from UCLA with a B.S. in Bioengineering and in the fall will begin her Masters in Bioengineering at UCSD, Swetha who is currently pursuing a Masters in Bioengineering in UCSD and Arya, who just finish his B.S. in Bioengineering: Biotechnology and in the fall will begin his Masters in Bioengineering. We have learned how to pipette, make dilutions, perform sterile technique, make solutions, make media for cell culture, and pH the solutions we make.

Outside of lab we attended a GR8 Discovery Lecture on Nanotechnology and a library presentation so we can do all of our research for our Ethics papers and projects. In Science Communications, with our Teacher Fellow, Mrs. Patty Fowler, we have evaluated and discussed presentations, been introduced to and begun our Ethics Project, learned how to maintain our data in laboratory notebooks, and reviewed how to present our data thoroughly and clearly.

The first week of COSMOS has been GR8 so far because....

... it's been fun to experience college life. —Michael

...of how quickly I've grown close to all my cluster mates! —Jared --ps- Hey Mom!

...I've become close to so many people in such a short amount of time and it's like a small family away from home. — Misha

... of all the awesome people I got to meet, especially those in my cluster. — Sameer

...I have been able to meet a lot of really nice people and am really excited for the next few weeks! — Celine

.. it is simply magnetizing! It's been a pleasure being in the melting pot of knowledge that COSMOS offers, from learning about nanotechnology to living at UCSD's campus, both my peers and professors have blown away every preset expectation I came to the program with. — Lizzie

...I was able to dive right into the subject of tissue engineering and meet so many amazing people. — Anna

...the people have been absolutely incredible from my cluster mates to Mrs. Fowler to the professors to the TA's. They make the experience not only educational but fun. — Rachel

...I met so many good friends and can't wait to know them more! — Andy

...I genuinely feel that I have grown so much already. I have put myself outside of my comfort zone, meeting countless new people and learning so much about the world of tissue engineering. In a couple of days, I've made friendships that will forever impact me. I've also learned so much both inside and outside of the lab, including the wide range of applications of tissue engineering and the many benefits it offers. I'm excited for the next 3 weeks to come! — Allie



CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Our second week of COSMOS has been a busy and exciting one. We began with project introductions with Dr. Sah and Dr. Gaetani and have spent more time during the week researching our projects, developing our aims, designing our experiments, and creating study designs. We went on our first field trip to Advanced Biomatrix, a local company that makes innovative 3D matrix products for tissue culture, cell assays, and cell proliferation. They gave us a tour of the facility, an overview of their company, and answered all of our questions from how the business began, to what was involved in manufacturing and production, and the purposes of their various products.

In Science Communications we attended a Discovery Lecture from Dr. Knight, who spoke to us about the evolution of biomolecules and genomes in different ecosystems, have completed our ethics essays, and began to learn how to present our data. In the lab, under the guidance of our Cluster Assistance, Arya, Steven and Swetha, we have completed and mastered all of our lab skills and are now able to thaw, grow and passage cells, use a hemocytometer to count cells, make collagen gels, and use a microscope to examine our, stained and unstained, cells and tissues.

Friday we will visit Gilead, a local company whose vision is, "To advance therapeutics against life-threatening diseases worldwide".

This week was GR8 because I learned

- ...the importance of ethical consideration in every field of science. Esha
- ...how to count cells. Jenny
- ...how advanced science has gotten and how we are on our way to being able to print organs. Kaylin
- ...how to perform sterile technique. Luke
- ...how to use a microscope. Michael
- ...the power of friendship. Mitchell ps-Hi mom.
- ...about the importance of microbiomes and their prevalence in the human. Shreya
- ...how a biotech company operates with only five people. Smera

Next week will be GR8 as we will begin our much anticipated projects.



CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Our second week ended with a GR8 tour of Gilead, a local biotech company that, "...researches, develop and commercializes drugs, primarily antiviral drugs used in the treatment of HIV, hepatitis B, hepatitis C, and influenza." We had an overview presentation followed by an extensive tour of their large facility, including a glimpse at their bioreactors, protein purification processes, mass spectrometers, and drug delivery systems. Week three began with a wonderful field trip to Sanford Consortium for Regenerative Medicine, a research center whose mission is 'to advance stem cell research through collaborative, multi-disciplinary interactions...to promote diagnoses, treatments, and cures for degenerative diseases and injuries.' Dr. Gaetani guided us on an extensive tour including a visit to the lab he collaborates with, a lab that is sending neural organoids to the space station this week, the stem core facility, and then concluding with a poster presentation given by some of the graduate students in his lab. Our morning ended with lunch at the Torrey Pines Glider Port overlooking the beach.



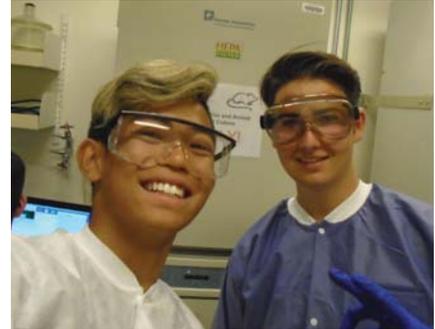
In Discovery Lecture, Dr. Ramanathan spoke about climate change morphing into climate disruption and the need to society to step up. In Cluster Explorations, it was all about cluster pride, as Dr. Sah presented Cluster Eight's undertakings to all of COSMOS. Dr. Sah definitely impressed everyone when he gave brief glimpse into the 'GR8' projects underway! In science communications, we began to present our ethics topics within cluster, worked on creating posters, power points, and papers to document our projects and prepared for our up-

coming presentations.



Everyone was prepared to execute the much anticipated projects. Briefly, three groups will be studying Cartilage Tissue Engineering with Dr. Sah. Celine, Jared and Mitchell, with the guidance of Swetha, will be 'Determining if Implanted Chondrocytes Helps Induce Cartilage Regeneration Using Cell Trackers', Elizabeth, Michael and Rachel, with the assistance of Arya, will be investigating 'Cartilage Resurfacing in Osteoarthritic Tissue' and Kaylin, Matthew and Shreya, with the help of Swetha, will be looking at 'A Model to Observe Cellular "Cross-Talk" Through the Subchondral Plate'. The other three groups will be focusing on Cardiac Regenerative Medicine with Dr. Gaetani. Anna, Esha and Luke, with

the guidance of Arya, will be investigating, 'The Effects of Skeletal Muscle ECM on Endothelial Cell Proliferation and Function', Andy, Jenny and



Sameer, with the assistance of Steven with look at, 'The effects of ECM Proteins on Cardiac Progenitor Cells' Ability to Proliferate', and Allison, Misha and Smera, with the help of Steven, will study, 'The Modulation of Microenvironments in Cardiac Progenitor Cells Across Dimensions'.

The week has been exciting in the lab as tissues are being processed, gels formed, cells cultured, and materials are being prepared and tested. Cluster 8 continues to be 'GR8' as we have mastered the required expertise to plan and execute our projects.



CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Four weeks really flew by! Week 4 began and ended with an immense amount of work. It was astonishing how much planning and preparing was necessary to complete our projects and how much thought was required to problem solve and analyze our data. As week four progressed our projects were completed, posters were finalized, power points finished, and our research paper ultimately completed. Each group worked with a professor and cluster assistant in order to complete their projects. In the end we proficiently presented our projects to our cluster, cluster 7, and on Saturday we will give professional poster presentations to our families and friends. In our last Discovery Lecture, Dr. Molly Roberts discussed how China maintains one of the most vibrant online communities while still repressing it. As COSMOS 2019 comes to a close, it is GR8 to see what everyone has accomplished. We have become proficient in our lab skills, refined our technical writing, and developed and implemented our leading edge projects. We all want to extend a gigantic thank you to our GR8 Professors, Dr. Sah and Dr. Gaetani, our GR8 Cluster Assistant's, Arya, Steven, Swetha and Veronica.

What I will always remember about COSMOS 2019 is...

...the wonderful friends that I have made here. Michael
...the wonderful people I have bonded with, and the amazing projects we worked on together. Esha
...the friends I made and the Italian I learned. Mitchell
...working with so many amazing people. Jared
...the unique, hands on experience. I have never been able to work so closely with real cells, and analyze their behavior. It was very eye opening and fascinating to have been able to

work in the lab with UCSD professors! Allie
...the invaluable experience I had with my friends and the rigorous but interesting labs with our professors. Andy
...all the amazing people I met. From the beginning my cluster felt like family and I enjoyed every moment with them. Kaylin
...the inspiring people and the galvanizing passion we all have for punny lab jokes and tissue engineering alike. Lizzie
...the close bonds I was able to form with the people in my cluster and the fun times we spent in lab #888! Celine
...coming into class/lab everyday and working in such a supportive environment. Anna
...the one-of-a-kind lab experience I've had the past few weeks and the bonds I've made with others over the many hours spent

together and our shared passions. Rachel
...meeting unforgettable people, culturing beautiful cells, and the sound of the centrifuge when we forgot the lid. Smera
...working with Dr. Gaetani, Mrs. Fowler, and Dr. Sah! Luke
...the people I've met and the friendships I've made. Sameer
...seeing how people came from different backgrounds can get along so well together like a family. Jenny
...Swetha morally supporting us even through our failures during lab. Matt
...the wonderful people I've met and the long lasting memories that I've made! Misha
...flying bones, seagulls, spilled coffee, cells that finally dyed, and laughter with Cluster 8. Shreya
Cluster 8 has had a GR8 summer at COSMOS!

