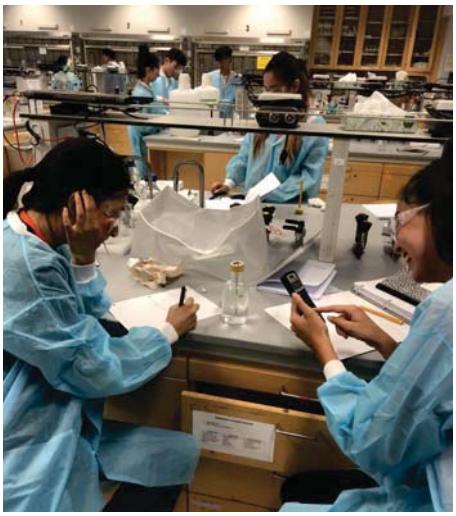
# CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE



Cluster 3 has gotten their feet wet and started swimming through material from Week 1. Our first week has been full of introduction to laboratory procedures, our projects and understanding climate change. Cluster 3 is honored to work under the guidance of Dr. Skip Pomeroy on atmospheric chemistry, Dr. George Anderson on seawater analysis as well as Dr. Ngai Chin Lai with oceanography. Below are student comments as they dive deep into the program:

"We kicked the first day here at COSMOS with a lab safety lecture that explained how to dress in a lab and use equipment safely. Then we met our lead instructor, Dr. Pomeray, who introduced the concepts of aerosols, cloud formation, and global warming. After lunch we headed down to Scripps and met with our second instructor, Dr. Lai, where we had a brief lecture on ocean science. We concluded the day with a trip to the pier where we measured turbidity of the ocean water using a special device called a secchi disk." Julia Hansen

"After breakfast at Cafe V, our cluster attended a discovery lecture with the rest of COSMOS given by Dr. Nicole Steinmetz, a German researcher and professor. She gave us an overview of nanotechnology and then dove into the specifics of her interesting and timely research concerning curing cancer in dogs and other areas. Cluster 3 then went to the lab where Ms. Solberg, our teacher fellow, introduced the ethics essay each COSMOS student has to write. We talked about topics related to our cluster that pose ethical dilemmas and brainstormed what we wanted to write about. After lunch at Cafe 64˚, we went back to the lab where we chose our groups and projects we will be working on throughout the program. In the evening we worked on our Cosmolympics skit and had evening program and suite time, then it was lights out and all of COSMOS went to bed." Emna Sellami

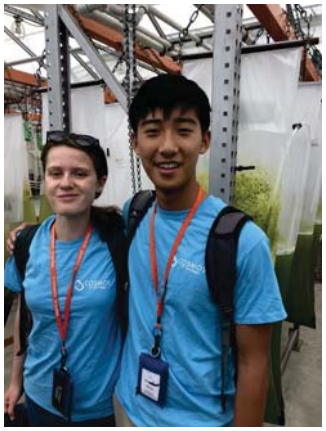
"On Wednesday July 10th, the cluster 3 students began their day with an engaging lecture by Dr. Robert Pomeroy about global warming and the hydrological cycle. Following this, students investigated the albedo of different surfaces using a flashlight, infrared temperature gun, and light sensor; this lab could be likened to the diverse environments of the Earth. In the afternoon, students utilized a variety of methods to obtain the density of seawater: density meters, digital and manual refractometers, BOD bottles, and conductivity. Students then worked to prepare for the COSMOLYMPICS event this Friday and participated in athletic/recreational activities during free time." Arjun Marwaha

"Starting my day with running in the morning, I had another great day with my cluster. In the morning, we learned about library resources in discovery lecture which was helpful to our further study in COSMOS. Then we spent out time in NSB researching for our ethics essay. After lunch, I did experiment with my group on our project about nitrate and its connection with ocean. And for the most exciting part at the end of the day, our cluster spent time to prepare for cosmolympics, designing costumes and making our cool ocean-theme banner for our skit! Absolutely lit!" Claire Liu

On Friday we will be hearing from local researchers in the fields of food security and greenhouse gas chemistry. Stay tuned to hear more about our adventures next week!

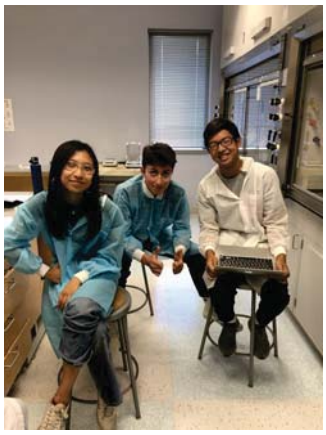
# CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE

Hello from Cluster 3! We can't believe that the program is halfway over already. We have started on our projects, written our ethics essays and learned to navigate the campus. Here is what we have done since last time you've heard from us:

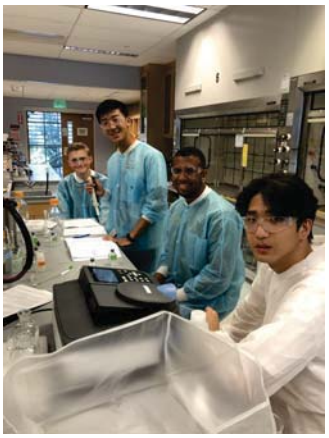


"We started last Friday with video lectures by Dr. Molina and Dr. Burney, where we learned about global warming and food security. We watched Merchants of Doubt, a sad movie about climate skeptics. After lunch, we enjoyed an afternoon at the Scripps beach. After exploring the tide pools with Dr. Lai, we got to play around in the water." Akshay P.

"On Monday 7/15, we participated in a lectured by Dr. Skip Pomeroy on greenhouse gases and learned how their specific molecular structures cause them to react differently to various wavelengths of light radiation. In the afternoon, we used reduction-oxidation reactions to determine the percentage of O2 in a sample of seawater and, under the instruction of George Anderson, performed the procedure using samples of seawater, H2SO4, NaS2O3, and starch." Vijay D.



"On Tuesday morning, all the clusters gathered at the Warren Lecture Hall for a Discovery Lecture by Rob Knight, who works in the fields of engineering, bioengineering, computer science, and pediatrics. He explained his work on the topic of "Microbiomes in Human and Environmental Health". His research connected the use of viruses and bacteria and the patterns of the seasons and wind cycles and how this information can together show and help predict where these pathogens will spread. Afterwards, we worked on our ethics essays until lunch, and then split up into our final projects groups. Cluster Three has groups working with aerosols, salinity, phosphates, silicates, and nitrates and connecting these topics to global climate change and how it affects our living oceans!" Anna N.



"For Cluster 3, Wednesday was a day packed with amazing experiences and the opportunity to see first hand the work directly related to the cluster's interests. The day started off with a long trek made worthwhile by the destination- the biological field station where students could witness the growth of algae as a source of renewable energy. Next, the students took a bus to the waveflume where students observed the fluctuations of the water and the explanations of the fascinating experiments taking place within. After lunch, the bus drove to the Hubbs Hatchery to see the location of white sea bass fertilization, maturation, tagging, and eventual release. Lastly, the aquafarm demonstrated the growth of millions of pounds of protein and the innovative technology used to farm mussels. The day ended with a movie night and the daily suite activities." Catherine D.

"On Thursday, professors presented lectures during Cluster Discovery. We gained insight as to what goes on the world of our fellow clusters, allowing us to explore what the clusters are learning about within their focuses. I especially enjoyed looking into the projects Robotic Inventors are working on along with my cluster's (cluster 3) future lab experiments." Christine D We look forward to sharing our experiences with parents this weekend!

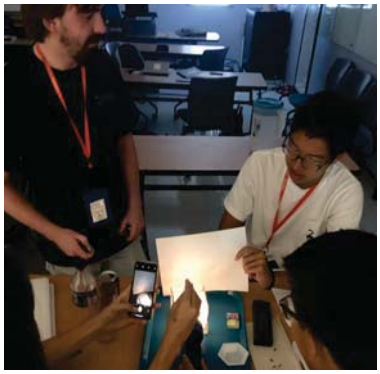
# CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE

Greetings from Cluster 3! Our third week has flown by quicker than we could have imagined. We are currently designing our presentations for our projects and working hard to prepare for our talks next week! This week we will be applying our knowledge of global climate change to ocean acidification. Here are some insights to our busy week:

"On Friday 7/19, cluster 3 went to a morning lecture with Kim Prather and Stephen Mayfield. Kim taught the cluster about major causes and effects of climate change as well as trends linked to climate change. Mayfield focused on biomanufacturing and introduced flip flops he and Dr. Pomeroy made from algae. After the lectures, students went down to SIO to see Professor Lai. He brought the cluster to the peer as he taught about fish in the different layers of the ocean and how they have adapted to surroundings. Finally, it was time to head back to the dorms and say goodbye for family weekend." Chris L.

"On Monday, Cluster 3, Living Oceans and Global Climate Change, started off the day doing a few different demos. The first one we did was called Cloud in a Bottle, which was where we condensed water in a soda bottle by rapidly expanding the air particles within the bottle, thus forming a cloud. Second, we did a demo called Milky Sunset where we gradually added milk to water and to see how light passed through the liquid as it became more translucent. Lastly, we poured root beer in a cup and saw where bubbles formed. In the afternoon, we made a circuit board which would be used on Wednesday to titrate a solution of NaCl with HCl."- Ethan C.

"On Tuesday morning, all of the students of COSMOS met in Warren Lecture Hall for a discovery lecture presentation. This week's presenter was Veerabhadran Ramanathan, director of the Center for Atmospheric Sciences at the Scripps Institution of Oceanography at UCSD. He spoke to us about the science and implications of global climate change. The presentation covered specific scientific ideas such as the albedo effect and the relationship of chlorofluorocarbons and the earth's ozone layer, but also included personal narratives and the direct consequences of global warming on people's lives all over the world. After the lecture, we returned to the Natural Sciences Building to work on our projects. We have a variety of student projects we are working on in Cluster 3; some groups are looking at the earth's atmosphere, while other groups are focusing more on chemistry and biology of the living oceans. On Tuesday, my group used a spectrometer to calculate the relationship between silicate concentration and light absorbance, in order to reach our final goal of determining and analyzing the amount of reactive silicate in seawater."- Alexis C.



"Today, July 24th, we began with a lecture about clouds. After the lecture we tried to learn organic chemistry in 10 minutes and it was hard. Peter in the day we had a lab and we built a constant current source to react with an indicator to calculate the molarity of HCL" Ricardo R.

"On Thursday, July 25, we opened by going to cluster exploration. We learned about clusters 4, 5, 7, 8, and 9 as instructors from each cluster discussed what each cluster was learning about and what the students would be doing for their final projects. We then went to Bonner Hall to look at examples of scientific posters. Later we worked on our final presentations and analyzed more solutions to determine absorption. One group went to SIO to work on their project with Dr. Lai, while the other groups stayed on campus to work in the lab at NSB with George." Connor C.

We can't wait to see you next week to present our projects to faculty, families, and friends!

# CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE

It's hard to believe that we are just a few days from the end of COSMOS. I am very proud of Cluster 3's progress over the past few weeks. Many started the program with limited knowledge of oceanography and atmospheric chemistry and have learned so much. Cluster 3 has been able to absorb a lot of knowledge from our amazing faculty and TA's. Now, they are experts in their projects!

"Last Friday morning began with two intriguing guest lectures from field experts. One discussed his work in engineering cyanobacteria to increase its predator resistance, and the other described the process of ocean acidification and measuring oceanic carbon levels. In the afternoon, we commuted to Scripps Institution of Oceanography to learn how to identify different types of fish. We physically classified them by analyzing their body structure and through hands-on interaction." David Y.

"Entering the classroom at NSB on Monday was a sobering experience for me. After weeks of insights and revelations from Dr. Skip Pomeroy, this was going to be his last lecture with us. When we all settled down, he declared "I'm either going to dazzle you with my brilliance, or baffle you". In a flourish of strokes, he began writing chemical reactions on the board. As he scrawled equations on the board, he explained to us how to derive the basicity of the ocean using simple logarithms and pH equations. I was amazed how he was able to accurately find the pH of the ocean by calculating the excess acidity from carbon dioxide entering the ocean and turning into acid and factoring in the excess basicity from carbon dioxide dissolving the calcium carbonate on the ocean floor. In the afternoon we completed an acid base titration lab in which we used a pH probe. We slowly added hydrochloric acid to a beaker full of deionized water, making sure to keep track of the amount of acid added and the pH of the solution. Inputting our data into google sheets, we were able to calculate the alkalinity of the water." Anthony S.

"Tuesday 7/30: Continuing our weekly lecture series, we heard from Dr. Margaret Roberts, a professor at UCSD specializing in data science. She details her findings from the book Censored: Distraction and Diversion Inside China's Great Firewall, revealing that China uses fear, friction, and flooding to control Internet usage. Later in the day, we finished up our data collection for our project. We analyzed seawater samples from the wave flume to determine the nitrite concentrations in the samples." Alex S.

"On Wednesday, my group and I made significant progress on our project presentation and poster. We analyzed the results from our experiments and wrote out the procedure we used in the lab these last few weeks. Using this information, along with some background research, we were able to write our abstract - the summary of our experiment, our results, and the significance of what we did." Matthew J

"On Thursday, my group and I worked on the presentation about the phosphate project we've been working on for the past three weeks. We assigned parts that we would work on in the presentation, and I decided to work on the poster. The poster contained the summarized information about our phosphate experiments, including the calibration curve and the phosphate concentration determination." Sihun L.

"We are going to present to our professors and rehearse for Closing Day on Friday! We can't wait to share everything that we have accomplished with our family and friends. We look forward to seeing you all very soon."- Arteen A.