In the first week of COSMOS, Cluster 6 has begun exploring the organic chemistry involved in making biodiesel, have made biodiesel from canola oil, and worked on purifying the biodiesel. We’ve also begun the process of researching ethical issues related to biodiesel and renewable resources.

“Opening day was a blast! We all arrived on campus, checked in, and got to know our suitemates. Then we went to a lecture where we learned more about all the activities that we’ll be doing in the upcoming month. At last we met our cluster and our cluster RA’s, Lizzie and Colin! They took us on a tour of the parts of the campus that we would be using. As we toured, we all realized that we’re going to be doing a ton of walking this month!

Next, we headed back to the dorms and said goodbye to parents. After a great first dinner at Café Ventanas, we played some entertaining icebreaker games with everyone in the camp, and then headed to the dorms to play some more icebreakers with our suitemates. With such an exciting and busy day, it was easy to fall asleep as soon as we lay down our heads.” - Allison Douglas

Next, Dr. Albizati reviewed more organic chemistry concepts pertaining to our biodiesel lab and went over the Valence Bond Theory. In the lab, we continued to rid our biodiesel of left over water through a drying process. We then chose our project topics and formed groups.

At night, all COSMOS students participated in a variety of activities including time management, chalk art, and sports.” - Austin Shakiban

With our first week well underway, we’ll next be using an array of equipment to analyze the properties of the biodiesel we’ve made, begin planning the group projects, and looking into ethical issues surrounding the cluster’s focus.

“Monday was our first day of class and lab in COSMOS 2015. We met Dr. Pomroy and Dr. Albizati and received an introductory lecture on chemistry concepts and biodiesel's potential to replace fossil fuels and create renewable energy. We proceeded that afternoon to the lab and split into partners. We then began the process of creating biodiesel by causing a reaction in fat molecules. Afterwards, we participated in recreational activities with our cluster and other students.” - Amith Lukkoor

“Tuesday, after breakfast, we started the day by attending a lecture given by Professor Thomas Bewley of robotics. All of COSMOS was told by Dr. Bewley about the trials of college, applying your specialties into something new, and how he combined his interests to make a hi-tech toy with his students. After the seminar, we had our first Science Communication class. With our teacher fellow, Mr. Towler, we discussed the value of the speech and the mechanics of a presentation in general. After lunch, we came back to the labs we started on Monday. We separated the biodiesel from the glycerol and began the process of washing the biodiesel so that we can proceed to the next step of the lab. After many washes, our biodiesel was clean of impurities and the academic day was over. We walked back to Eleanor Roosevelt College to spend the rest of our COSMOS day.”

“During lecture, Dr. Pomroy explained the advantages and disadvantages of biodiesel engines compared to gasoline. He presented the students with other aspects of the biodiesel industry such as government involvement, foreign policy, and the use of algae to make gasoline and biodiesel.
"Thursday was a great day for Cluster 6 students: the weather was perfect, the students were beginning their group projects, and class had been moved half an hour to start at 9:00 AM. Thursday was the first day to exhibit standard San Diego weather - it’s perfectly warm and the sky was almost impossibly blue by the time students begin walking to class. Cluster 6 students had been divided into groups to research different uses and components of biofuel and its by-products; the groups were solketal, dioxane, algae, polyol, and particle emissions. While the polyol group went directly to the lab to begin their experiments, the other groups attended a stimulating lecture and review of chemistry given by Professor Pomeroy. Lunch was about as exciting as usual, and the grilled cheese sandwiches and "boy choy" were among the cluster's favorites. Then came the wonderful process of drying biodiesel in the lab, which provided an exercise in patience for the excited students and an opportunity to begin the group projects. After class and lab were over, the students of Cluster 6 practiced for the Cosmolympics competition to be taking place on Friday." - Bansri Parekh

"Friday, July 10th, was our third day producing biodiesel. Since the last step - drying out water from the biodiesel by heating it - was completed, we were finally able to see the final product we had been striving for for a whole week. Unfortunately, that was not the end; how are we going to ensure that the products came out are actually biodiesel? To check the purity of our biodiesel, we began a new project including many steps and analytical tests.

Cluster 6 was divided into five groups and guided to different tests for the analysis process. We tested - or planned to test - our biodiesel's density, water content, viscosity, cloud point, composition, glycerol percentage, flash point, percentage of pure biodiesel (using FTIR), and energy efficiency (using a bomb calorimeter). As each of the processes took about 45 minutes, we could not finish all the steps in one day. It was a good chance to learn how the properties of biodiesel can be tested, how the testing process works, and how the machine carries out the procedure." - Cindi Park

"Monday marked the start of our second week at COSMOS! After we had navigated our way there by ourselves for the first time, we began the day working in the lab. Dr. Pomeroy assigned each pair of lab partners to a station, where we would test different properties of our biofuel, alternating stations throughout the week. The types of properties that we tested for included Cetane Number, Energy Content, Flashpoint, Viscosity, Oxidative Stability, and Cloud Point. I began with testing the energy content, or heating value, of my biodiesel by using a bomb calorimeter. This test is performed to determine the thermal efficiency of the fuel. After lunch, we proceeded to our classroom where Dr. Pomeroy gave a lecture on the history and different implications of diesel and biodiesel. Next, Dr. Albizati continued with a lecture on the importance of science communication and information on the vastness of scientific literature." - Carly Rick

"Tuesday, after breakfast, our cluster went to a discovery lecture led by Professor Elsa Cleland. She specializes in plant ecology, and told us about her fascinating field studies that took her from the beautiful White Mountain Range to the semiarid deserts of Arizona. She focused on opportunities for undergraduate research and work in the field. Afterwards, we discussed the pros and cons of her presentation techniques and had some time to give constructive criticism on each other's ethics essay. Later, we went to work on our final group projects. My group, which focuses on aerosols, washed some biodiesel for future use and tested out the particle counter." - Christian Fong

"On Wednesday, our daily morning lecture was way different than what I had expected. Dr. Pomeroy welcomed us, as usual, yet he then began to lecture us about spectroscopy which basically covers the different wavelengths known to us such as light and microwaves. Anyways, what does the spectroscopy have to do with biodiesel? Well, he and Dr. Albizati later explained that we can tell how things are chemically composed based on how they react to these wavelengths. In other words, they could literally do incredible things such as find out how our biodiesel was composed or also see if your golden necklace was really gold or not." - Christian Mojica

Cluster 6 has made great advances learning the background organic chemistry involved in making and testing their biodiesel. They have also begun organizing the projects that they will be working on over the duration of COSMOS and will be presenting the last day. Cluster 6 has also excelled with their after session activities, winning the COSMOS Olympics last Friday. We look forward to our field trip next week, and the activities that we are engaged in expanding our knowledge and experience.
He took us through the definition of energy, and enthalpy that drive chemical reactions. Over a few of the organic chemistry functional groups, Dr. Albizati’s lecture focused on energy and enthalpy that drive chemical reactions. He took us through the definition of energy, heat, mechanisms, and energy transfer within reactions. The second half of Dr. Albizati’s lecture was on enthalpy and heat of a reaction, involving some mathematical concepts and equations. Finally, Dr. Albizati finished his lecture by testing our “chemical intuition” about enthalpy of combustion of different molecules. Now it was time for lunch over at 64 degrees and the much needed break after the morning of chemistry lectures. After lunch, each group of 2 lab partners broke up to continue testing our biodiesel products using different analytical chemistry methods. My lab partner and I went to the FAME station with the Teacher’s Assistant, Morgan. In this station, we began by preparing a diluted solution of our biodiesel and an organic solvent, pentane, in order to test the different compounds in our biodiesel by using a gas chromatography electron ionization detector. This test took about 45 minutes, but at the end we had a nice chromatogram of the different components in our biodiesel. When 4:00 rolled around, we all cleaned up and went back to Eleanor Roosevelt College dorms to see our parents for Parent’s Weekend!

-Jamie Salinger

“We started off Tuesday morning with an interesting and fascinating Discovery Lecture put together by Rommie E. Anaro on Enabling Chemical Discovery Through the Lens of a Computational Microscope. Dr. Anaro elaborated on current methods of creating computational models of proteins, specifically p53, to better understand their structure and help discover new forms of cancer treatment. Her lecture was followed by a session of Science Communication with Mr. Towler where we held a discussion about the pros and cons of Ms Anaro’s presentation. We were also briefed on how to prepare for our own final presentations and the different components that should be included. For lunch, we ate at 64°. I found it quite enjoyable and relaxing, being able to sit in one another’s company and eat together as a Cluster. After filling our bellies, we arrived at the lab and hit the ground running. Everyone was busy working on their final projects and carrying out experiments within their group for the rest of our time together.”

-Joy Suh

During the lecture the professors who lead the clusters gave a short lecture and updates on what their clusters were doing. The clusters that we learned about were clusters 2, 3, 4, and 5; this lecture provided insight on what our peers were doing in their groups and the projects they have come up with. After the lecture our cluster headed to one of the classes above Center Hall. In the class we discussed the lecture and spoke to the class about the topics of our ethic papers and were then given time to finish the papers. After lunch the cluster headed down to the lab where we split up into groups to work on our final projects. It was during that time that we could catch up on work and further analyze our final project topics. The day ended with several activities such as, playing Just Dance or Volleyball and making parfaits or going to a Positive Body Image speech.

-Irene Ramirez

“On Thursday everyone began their day by walking to Center Hall where we would be having our Cluster Exploration lecture.

- Jamie Geng

“On Wednesday, we had our first Cluster field trip! All of us (along with Cluster 3) went to the Birch Aquarium and the Algae farm (Field Station) on the UCSD Campus! We started off in the Beat the Heat Special exhibit. There, we learned the hard facts and statistics about what we are doing by releasing billions of tons of Carbon Dioxide into the atmosphere. We also learned about aerosols, the pros and cons of the ways to control our Carbon Dioxide emissions, and what we can do about it. We then explored the other exhibits in the aquarium, from the exotic and endangered dragon fish, to humongous leopard shark. After finishing our visit, we drove back to the main UCSD campus to eat lunch. It was a real treat to eat with both of our cluster RA’s, our Teacher Fellow Mr. Tim Towler, and Dr. “Skip” Pomeroy.

After lunch, we took the campus shuttle bus to the algae farm on the UCSD campus. There, we got a wonderful tour of the farm from Mr. Dominic, and he thoroughly explained the processes about how algae is grown, what it can be used for, and how much energy can be produced from it. It was really interesting to see just how algae could be mass produced, and the possibilities of what algae can bring to our world.”

- Kevin Amemiya
“After our cluster exploration session, our cluster headed towards our classroom. After lunch, the algae group had their share of fun measuring out and feeding dry ice to their algae cultures, hoping not to get frostbite nor let all the CO₂ sublime before reaching the culture flask. The aerosols group had an equally fun day burning biodiesel to measure particulate concentrations in the air.

After our cluster activities had ended, a few of us volunteered to stay at the lab to pass on the knowledge of biodiesel brewing to Latino/a students from a summer camp (Institute of the Americas) not much different from ours. We instructed and guided groups of students in the making of biodiesel from the mixing of the original oils to the washing and drying of the final biodiesel product. We all enjoyed attempting to communicate with the students and fooling around with Google Translate.” - Raylen Li

“Friday morning Dr. Pomeroy focused his talk on algae, explaining its various environmental and economic benefits and its global significance as a sustainable resource for fuel. He left us intrigued over the possibility of algae biodiesel as a growing source of fuel looking into the future. Dr. Albizati began by reviewing a series of functional groups, specific bonding arrangements of elements which appear together in larger compounds. Then, he introduced the ABCD gas laws, before concentrating on the ideal gas law. He explained how the ideal gas law has many important implications in various fields of science. After lunch we continued testing the quality of our biodiesel. After a long day in the classroom and at the lab, we had a blast watching the COSMOS Talent Show when we got back to Eleanor Roosevelt College for programming.” - Riley Henderson

“On Monday, we started our fourth and final week of COSMOS! Dr. Albizati gave us two lectures today. The first was on chemistry and fuels in the real world. We learned about oil production and biomass composition. After a break, we had our second lecture: tips on a career of science in the real world. We learned a lot about benefits and drawbacks of going into a career of teaching science versus working in a private company. It was very interesting, and I think most people enjoyed it. After lunch many groups continued their lab work, finishing up their testing and starting to work on their posters.” - Selena Huang

“On Tuesday morning, we walked to Center Hall for our last ever Discovery Lecture. We listened to Dr. Shaochen Chen talk about nanoeengineering, which involves mechanical engineering combined with biology. Afterward, we had Scientific Communication where we walked to Bonner Hall and Urey Hall to look at some posters. They were all very unique, and we obtained a lot of insight and new ideas that we were excited to add to our own posters.

After lunch, we worked on putting finishing touches on our individual projects. We were also finally able to calculate the amounts of different FAMEs, or fatty acid methyl esters, in our biodiesel.

As we continue to finish up our projects, it’s finally hitting us that these are the final few days we have with our new friends. But for now, we’ll cherish the moments that we have together.” - Tiffany Zhang

“We spent nearly the entire day working on various tasks related to analytical tests on our biodiesel and our projects. Some students filled out a Certificate of Analysis form with facts about the composition of their biodiesel, which is checked by the professors for documentation that the students have made good quality biodiesel. Others continued working on their Power Point presentations for the group projects. There were even students who helped each other practice presentation skills, identifying areas of improvement in speech or body language.” - Wilson Tam

To finish off the week with Cluster 6, our project groups are evaluating the results of their experiments and preparing their presentations.

“It has been a pleasure working with Cluster 6 over the last month. The Cluster has come together, learned a lot of organic chemistry and options for resolving the fuel and climate situation the world is dealing with. The Cluster has worked together well, and had a lot of fun in the process. I appreciate all the effort and hard work that the students, Cluster RA’s, Cluster Assistants and Faculty Instructors have put in to make this a fantastic summer for Cluster 6” - Mr. Towler