



COSMOS UC San Diego

California State Summer School for Mathematics and Science

UCSD Jacobs School of Engineering

A RESIDENTIAL ACADEMIC EXPERIENCE FOR TALENTED HIGH SCHOOL STUDENTS AT UC SAN DIEGO

Week 2 Newsletter REMINDER!

Family Weekend is July 21st through July 23rd. Students must be checked out by an adult specified on the Family Weekend Form between **5-9pm on Friday and must return between 2-5pm on Sunday**. Optionally, students can be checked out at 5pm on Friday and returned by 9pm that same evening or alternatively, 2pm on Sunday, returning by 5pm that day. We do not have the staff to accommodate individual schedules. **All students MUST be back to campus by 5pm on Sunday**. If you have any questions, please call our office at (858) 822-4361 or email: cosmos@ucsd.edu.

ADMISSIONS PRESENTATION

This coming Sunday, students and parents will be given the opportunity to attend a UCSD Admissions presentation. The presentation will be conducted by the Office of Admissions at UCSD. It will begin with basic eligibility requirements for applying to UC colleges, followed by the presentation of statistics to provide students with a visual of the competitiveness of the applicant pool. It will conclude with a Q&A session. The presentation will be held this

Sunday, July 23rd from 3-4pm at Solis 107.

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(during the summer program)

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DISCOVERY LECTURE SERIES



Dr. Gabriel Silva presented the second Discovery Lecture of the program with the lecture titled "Discovering the Brains Internal Algorithm." Dr. Silva is Professor and Vice Chair of the Department of Bioengineering and Professor of Neurosciences at UCSD. He is the founding Director of the Center for Engineered Natural Intelligence, and Co-Director of the Retinal Engineering Center in the Institute of Engineering in Medicine. Dr. Silva received an [Hon.B.Sc.](#) in human physiology and a B.Sc. in biophysics from the University of Toronto, Canada in 1996, followed by an M.Sc. in neuroscience also from the University of Toronto in 1997. He then did his Ph.D. in bioengineering and neurophysiology at the University of Illinois at Chicago, graduating in 2001. Dr. Silva began his lecture by defining artificial intelligence and describing how it has been increasing in its effects on society. One of the goals of the Center for Engineered Natural Intelligence is to extract as much information from the brain as possible and create algorithms that will allow autonomous systems to go beyond contextual decision making to contextually relevant and autonomous problem solving. There are many challenges they face, including how to enable machines to think on their own and solve problems beyond learned data.

Dr. Silva gave many examples of how far artificial intelligence has come in the last few decades. For example, self driving cars, video games, automated news generation, and fraud detection software are all technologies that have evolved using machines and algorithms that study behavior patterns and "learn." However, the technology is not perfect. We may have self-driving cars, but they are designed to follow every law. Humans do not follow every traffic law and it is difficult to "teach" the car to react to nuanced human behaviors on the road. The self-driving car will only react to situations it has been taught to react to. The same concept can be applied to fraud detection. The system is only designed to detect fraudulent transactions it has been taught to recognize. If there is a new transaction the system has never seen before, it wouldn't necessarily recognize it as fraudulent. Dr. Silva also described how the brain is inherently different from artificial intelligence networks. Essentially, the brain can adapt to different situations and contexts it may not have previously encountered. Artificial networks cannot extrapolate beyond their training sets. The brain has tremendous computational power and is self-contained and only requires about 20W of power, enough to power a dim light bulb. A robot with the computational power of the brain would require 10MW.

Dr. Silva ended his talk by telling the students that the The Center for Engineered Natural Intelligence is one of 147 teams selected to compete in the IBM Watson AI X Prize, which is a \$5 million AI and cognitive computing competition that challenges teams to develop and demonstrate how humans can collaborate with AI technologies to tackle the world's greatest challenges. UCSD is very excited to see the team advance into the next stages of the competition!

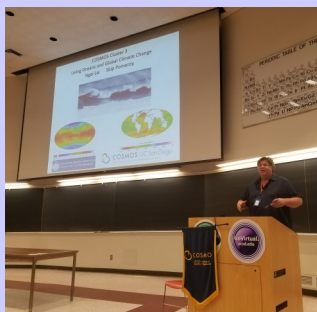


CLUSTER EXPLORATION

Professors from Cluster 1, 2, 3, 6, and 10 gave great summaries of the various research topics that COSMOS students are engaged in. This gave students an idea of the variety of research going on at COSMOS and on the campus. We started off with Professor Raymond de Callafon from Cluster 2, who showed us how COSMOS students are using physics and math concepts to build large structures that involve various sensors and robots. Next we had Professor Robert "Skip" Pomeroy, faculty for both Cluster 3 and 6, discuss the importance of learning about CO2 and the effects on the environment. Cluster 6 students learn about biodiesel and renewable energy sources. Students get to create their own biodiesel and test how "clean" the gas is, like any other technician in a lab would. The students learned a lot about alternative energy sources, such as algae biofuels, and how economics plays a large role in determining the sources of energy people use today. Finally, Professor Curt Schurgers from Cluster 1 took us back in time to when computers were first developed and

showed us how much they have evolved and how much we rely on computers in everyday life. He also showed us some of the amazing apps that Cluster 1

students are creating. Professor Schurgers is also the instructor for Cluster 10 - Robot Inventors, which is brand new this year! He talked about the amazing robots Cluster 10 students are building and the robot competitions they plan on having in the next couple of weeks. Next week, students will hear from Clusters 4, 5, 7, 8, and 9!



RESIDENTIAL LIFE

We are half way through COSMOS! Can you believe it? After the first week of awkward hellos and getting to know new people, your student has acclimated to this new environment and is making friends both in their suite and their cluster! Last Friday we had our annual COSMOlympics competition with Cluster 9 coming out on top. This second week was exciting and eventful. The RAs planned another week of amazing programs including ice blocking, karaoke, balloon tennis, galaxy jar making, and professionalism 101. Not only did we have our typical week of programs, but we also went on two field trips. On Saturday we went to the San Diego Zoo and on Sunday we went to La Jolla Shores where we had a beach day and a bonfire. Some took the recommendation of putting on sunblock very seriously and made it through the weekend unscathed, while some did not take it as seriously and were not as lucky. Despite

all that, fun was had by all. Lastly, since several kids have their birthdays during COSMOS, we had one giant birthday party and celebrated all of the COSMOS birthdays with delicious cakes and cookies.



CLUSTER 1: COMPUTERS IN EVERYDAY LIFE



Cluster 1

An update to Week 1's adventures can be found on our blog ucsdcosmoscluster1-2017.blogspot.com. Demos of our labs and presentations will be available on Monday. To see who was recognized with the Faculty's Choice and People's Choice awards check out our blog!

Last Friday, after our presentation (see our blog for the videos and demos), we visit the Robot Zoo to see Diego-San and checked out the opening of the Sun Lab. Diego is a machine learning robot who "looks like a toddler". The Sun Lab is 3-D environment where we got to virtually visit places around the world. When we got back to lab, we began to put together the peripherals we'd need for our Raspberry Pis.

On Monday, we learned about image processing. We learned how programs like paint and Photoshop do some of their basic functionality like finding a color and changing it to another or clearing the screen. We discovered how to do some image processing functions in Python – which means we'll be able to do it with our Raspberry Pis! In lab, we began to work on some image processing labs to change the color of every other bit to give the picture a different hue.

Tuesday, our Discovery Lecture on Artificial Intelligence from the Dr. Silva, gave us a life science take on A.I. This was a different perspective of A.I. than we got from Dr. Dasgupta from the Computer Science department. They were closely related and we could understand the Discovery Lecture better because of what we learned last week. Research is truly interdisciplinary! After the Discovery Lecture, we got a chance to peer edit our ethics essay. It's due this week and the top COSMOS essays will be announced at the closing ceremony! Wish us luck!



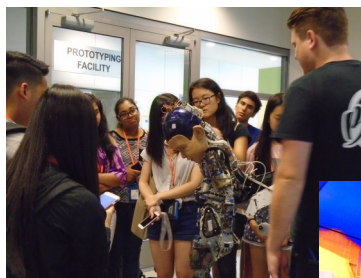
In the afternoon, we had our field trip to Qualcomm. Saura Naderi (formerly a Cluster 1 faculty in 2012) was our host. We visited their Research Showcase which highlighted some of the current technology they are working on such as small cell towers that we could have at home and autonomous vehicles.

We checked out the Qualcomm Museum which shows the history of technology that the company has done and their future projects. We then checked out a self-charging car. This

car doesn't have to be plugged in to charge! Currently, it sits on a mat which charges it. We got to meet Donald (mechanical engineer who is a two-time Battle Bot champion), who shared some of his work that's in the Research Showcase and was on Saura's team for the Robot Dress. Saura had an idea for a robotic dress and debuted in just a couple months ago. We go to see it in-person and get robot hugs from it!

On Wednesday, we learned about electricity and circuitry. It was a quick course of circuitry that we will start to apply when we work with Arduinos soon. Then we had a guest lecturer, Ryan Kastner (Cluster 1 faculty 2009-15). He shared the work his research group "Engineers for Exploration" is doing. One of our professors, Curt, is also part of this research group. We were fascinated by the behavior monitoring work. Its goal is to characterize animal behavior and health. One example is a camera trap. It can detect when an animal is there and then records. National Geographic used to just always record footage, but then people would have to go through each image and often times, it did not contain the animal. Now, the camera only takes pictures when it recognizes that the animal is there and a computer will verify if it is "good". We also learned how his research documents Maya culture by have aerial and 3-D mapping of artifacts and sites in Guatemala. It's like Indiana Jones with technology. Previous existing documentation was for archeologists to sit in the tomb to measure and draw. What Dr. Kastner (and our professor Curt) used was LIDAR (which is like radar but with lasers) to map out the tombs and its artifacts. Then, the measurements were put into a point cloud to view a 3-D model. It was like we were walking throughout an underground Maya temple. Since LIDAR is expensive (\$20,000), they are working on using an X-Box Kinect and Google's Tango (\$200) to get the measurements that the LIDAR would do in caves out in the desert.

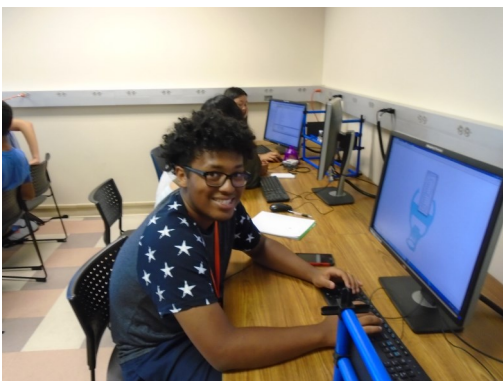
Thursday we continued to work on our image processing project – our picture with a green screen background and manipulating it with our programming!



On Friday, we'll have a guest lecture on picobots!



CLUSTER 2: ENGINEERING DESIGN AND CONTROL OF KINETIC SCULPTURES

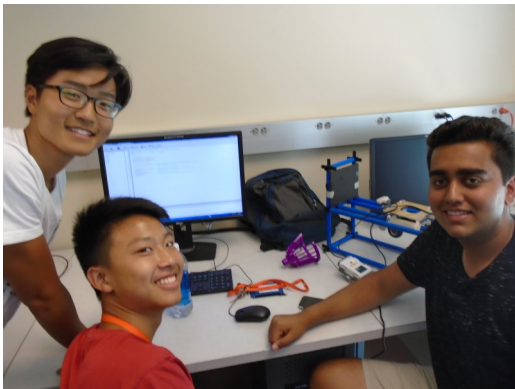


In week 2 COSMOS Cluster 2 was joined by our third instructor, Dr. Jack Silberman. Students also finished analyzing the timing of the clocks. All students in the cluster were under 8% error in their predictions for the period of their clock pendulums. The clocks functioned beautifully, ticking and tocking as designed.

A team building exercise was the recursive water balloon drop. Students formed teams and dropped a water balloon from ever increasing heights into a device constructed to cushion the fall and prevent breakage. The Cluster students had to use their knowledge of physics and their engineering skills to design and construct the device. The greatest height survived by a water balloon was 8 feet. This activity introduced students to the design process with limited tools and materials as well as limited time.

For science communications Cluster 2 gave oral presentations on their water balloon project and also made webpages for the clock project. The student pages can be viewed here <https://sites.google.com/a/eng.ucsd.edu/kinetic-sculpt/teams> Students attended the Discovery Lecture by Dr. Silva on artificial intelligence.

Cluster 2 also learned the physics of falling objects and rolling balls. They worked on calculating the speed of balls at a height given initial height and accounting for rotational kinetic energy. The students made predictions with calculations and the Working Model 2D simulation program, then built apparatus to test their predictions in the real world. This activity introduced them to the Chaos roller coaster kits they will use for their final project, the kinetic sculpture.



CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE

Hi Guardians, Families and Friends! It's Week 2 and Cluster 3 has a blast. We finished our Ethics Essays with flying colors and are in the midst of our projects. This week we are focusing on particles, aerosols chemistry and clouds with Dr. Pomeroy and learning about pelagic fish and geographical differences across different aquatic zones with Dr. Lai.



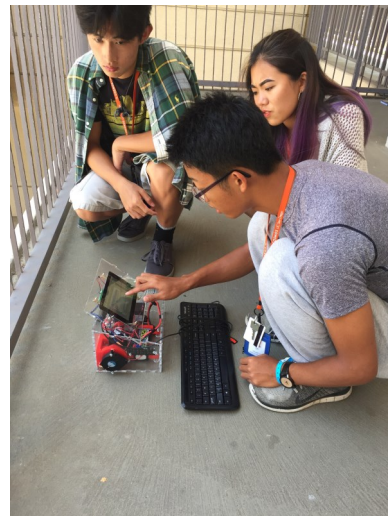
On Monday, our cluster started the morning visiting Scripps Institute of Oceanography to attend a lecture by Dr. Lai. We discussed various anthropogenic effects on the ocean, as well as taxonomy of various fish. After the lecture, we went down to the tide pools outside our classroom and saw many anemones, crabs, sea hares, and barnacles in their natural habitat. We went back to the main campus for lunch, and afterwards attended a lecture with Dr. Pomeroy and did a few labs regarding the formation of



clouds and rain drops. – Caroline Z

On Tuesday our cluster revisited the ideas of aerosol energy and cloud formation in the morning with Ms. Whitelock. We then transitioned to our projects, where me and my cluster tested the salinity of different water with our coulometer. –Nathan K

On Wednesday cluster 3 visited Mission Bay to collect fish and categorize them by using the dichotomous key. After a few trials of catching fish and letting them go we decided to go for a swim. Then we chased our group project partners on kayaks thanks to Dr. Lai. Overall it was a very tiring, but extremely fun day!- Kayla H



Our cluster started off the day with Cluster Exploration, during which we learned about what a few of the other clusters had been doing since the beginning of COSMOS. We then focused on finishing our ethics essays, and after lunch, we worked on our final projects. – Jason Y

On Friday we are looking forward to making Clouds in a Bottle by altering particle amounts with differing combustion sources. In the afternoon, we will be dissecting a tuna fish to better understand pelagic fish physiology. We are excited to share our adventures on Parents Weekend!



CLUSTER 4: WHEN DISASTER STRIKES: EARTHQUAKE ENGINEERING



Our Cluster 4 Cosmopolitans continue to impress us with their superior work effort, problem solving strategies, and tremendously positive attitudes. Above all that, we find this group to be a very warm and friendly assembly of inquisitive young adults. Good job parents! Students have begun their project work, and are busy organizing responsibilities and creating designs.

The eight project groups each have their own unique characteristics and design challenges, not to mention time management hurdles. Yet, the students have bravely forged ahead, and soon will experience the realities of a three week deadline. During the morning sessions, Adel continues to explore various aspects of engineering design considerations with the students, preparing them to strike out on their own with idea development. Following approval of their designs, they began building and will eventually test their models based upon the assigned structural type. Cluster Assistants Brandon and Allen keep very busy advising and supporting our student groups during the afternoon project sessions.

In other news, our students were treated to a Discovery Lecture by Dr. Gabriel Silva on Tuesday. His research revolves around the human brain, neural computation, and artificial intelligence. It is powerful for the students to experience his passion towards such an interesting issue, and to understand that he also considers the ethical

applications of his research. On Thursday we are attending our first cluster exploration hour, where they are able to hear about the cool things other clusters are doing. The final exploration hour will be next week.

After Tuesday's lecture, we soaked in the warm San Diego sun and learned about San Diego geology from Bob. We trekked a short distance up Mt. Soladad and were inspired by the beauty of a 360 degree view. Box lunches were enjoyed on the beach at nearby La Jolla (tough job, isn't it!) before we journeyed to Torrey Pines State Natural Reserve. We learned more about Mesozoic nature of the local rock formations, the ancient Ballena River and Poway clasts, then hiked down the trail to the beach. Before returning to campus, students relaxed on the beach and appreciated the amazing setting that UCSD students are so fortunate to experience.

Our student groups are functioning well thus far, and the process of building, testing, analyzing, and redesigning will continue into next week. Those families taking advantage of Parent Weekend will undoubtedly hear all about their successes and challenges over some home cooking. They look forward to sharing their final results and products with you in two more weeks. As always, please keep up with their endeavors by checking out our Cluster 4 Website and photo galleries.



CLUSTER 5: FROM LASERS TO LCDs: LIGHT AT WORK

A Week in Focus

The end of Week 1 at COSMOS saw most, if not all, of Cluster 5 adjusted to the daily morning lectures and afternoon labs— along with squeezing in homework and an ethics essay into any free time.

On Thursday in class, we were introduced to the world of solar cells and how they convert solar energy to usable electric energy. To reinforce this concept, we used blackberry juice to create a dye-sensitized solar cell. However, in reality, our solar cells could probably only power a very small and dim lightbulb.

We celebrated the conclusion of our first week of COSMOS on Friday afternoon with COSMOlympics, an event combining skits prepared by each cluster and a relay race. Though our cluster did not win the relay, we were all proud of the work we had put into the skit, including the props, musical accompaniment, acting and script-writing, and even celebrated afterwards with the rest of the clusters with an outdoors dance.

After a grueling week of waking up early and 7 hours of labs and lectures, we were finally able to sleep in; despite it being the weekend, however, long laundry room lines and extensive ethics essay writing forced many COSMOS students to wake up even earlier than usual.

However, there were some fun excursions planned to visit some local attractions on the weekend, such as the San Diego Zoo and La Jolla Shores. Our cluster had a lot of fun taking pictures with the orangutans, visiting the various unique exhibits of the zoo, swimming in the ocean, and playing games on the beach.

After a relaxing weekend, Cluster 5 resumed our labs and lectures on Monday, eager to continue our learning from the previous week. Dr. Tu and Dr. Ilinikh delved into more topics, from diffraction to polarization, lithography, lenses, and much more. Wednesday's discussion about holography even allowed us to create our very own holograms in the lab, a cool memento of our learning.

At this point, nearly halfway done with COSMOS, our cluster has not only been challenged to learn completely new things, we have already formed tight bonds and new ways of thinking that will carry us throughout the rest of the program and hopefully even after.

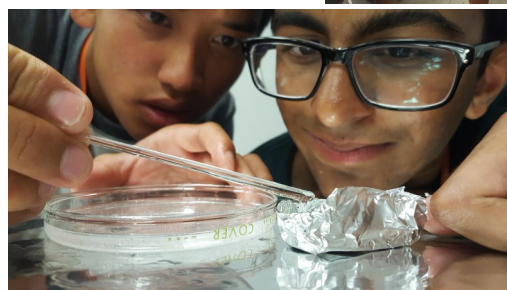
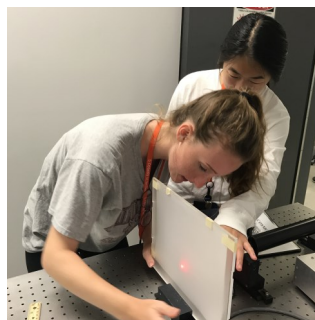
-Roselyn L.



Getting Down to Business

After enjoying a relaxing weekend, we went right back into lab work, this time focusing on workshops that challenged our grasp of waves as exposed to us by Dr. Tu. In this week's lectures we were introduced to the wave-particle duality of light: sometimes it behaves as a particle, as seen in laser beams, but in other instances it behaves as a wave, much like water ripples in a lake. The lab experiments that Dr. Ilinikh prepared captured these concepts. By using beam splitting prisms and a specific arrangement of mirrors, we were able to view the interference amongst two waves of light in a phenomenon called constructive and destructive interference. Also relating to the wave nature of light, we investigated how light is affected when passing through a narrow opening or across a gap, this occurrence being known as diffraction. Perhaps the most notable event this week was creating a hologram. Unlike digital photography, holography captures all three dimensions of the subject; able to do so through the propagation of waves from a light beam aimed at a film. This process demanded an isolated, controlled environment in a pitch-black room and an assembly-line of students, each with a role in generating the holographic image on the film. Any missed step, any hesitation, any slight movement in fact would ruin the experiment. The results were certainly worth the stress though, because the mermaid hologram we created was wicked cool! Any instance when we take our learning from a PowerPoint presentation and translate it into a lab setting where we can experience light at work is incredible, and to be able to conduct these experiments and observe these phenomena has been truly gratifying. We have a very unique and diverse group of people, and have been bonding extremely well throughout this past week and a half. Cluster five couldn't be more blessed to be here at UC San Diego in beautiful La Jolla, learning college-level physics AND having an amazing time. Until next week!

- Cameron W.



CLUSTER 6: BIODIESEL FROM RENEWABLE SOURCES

Week 2, the focus of Cluster 6 has been to begin analytical testing of the Biodiesel made in week 1. We have organized into project groups, and have begun working on the projects. Students have been working on their ethics essays, and they have submitted them for judging. Our Cluster 6 field trip was also this week, we spent the day at the Birch Aquarium, and touring the Hydrology Lab and the Field Research Station. Next week will be more analytical tests of our Biodiesel and work on projects. Mr. Towler

"The COSMOlympics were so fun and a great way to get our cluster working together " Anmol K.

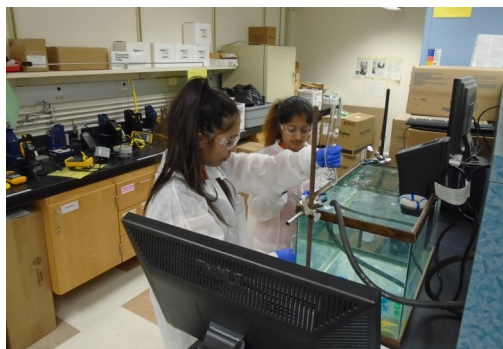
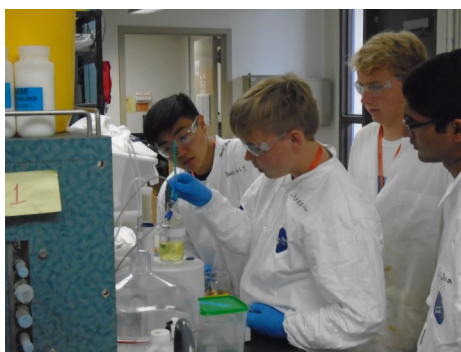
"We began to complete the certificate of analysis for our biodiesel. My group used the bomb calorimeter, which was exciting because the equipment was much more advanced than the styrofoam calorimeters that I used in the Chem labs this past school year." Liana K.

"Today we had a lecture about A.I. and how it interlocks with other fields of science like biology and physics. It was interesting to see the vast amounts of

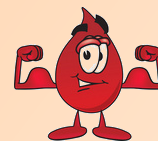
knowledge that gets developed through these technologies." Claire L.

"I really enjoyed seeing the Algae fields and hydrology lab. It was cool to see that fuel could be grown, not extracted from the ground. Seeing the only salt water flume in the world was cool." Chet M.

"This morning we got to listen to what a lot of the other clusters are working on. It was fun to hear in more depth what our fellow Cosmos students do every day!" Lydia M.



CLUSTER 7: BIOENGINEERING/MECHANICAL ENGINEERING: THE AMAZING RED BLOOD CELL



COSMOS Cluster 7 has been busy, busy, busy! We have been working in the lab with Dr. Vera on growing and isolating E.coli that are resistant to antibiotics and isolating red blood cells. Students have been working on their Ethics Essays, presentation skills, and lab analysis questions Dr. Vera provides during Science Communication time. Students are looking forward to touring J. Craig Venter Institute on Thursday afternoon and their final day with Dr. Vera on Friday.

Friday, July 14th

"COSMOS Cluster 7 had an exciting Friday in the lab working on red blood cells. After listening to Dr. Vera's morning lecture on blood cell structure, the students eagerly put on their lab coats and went to work. Friday's lab consisted of separating red blood cells using various solutions and centrifuges. During the lab, student's objective was to separate the plasma and white blood cells from the red blood cells using a centrifuge; then the student would isolate the red blood cells, and then put it through the centrifuge again, repeating it three times. Each time we took out the white blood cells and plasma, we would add some wash buffer which helped to purify the membrane we wanted. Although the work was strenuous and tedious, Cluster 7 students pushed on and successfully separated their blood cells. Student Jeannette A. says, "My favorite part about the lab was able to extract bovine blood." In addition to doing the bovine red blood cell ghost membrane extraction lab, students attempted to continue a lab previously started on Wednesday. Dr. Vera brought out the Agar plates which had been sitting at room temperature for two hours this out the E. coli plates to show everyone how much the bacteria had grown. Unfortunately, most of the plates did not have colonies, but some had a few white specs. Dr. Vera speculated that because we had kept the plates at room temperature for two days instead of in the incubator for 24 hours. Now, the plan is to keep the plates in the incubator on Saturday so we can use it on Monday." - Arvind and Todd

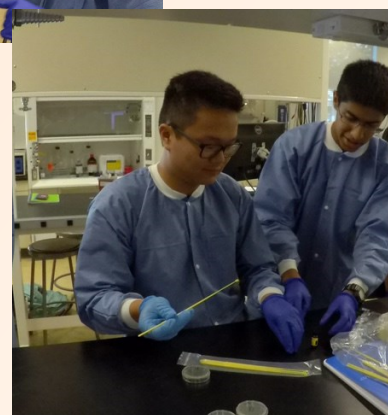
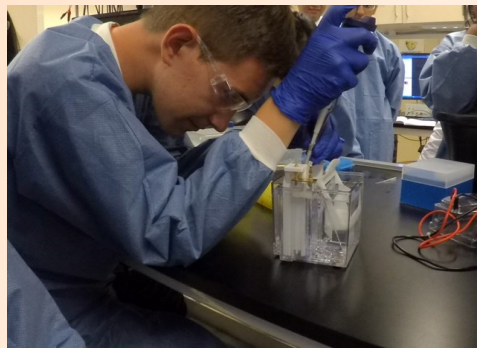
Monday, July 17th:

"After learning about the wonders of replication, transcription, translation and gene expression from Dr. Vera's interesting morning lecture, the students moved to the lab for a continuation of the pGLO and ghost membrane lab. First, Cluster 7 revisited the growing e Coli to check for growth and finish the proce-

dure. By transferring different colonies of bacteria into various buffers, Cluster 7 followed the path to plasmid transformation. Next, in the afternoon, students learned about the wonders of tensegrity with diagrams and exciting DIY models. Finally, Cluster 7 returned to finish the ghost membrane lab, using their perfected pipette skills to apply the final touches to the centrifuged ghost membranes. The day ended with the exciting use of gel electrophoresis." - Swathi & Karen

Wednesday, July 19th:

"During today's lecture, students learned about the Western Blot, antibodies and the immune system. Dr. Vera also went into great detail about other types of isolating procedures, such as the Southern Blot and the Northern Blot, and how primary and secondary immune responses work. After the hour-long lecture, students eagerly rushed to the laboratory to put their newly acquired knowledge to work. Everyone worked together to perform the first stages of the Western Blot with Dr. Vera. Students were able to see the results of their gel electrophoresis from a previous lab and analyze their findings. After a well-deserved lunch break, students headed back to the classroom for another lecture about our upcoming field trip on Thursday and using chromatography to isolate the green fluorescent protein from our E.coli cultures." - Jeannette & Danna L.



CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

The first week ended with COS-MOlympics! A fun filled evening of skits and challenges and even though we did not win it was GR8 to get out and bond as a cluster. Over the weekend we took time out to go the San Diego Zoo and the beach, all the while spending a little time writing our ethics papers!

We began our second week with a field trip to Advanced Biomatrix which is involved in the production of three dimensional (3D) applications for tissue culture, cell assay, 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. Recently they have had success at 3D printing using collagen and they showed us some of the structures they have made, including a nose! As we left they gave us a very generous gift of collagen for us to use in our projects!

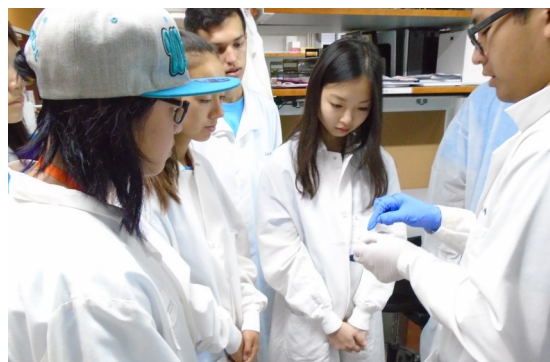
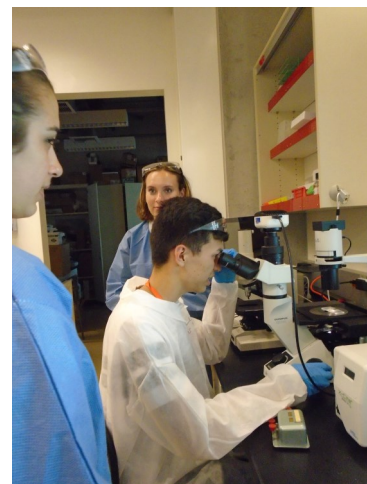
In the lab we have finished mastering our twelve lab skills. We are now accomplished enough to use a microscope to view stained and unstained cells and use a hemocytometer to count cells. Additionally we can thaw, grow and passage our cells, create collagen gels, decellularize tissue, and examine histology slides to evaluate our tissues. Our TA's, Erica, Rebecca, Marisa and Nathan, have taken the lead instructing us in pre and post lab and guiding us through

each technique. They have been GR8 teachers as we navigate through a wide range of bioengineering skills. We know that next week, as we embark on our projects, we will have the expertise needed to perform our own experiments, with a little guidance of course.

In the communications portion of the cluster we have had the opportunity to attend a Discovery Lecture from Dr. Silva, who studies neurosignaling and the resulting emergent properties, with the goal of creating real time, robust, contextual, and adaptive artificial intelligence. In Science Communications we had time to debrief after Discovery Lecture, review other students' ethics papers, submit our final ethics papers on Thursday, and discuss the research process.

Last week our lectures and discussions by our distinguished faculty, Dr. Sah and Dr. Gaetani expanded our knowledge about stem cells, biomaterials and biomechanics in tissue engineering. As we increase our comprehension about tissue engineering we have many more questions and Dr. Sah and Dr. Gaetani are always eager to help us. This week was exciting as we spent time summarizing our lectures, and discussing and researching our project ideas with our professors. Our plans are finalized and next week our much anticipated projects begin.

What a GR8 week we had!



CLUSTER 9: MUSIC AND TECHNOLOGY

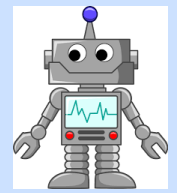
The watchword for Cluster 9 at the end of week one was VICTORY! The “Niners” finished the week in triumph by winning the COSMOS Olympics. The cream rose to the top as the musical and choreographic talent of the cluster members, under the leadership of RA’s Kevork and Sabira, carried the day. The performers included John G. (violin), Rochelle T. (clarinet), Elena C. (cello), Sam L. (violin), Ryan W. (trumpet), Maria V. (viola), Laryn Q. (drums), Emily K. (violin), Kaylee T. (vocals), Ashley C. (flute), Nick P. (guitar), and Saachi K. (cajon). The after-hours fun took place only at the

conclusion of challenging days filled with fast-paced learning in the lab and the music hall. The team had to opportunity to rehearse its Olympics act in the Conrad Prebys Music Hall recording studio. The session featured a guitar and violin serenade by Nick and Sam of Piazzolla’s Libertango and a complex Bach fugue played by Ike Tamana. The students learned not one but two microcontroller systems that will be used to control their upcoming musical projects. In addition, they were served a rapid fire lecture in the basics of Python programming. Toward the end of Monday’s session the

group learned that not all music comes from dedicated musical instruments; in fact, virtually any instrument that can vibrate the air can fulfill a musical purpose. The highlight of the afternoon was instruction in the art of playing a saw with a fiddle bow. Week three promises to be a bustle of activity as the cluster members form groups and embark on their capstone projects.



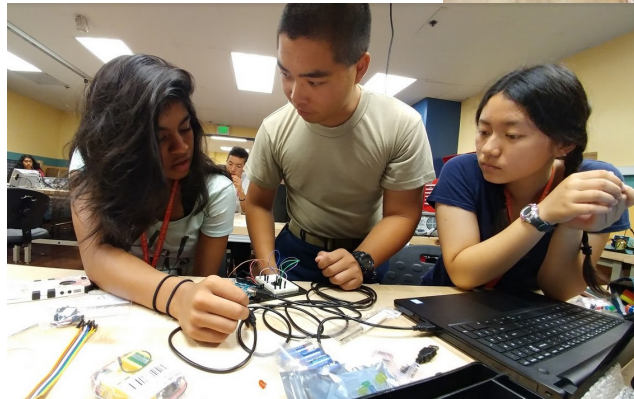
CLUSTER 10: ROBOT INVENTORS



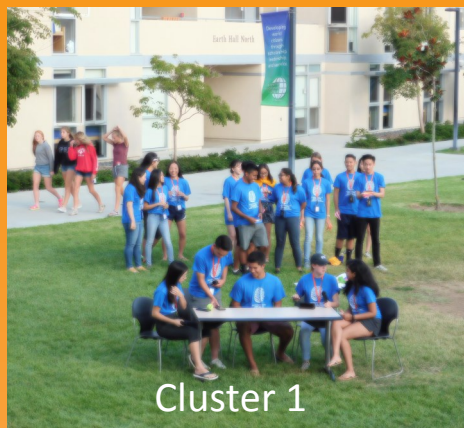
Cluster 10 has jumped into the world of robotic design this week. While last week students focused on programming pre-made robots, this week they have been tasked with designing their own. The task: design a car (with an onboard arduino) that can compete against others in a MarioKart-style melee. Cars will have a balloon attached to the back which they must protect, and toothpicks attached to their vehicle with which to pop the other cars' balloons. The car with the last balloon to be popped wins! Students will use cell phones with a steering app to control their vehicles. This challenge incorporates programming arduinos, using SolidWorks to design parts for laser cutting, 3D design thinking, and strategy.

Students have also learned a variety of new techniques this week, with guest lectures from several roboticists. These topics include weather balloon design for analysis of hurricanes, toy design for robots based on an inverted pendulum, and automation of robots, including the development of sensors, localization and mapping tools. Students have also had faculty lectures on the principles of finite state machines (using the online tool Picobot), a review of general electronics, and an introduction to arduinos.

Finally, students have completed an essay on ethical challenges faced by the field of robotics. The students addressed many complex issues, including robotic surgery, military drones, and potential job loss as a result of increased use of robotics. Final selections will be made this week to determine whose essays will go on to the final competition for best ethics essay. Stay tuned for potential winners!



COSMOLympics



Cluster 1



Cluster 2



Cluster 3



Cluster 4



Cluster 5





Cluster 6



Cluster 7



Cluster 7



Cluster 8



Cluster 8



Cluster 9



Cluster 10

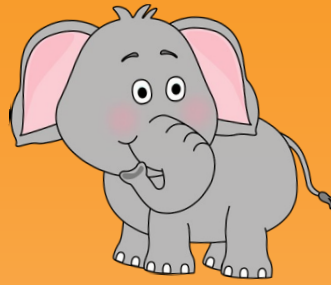


Residential Activities





San Diego Zoo



Closing Day Information—Aug 5th, 2017

- Parents should plan to be on campus at 8:30am and meet at the Warren Mall in front of [Jacobs Hall](#)
- Parents will be escorted to the classrooms where presentations will be held
- Presentations will begin promptly at 9am
- The awards ceremony and closing ceremony will begin at approximately 10:15am and end at 11:45am in the [PC Ballroom](#)
- Students must checkout of the dorms between 11:45am—1:00pm in front of the dorms at Eleanor Roosevelt College
- Please Park in the [Gilman Parking Structure](#) and follow the signs to the Warren Mall. Parking is free on the weekends.

Parent Information

Several parents have requested access to other parent contact information to see if there is interest in creating car-pools for parent weekend or closing day. Please follow the [link and add your information](#) if you would like to share your contact info with fellow COSMOS parents. Parents are responsible for reaching out to each other. If you do not wish to be contacted, do not add your information.