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 3 Newsletter

Closing Day!

On Saturday, August 2nd, students will present their final projects. Please plan to arrive at 8:30am at the Price Center Ballroom, located on the second floor of the Price Center at UCSD. You will be escorted to your student's cluster project location where presentations will be from 9-10:15 am. Following the presentations will be the COSMOS Awards Ceremony at 10:30am. Students will be presented with their Completion Certificates and special awards will be presented at that time. We encourage friends and family to come see all of the hard work that the student have been putting in during their month at COSMOS!

After the Awards Ceremony, we ask that families start heading back to the Eleanor Roosevelt College (ERC) residential halls to pick up their belongings and check-out. This means that all students should be packed prior to the Research Expo and have their keys and meal cards ready to be turned in. If your student has lost their key(s), it is a $155 expense per set of keys and this must be paid at the time of check-out if not before. Broken keys are free to replace.

Families should park at the Gilman Parking structure near the Price Center. ***Do not use the 9500 Gilman Dr. address in your navigation system-it will take you to our central mail processing!*** Families can park in Gilman for the Research Expo and Awards Ceremony then drive to the Pangea Parking Structure to pick-up their student's belongings and check-out. All students MUST be checked out by 1pm.

IMPORTANT INFORMATION

Contact Information

COSMOS Office Hours:
(during the summer program)
Monday - Friday: 7:30am - 5:30pm

Emergency after hours,
please call:
(858) 255-0667
Email: cosmos@ucsd.edu

Mail

*NOTE: Mail and/or packages mailed after Monday 7/28 will not be received before Closing Day.

In this issue:

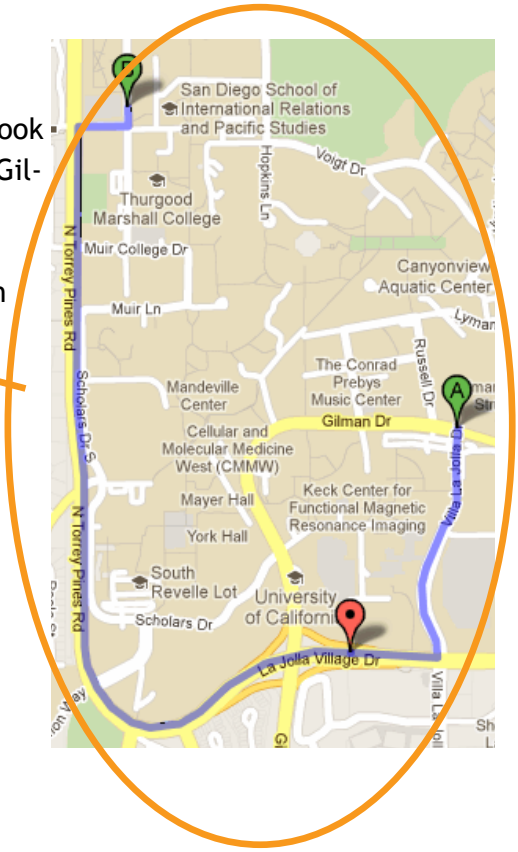
Closing Day Driving Directions

Getting to GILMAN PARKING STRUCTURE

1. Exit La Jolla Village Drive from the I-5 and head west to turn onto La Jolla Village Drive.
2. Turn right onto Villa La Jolla Drive.
3. Continue straight past Gilman Drive into Gilman Parking structure.

(Walking) From GILMAN PARKING STRUCTURE to PRICE CENTER BALLROOM

1. Head North from the Gilman Parking Structure on Russell Lane. Look for COSMOS signs that will be along the way to Price Center from Gilman parking structure.
2. Turn Left onto Lyman Lane.
3. Continue straight on Lyman Lane, past the Triton Fountain (on right).
4. Enter Price Center West by taking stairs on the right.



(Driving) From GILMAN PARKING STRUCTURE to PANGEA PARKING LOT

1. Head South on Villa La Jolla Drive.
2. Turn right onto La Jolla Village Drive
3. Continue straight onto N Torrey Pines Road.
4. Turn right onto Pangea Drive.

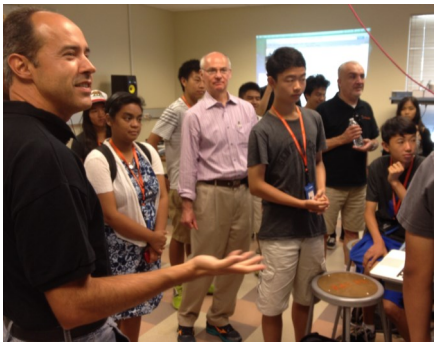
*NOTE: Parking is free on weekends unless otherwise noted.

CLUSTER INFO SESSION

This week we finished up our Cluster Information Sessions , where the students had an opportunity to learn what other students are doing in Clusters 5-9.

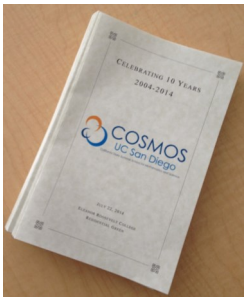
VISITORS FROM COSMOS ADVISORY BOARD

On Wednesday, our students had visitors from the COSMOS Advisory Board & Statewide Office. Some students had the opportunity to ask them questions and they in turn had the opportunity to visit some of the clusters and see what the students have been learning.



10 YEAR ANNIVERSARY CELEBRATION

On Tuesday, we celebrated our 10th summer of COSMOS at UCSD. All of our students joined faculty, staff, the COSMOS Advisory Board, the Dean of the Jacobs School of Engineering, and other invited guests for a reception, community barbeque, and presentations by Dean Albert Pisano; former California First Lady, and COSMOS founder, Gayle Wilson; and UCSD COSMOS 2009 alumnus, Alan Sanchez. Twenty-five COSMOS student ambassadors greeted our special guests upon their arrival and helped them to feel welcome to our campus. All of our students did a great job of networking with our guests and helping us to celebrate the success of the UCSD COSMOS program over the past ten years



Discovery Lecture

The lecturer for the COSMOS third Discovery Lecture was introduced to the students as a modern day "Indiana Jones", and his presentation lived up to that statement! Using a storytelling presentation style, Dr. Albert Lin took the students on a journey from his early child hood in Hong Kong through his MAE PhD, earned at the Jacobs School, UCSD. This sounded typical enough, but that's when the adventure began. As a young boy, Dr. Lin's grandfather had often mentioned that the family was of Mongolian descent, but there was no proof. After seeing a representation of Genghis Khan in a movie, and then researching him, Dr. Lin found that Genghis Khan controlled the largest empire in human history, roughly from Japan to Poland. There is surprisingly little factual knowledge about him though, so Dr. Lin sold everything he owned, which wasn't much at the time, and headed to Mongolia, determined to see what he could discover. He set his sights on the tomb of Genghis Khan, which has never been found. His first trip convinced him that he needed more funding and better connections. After applying for and not receiving several grants, he began emailing influential people, finally piquing the interest of the National Geographic Society. The students learned that the National Geographic Society was founded by Alexander Graham Bell, an engineer, and that engineers have often been at the forefront of exploration. The remoteness of the area and the restrictions against site excavation lead to the creation of new tools, including drones for

aerial surveying and ground penetrating radar. Dr. Lin had aerial photographs taken from space of the massive Mongolian Steppes area, and quickly realized he didn't have the staff to review every photo for clues. He instituted a new technique for that time called "crowd sourcing", which involved placing all the photos on the web for the public to view and mark interesting areas with certain predetermined categories. As tens of thousands of people all over the world reviewed the photos, features began to appear such as rivers, roads and interesting shapes on the ground that had been grown over by vegetation. Many trips back and forth between Mongolia and UCSD were taken to review and evaluate the data collected. The team focused on a sacred mountain that legend said had temples at the base, middle and top, hoping to find clues. The clues finally came after a big storm blew down trees. In the roots of the trees they found pieces of ancient temples, which were buried below their feet. Using non-invasive equipment, they mapped a subterranean structure then brought the data back to the Star Cave at Calit2 at UCSD, where they were able to visualize the structure in 3D from the collected data. This site is now in for acceptance as a UNESCO World Heritage site. Like any good story, there is much more to it than these few paragraphs. Be sure to ask your child about traversing the terrain on vehicles and horseback, the Shamans guarding the sacred site and the first flight of the experimental drone. Dr. Lin's exploration continues in diverse areas like Guatemala and the recent use of crowd sourcing techniques to assist in locating the downed Malaysian airliner. The Shaman's made Dr. Lin realize that what you do is important, but it is the intention that you have that really matters.

RESIDENTIAL LIFE

There is so much we would like to share with you about your students lives and progress here at COSMOS. The number one lesson each student has been working on outside of class has been time management. We are happy to say that many students have shown great skill in getting homework done during the 4-8pm and 9:30-10pm time frames allowing for learning outside of the classroom 8-9:30. Most students are productive during their free/study time with limited guidance. With this skill in hand, they are destined to do far better in a university environment, assuming they keep working on this skill.

Another lesson learned is that attending programs, events, and down-time outside of class is essential to a balanced academic life. At the College Success program the Admissions and College representatives stressed this important skill. It is not enough to write a good personal statement, but a successful college student also learns to fill their resume with more than just a good GPA and an internship. Involvement is key. This has been a driving force for the Resident Advisors to instill in the students and we believe they are beginning to embrace the wellness philosophy.

So what have they been up to this past week? Students who did not go away during Family Weekend enjoyed a fun and adventurous trip to our local Arclight

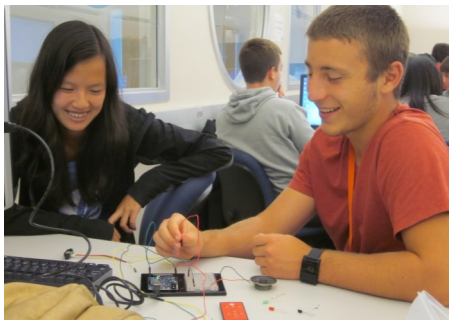
Cinema. They were also able to participate in a scavenger hunt, a visit to the mall, a jam session, general down time, and play Just Dance. Upon everyone's return there were a lot more things to do for the week including but not limited to: an 80's dance, resume writing, a mostly made up Haunted Tour, pool, gardening, duct tape crafting, and a bonfire at La Jolla Shores with s'mores and a beautiful sunset. During all of this we learned so much more about our residents. Uriel has a great capacity for chess. Kate got a lot out of being an Ambassador to Tony Tyson. Telling twins Andrew and Mark apart isn't really that hard. Coacheleans have an amazing collective spirit. And all of these activities were capped off with a UCSD COSMOS 10 Year Anniversary Celebration with guests like Gayle Wilson, COSMOS Board Members

including Ken Hess, and Jacobs School of Engineering Dean Albert Pisano. Needless to say, it was an action packed week.

We must forewarn you that this last week is often a time when you will not hear much from your student. They are not only busy getting ready for their presentations and projects, but they are also already preparing to shed tears over leaving one another. Students will go to Knott's Berry Farm, put on a Talent Show, attend a fun filled carnival, watch a movie, have a yearbook party, and experience one last COSMOS dance, just to name a few events. Though UCSD COSMOS 2014 is coming to an end, there is a lot of fun in store to make the students' experiences as memorable and well balanced as possible.

CLUSTER 1: COMPUTERS IN EVERYDAY LIFE

On Monday, we learned about adding binary numbers using adders. As a cluster, we added two 19-bit binary numbers together. Each one of us was a digit and we used what we learned about sum and carry bits to accomplish the task. Did you know that all the following are true: 1 + 1 = 0, 1 + 1 = 1, 1 + 1 = 2 and 1 + 1 = 10? We did. And we know why.

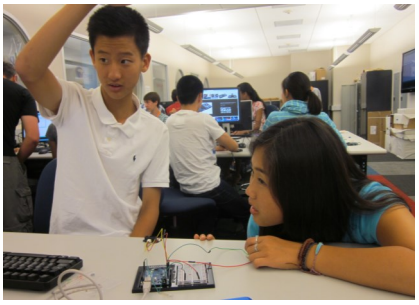


Later that morning, Tom Bewley was our guest speaker. One of his areas of research is feedback control. If you try to balance a pool cue stick upright in your hand, you move back and forth in an attempt to keep it standing up – that's using feedback to make adjustments. One project he spoke about was a self-righting mobile inverted pendulum (MiP). It originally started as a final exam problem on a test. After the class, so some students wanted to not just do the theory of it, but put it in action. Once they got it working and did more work, they realized it would make a fun toy and so they went to Wowee to pitch their idea. Now, you can get it at Best Buy. It was in the "swag bag" at the recent Grammy's. Here's a link to see it in action - https://www.youtube.com/watch?v=zTHp_GX2uOc .

In the afternoon, we continued to work on our musical instrument Arduino project. We became adept at circuits and got some new parts that we could include – like push buttons. Our projects were completed on Tuesday and you can see videos of us playing our instruments on our blog (http://ucsdcosmoscluster1-2014.blogspot.com/). The top musical instrument projects were made by Sam C. and Michelle, and Nick and Tiffany.

Also on Tuesday, we had the opportunity to tour CalIT2 where Curt's lab is located and Engineers for Exploration (E4E) does their research as well. We visited the Visualization lab which had a tiled display of monitors. When we wore 3-D goggles we felt immersed in the scene. If we put on a ball cap (which had 4 balls on it) then our movements would be tracked and it knew when we turned our head and the view would change accordingly. We peeked into the clean rooms at CalIT2 – we couldn't go in or we'd contaminate them! Next was the Audio Spatialization lab (Spat lab). It had

twenty-four speakers around the room, and we heard the difference between playing the rain on all 24 speakers with and without processing. Once the sound was processed, it sounded more realistic. They also had an array of speakers which beamed sounds. Depending on where you stood, you'd get a different sound. Also, the speaker array could send different sounds to each ear and make it sound like someone was talking on one side and someone was getting a haircut on the other side. Very realistic!



On Wednesday, we began working on our walking Arduino robot. Each team has a different idea on how to get theirs to move around the room. We were also honored to receive a visit from the COSMOS Advisory Board. They toured our cluster and we had a chance to show off our work. Nick and Tiffany personally demonstrated their musical instrument to the visiting Board members. They requested the link to our blog so they could see our final walking bots.

The Rubik's cube guys came by with Ruku (their robot). This time we got a chance to see it in action. Not only that, but we got to program it ourselves. They gave us some libraries to work with and we wrote our own Python code to try to get the robot to solve the cube.

We'll finish off the week working on our walking Arduino robot and proposing our final projects. It's been a busy and challenging week. We're going to make the best of the final week of COSMOS!

CLUSTER 2: ENGINEERING DESIGN AND CONTROL OF KINETIC SCULPTURES

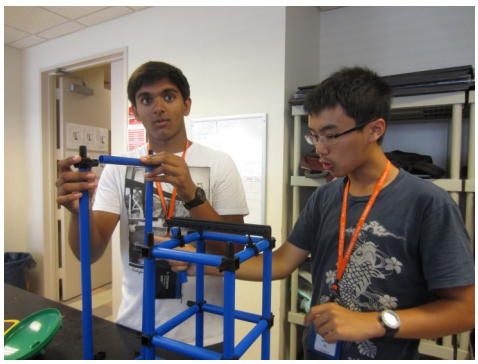
Week 3 has continued the rapid pace for Cluster 2! We started off this week with a lecture on the software Working Model 2D which we originally used for the clock project. We have returned to this software as a means to model our mini-kinetic sculptures. The hope is that this week we will complete our mini-sculpture which will serve as a foundation for our main sculpture due next week (which you all will be able to see on Saturday, August 2nd).

On Tuesday, we had the third Discovery Lecture presented by an actual "Explorer". Dr. Albert Lin was a UCSD alum who is following the trail of Genghis Khan in Mongolia! He is a real "Indiana Jones" who has developed various tools to help study the Mongol Empire! The kids were amazed that engineering drones and sensors could play such a dramatic form of study in a "laboratory" unlike any other! Dr. Lim's lecture has been a high-light of COSMOS for sure.

Not to be out done by Dr. Lim, we also went on our cluster field trip on Tuesday. We went to Solar Turbines in San Diego to see how turbines are manufactured. The factory tour was outstanding as the kids spoke to a wide variety of engineers. The facility doesn't usually grant field trip requests, so this was a special treat as the kids saw the industrial process of creating enormous power producing turbines. (These turbines are used to create large amounts of power on oil rigs or other industrial applications. They are also used in large pumps on oil pipelines.)

On Wednesday, we had the final lecture from Dr. de Calafon on "control systems" with a tour of the graduate labs. Control systems is, loosely, a combination of mechanical, electrical, and computer engineering whereby engineers look at an automated systems and use sensors and actuators to manipulate a process. Think about cruise control in your car…. The car has to sense how fast it is going and then manipulate the motor/brakes in the car to maintain a desired speed. This process continues automatically until the driver stops the process. The lab tour was interesting as we saw how complex systems can be consistently modified to incorporate changes detected by sensors.

On Thursday, we continued hearing about the other clusters' work. We also had the opportunity to tour the Jacob's Building at UCSD to see poster presentations about current research. These posters will serve as a model for our posters for our final presentations! We also had the opportunity to see the "Falling Star" house on top of the building; very vertigo inducing. We ended the day by continuing our work on out kinetic sculptures. See you next week!



CLUSTER 3: LIVING OCEANS AND GLOBAL CLIMATE CHANGE

Week 3 for Cluster 3 has focused on data collection for final projects. Our Science Communications classes have been used to address presentation styles and techniques and to discuss the lectures from the previous sessions.

On Thursday, Cluster 3 visited the Hubbs-SeaWorld Research Institute in Carlsbad and the Birch Aquarium at Scripps. At the Hubbs-SeaWorld, we saw how white sea bass were raised from larvae to enormous yard-long fish, and then released into the wild for game fishing. We saw how they tagged the fish in the cheeks to keep track of them (if you ever go white sea bass fishing, give them your fish heads!). At Birch Aquarium, we were able to learn more about the environment and ocean biosphere while gazing at the beautiful tanks full of fish, corals, sea stars, anemones, and seahorses – just to name a few. Overall, it was a very interesting and educational day. But one disappointment: there wasn't enough time to fully enjoy the aquarium!

- Sara Y.

On Friday, we went down to SIO and heard a lecture about aerosols and the work that's done at the wave flume experiment. Afterwards, we went to tour the wave flume and learned about the work they do, what a typical day was like, and saw all the machinery. It was definitely a unique experience! In the afternoon, we were able to see one of the largest collections of fish and saw some incredible preserved deep sea fish. We also saw a collection of invertebrates, which included two of the largest squid we've ever seen! We ended the day with an interesting lecture about classification, taxonomy, and cladistics.

- Maggie W.

On Monday, our cluster got to go down to Scripps Institution of Oceanography to receive another lecture from Dr. Lai. This lecture was the most extraordinary out of all the previous lecture that he has given. The lecture was given on the pier down at the beach. Cluster 3 students were expecting a normal lecture but couldn't believe their eyes when they saw what Dr. Lai had stored for us. His lecture consisted of us dissecting a 2 day dead 4 foot long mako shark. In the dissecting process we got to see all of the body parts of the animal and obtain information about the life of the shark. Following the dissection we got another lecture in a classroom about evolution. I learned the many evolution theories such as Darwin and Wallace's theory: they both had the same theory "descent with modification".

- Lucerito L.

This Tuesday we got to go to a fantastic Discovery lecture by the National Geographic Explorer Albert Lin, and everyone loved his presentation about his travels and research on Genghis Khan in Mongolia. We also worked on our final projects as well. At Scripps Institution of Oceanography we executed the main part of our final project, measuring thermal effects on arthropod's aerobic capacity. For the project, we heated up the temperature while measuring the respiration rate of one crab as a control group and then ran the other crabs on a treadmill while timing them. At the end we collected our data and headed back to ERC for the Cosmos 10th anniversary dinner.

-Allison M.

The morning of our third Wednesday at COSMOS, Cluster 3 trekked to the Natural Science Building for our lab and lecture with Dr. Pomeroy. Early on the COSMOS board members stopped by to see us in action, then moved on to Clusters 1 and 9. This week in the lab we're focusing on ocean acidification from carbon dioxide and how it's affected by climate change. We constructed and calibrated our own pH probes, measured the pH of ocean model systems and collected data on sea water acidity. The data taken will then be put into Excel as we learn how to compute and organize within the program.

- Ava S.

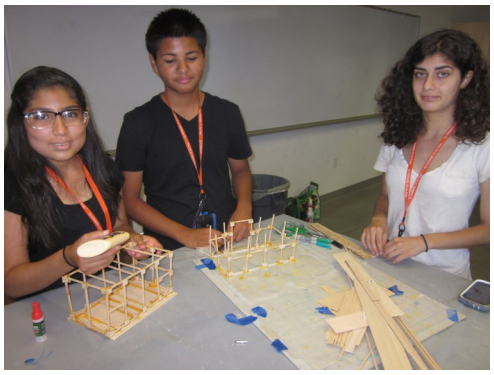
With just over a week to go this summer, we are preparing for GeoEngineering debates on Wednesday, and practicing presentations on Friday. Our Cluster is looking forward to presenting our projects to parents on our final day of our summer adventure into The Living Ocean & Global Climate Change.

CLUSTER 4: WHEN DISASTER STRIKE: EARTHQUAKE ENGINEERING

As we conclude an exciting week three of COSMOS 2014, our eight project groups are moving forward with structural testing as efficiently as possible with the knowledge that their poster development and presentation is just around the corner. They continued to refine the retrofitting on their structures, with the hope that additional testing and analysis will provide data showing that they have successfully mitigated the potentially damaging seismic vibrations. Our cluster students also participated in many other engaging activities during the week,

including Tuesday's COSMOS 10th anniversary celebration barbeque.

Early this week, students received valuable lectures on how certain types of building react to seismic forces. We watched spontaneous videos of recent earthquakes, thanks to social media, showing actual damage happening

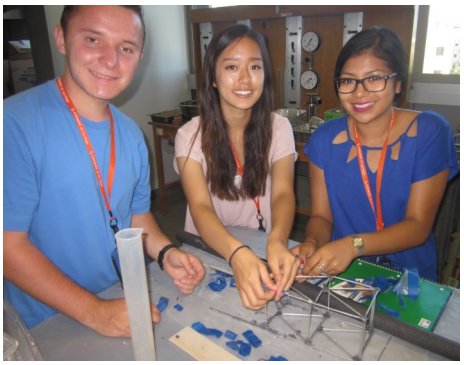


from street level. The students are beginning to find logic in which techniques are most effective in retrofitting existing buildings to make them safer. Those ideas translate into their project design, with great attention given to the available materials in their assigned geographic regions. There is great anticipation when the students test their structures! Some fare very well and others still require further research and design innovation. They will continue testing through next Tuesday before they buckle down to produce their poster and ready their presentation.

We also enjoyed several ventures out of our lab this week.

We began by touring the campus CalTrans SRMD facility. You may enjoy reading more about it at this link: http://structures.ucsd.edu/node/62.

The Seismic Response Modification Devices are used to test structures such as highway bridge columns under earthquake stresses. Later we bussed to the San Diego Emergency Services office, receiving a tour detailing the responsibilities of personnel during fires, earthquakes, and other disasters. The building itself has been fitted with base isolation devices, which the students saw from below ground level. The day concluded with an amazing tour of the Englekirk Center and the UCSD NEES shake table, a full scale earthquake shake table, capable of testing buildings as tall as seven stories. You may enjoy watching their testing videos at this link: http://nees.ucsd.edu/. It was truly special to see and learn about such a world-class facility.



Last weekend, students turned in essays regarding the ethical considerations faced by professional engineers and geophysicists. Our cluster will forward the three best essays to compete with the other COSMOS clusters for awards. It really assisted the students to appreciate the value of decision-making in the workplace. We press on towards the completion of our projects, and producing some terrific posters and professional presentations.

CLUSTER 5: FROM LASERS TO LCDS: LIGHT AT WORK

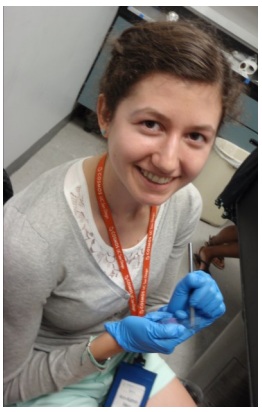
Allan Brown is credited for saying "Education is the movement from darkness to light." This is a great quote to describe what is happening in week 3 for Cluster 5. These were some of the best essays written and we can only hope the final judges recognize their extremely hard work. Topics ranged from Blue Light being used to stimulate nerve cells and biometrics to solar cells and Google Glass. Students put in a lot of time doing research on their topic and finalizing their essays. During the week we were able to visit some additional labs on campus. We saw some great applications of microfluidics and both of our Cluster Assistant's Labs and the work they are doing. As they have been helping us so much, it was exciting to see what they are studying and working on!

Everyone has also finalized their final project choices. Lectures and Lab time have gotten more specific for the students as they work on their projects. Once they have concluded their background research, they will be creating an experiment, collecting data, and then presenting their findings on the final day. Projects range from building solar cells, PDMS lens, holographic images, and using lasers to build a boardless keyboard.

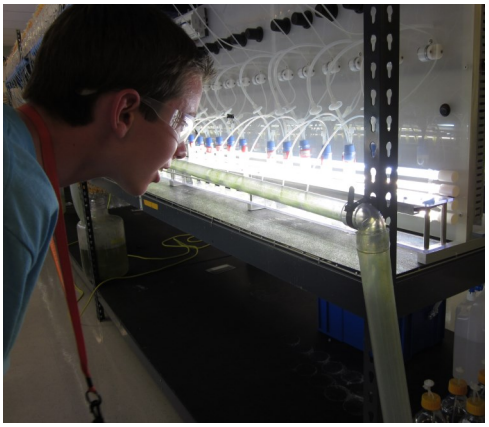
As a group, the cluster has become a very close family. We all enjoy eating with each other and during the evening programs typically stay close to each other. It is amazing how fast these past three weeks have gone, so we made sure to have some fun this week as well.

During Thursday's communication class, we finally went up to see the art piece "Wandering Star," or is commonly called Dorothy's House. It's built on the roof of the engineering buildings and designed in a way to optically stimulate and to create illusions. It was a great, fun trip for us all and a well deserved break from our research.

Keep on Shining everyone and we are going to head on back to work on our projects!



CLUSTER 6: BIODIESEL FROM RENEWABLE SOURCES

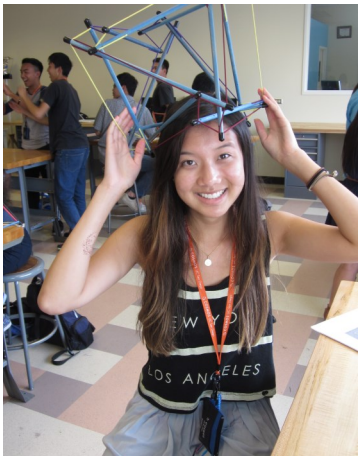


During week three of COSMOS, Cluster 6 continues to work on testing their biofuel for various impurities following the procedures outline by certificate of analysis. So far, all biofuels are passing the tests, which means they could be sold as a diesel fuel. Students also continue to work on their group projects and are quickly approaching the preparation of their final projects. Students must not only produce a visual science fair style display of their findings, but also prepare a speaking and visual presentation to their work to share as well.

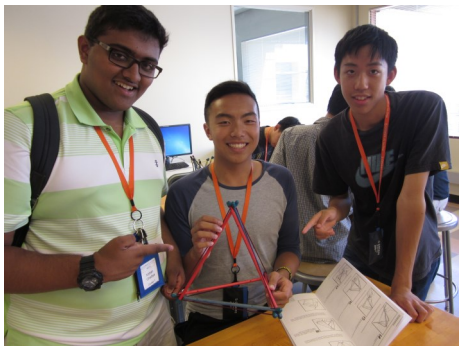
On Friday Cluster 6 was able to spend the day on field trips. First, we went out to UCSD's Biological Field Station which houses various research components for utilization of algae not only for biofuel production, but also water sanitation. We then visited Sapphire Energy, a state of the art research and production facility that manufactures crude oil through algae production. Sapphire Energy houses their Research and Development labs in San Diego, whereas their actual algae production is in New Mexico. It was really impressive to see Sapphire's research lab, but more importantly, student's asked phenomenal questions demonstrating not only their retention of the scientific principles related to biofuel production, but also the potential ethical concerns. Also on that day we had a couple hours left over, so students were able to relax a bit and explore the UCSD's Price Center and Bookstore. I think everyone enjoyed a little bit of diffusion time.

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

The second half of Cluster 7 began with the introduction of tensegrity structures, built entirely with elastic strings and wooden sticks, by Professor Mauricio Olivera and cluster assistant Talesa Bleything. The objective for week 3 was to develop an appreciation for tensegrity structures as models for the mechanical properties of red blood cells (RBCs). A tensegrity structure stabilizes itself mechanically

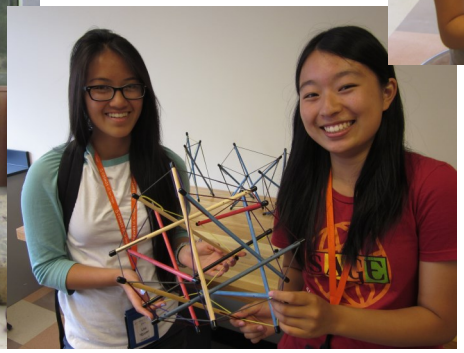


based on the way tensional and compressive forces are distributed. The simplest tensegrity structures, called Snelson prisms, were constructed by students, which led to the creation of some very interesting 3-D shapes (and fashion statements)! This was followed by mechanical



engineering experiments to determine the forces associated with the tensegrity structures. Using Hooke's law ($F = -k \Delta L$), students first experimentally determined the stiffness (k) of various elastic materials (strings, bungee cords, etc) and then analyzed Force (F) versus Load Displacement (ΔL) curves for selected strings. Students then used their knowledge of Hooke's law to determine the pretension characteristics in a 6 string / 3 rod Snelson prism. From these experiments Cluster 7 students are now poised to connect the value of tensegrity structures as models for RBC membrane shape and function.

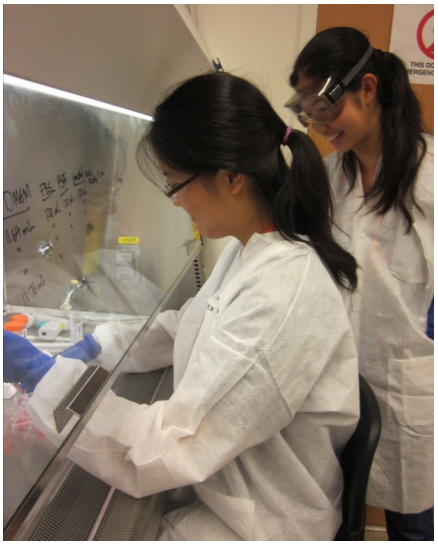
Cluster 7 also had its first field trip this week to the new building of the J. Craig Venter Institute (JCVI), and got a behind-the-scenes look at a dynamic biomedical research laboratory. JCVI was famously involved in sequencing the entire human genome and more recently created the first artificial bacterial chromosome described as "a defining moment in the history of biology and biotechnology." Additional research on sequencing life in the oceans and the use of microorganisms for wastewater purification were also described. Cluster 7 students also attended a presentation by Professor Tom Bewley of the Coordinated Robotics Lab. Dr. Bewley described UCSD-designed robots with capabilities of self balance and step climbing. One robot has even been commercialized as a toy named MIP (available at *Best Buy!*). Other models named Switchblade and IceCube are under development for tracking smoke plumes associated with wildfires and for military reconnaissance, respectively. With only one week to go in COSMOS 2014, students are busy during Science Communication working on aspects of their final projects and refining their much anticipated closing day presentations!

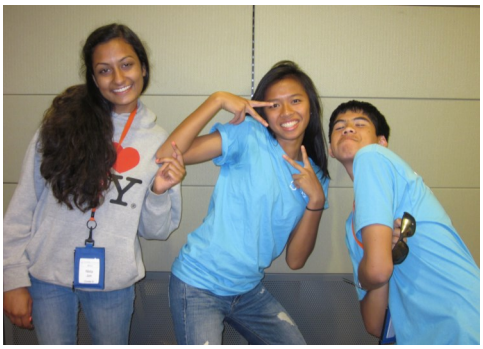


CLUSTER 8: TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Our first cluster field trip to Organogenesis in La Jolla was awesome! There we participated in 5 different stations and toured the facility. We learned about various scaffolding material, how a 3D printer works, and observed the various types of cells found in skin. Many got to take home 3D printed memorabilia! On our tour we learned about the evolution of the company from its humble beginnings as Advanced Tissue Sciences and final acquisition by Shire. Additionally, we learned how fibroblast cells from a male donor in 1990 provided the original cell stock for the fibroblasts that are seeded on the Dermagraft® product that has been manufactured in La Jolla since its approval in 2001! Not a bad morning for the cluster!

A tour of the J.Craig Venter Institute was our second field trip. A beautifully designed facility, it is also the only net zero energy research institute in the world! We heard from 3 faculty members on their cutting edge research and then



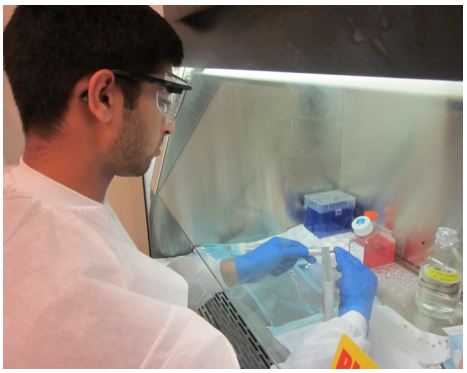


took a tour of the wood/concrete structures. Some of us even got to use the eco-friendly toilets that use reclaimed storm water!

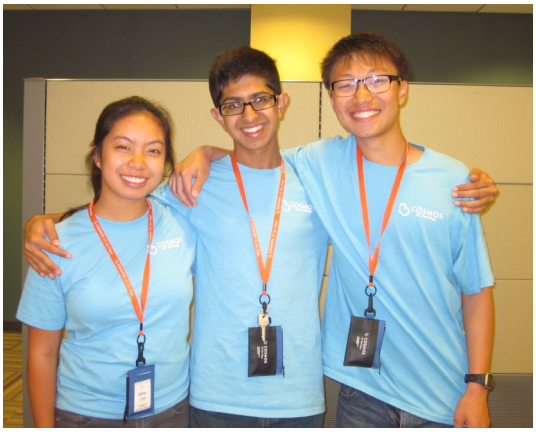
In the laboratory, we were hard at work acquiring more fundamental lab skills. Thawing and seeding cells to a T25 flask and trypsinizing those same cells with Mrs. Schu-

macher were the highlights of Thursday's lab session. Our next steps included making collagen gels with Liz Bird and learning about mechanical testing of cartilage discs with Sankha Ghatak. By the end of the week, we were working on our group projects. Several groups handled cartilage discs, while others made cell media with various growth hormones. All groups worked with Dr. Sah to review their experimental design. There were many questions and some awesome discussions between the students and the professors.

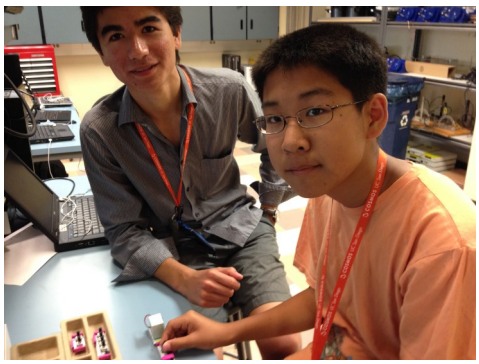
In science communication class, the ethics paper took center stage. Luckily for us, ethical issues in tissue engineering and regenerative medicine were addressed throughout the week. The hard part was narrowing down the choic-



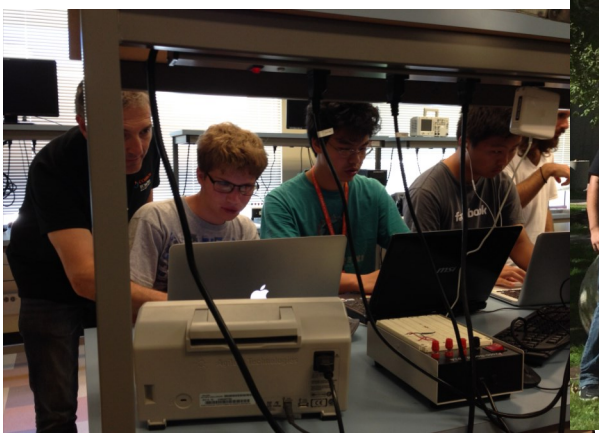
es to one topic for the ethics essay. To reinforce our speaking skills, we spent Thursday morning presenting our paper in visual form using Google Presentation. It was a challenge to use only visual images in our 5 slide presentation. After observing Dr. Albert Lin accomplish this during the Discovery Lecture Series, we were up for the challenge!



CLUSTER 9: MUSIC & TECHNOLOGY



Week 3 of Cluster 9 has allowed students to start to get a grasp of their projects. In order to give the students more contact knowledge and before getting into the projects our professors took our students over the basics of modulation. In electronics and telecommunications, modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal that typically contains information to be transmitted. In music, modulation is most commonly the act or process of changing from one key to another. Students then observed the modulation of a wave through the littleBits' envelope module, which contains knobs that control the attack and decay of a sound. Professor Mauricio de Oliveira and Professor Shlomo Dubnov wanted to find a way to bridge content and passion for music and technology. Our students have been deciding between several project genres. They can compose or play apiece using their own instruments or instruments constructed using Little Bits or PD. Students will incorporate some of the techniques discussed in class using Little Bits, PD and Ableton in the context of a live performance. Students can also design and construct a device for a musical installation, where they will incorporate the Raspberry Pi or Arduino boards. Finally, they may choose to develop musical technology to construct a new instrument or process audio signals. Whatever they choose, we are excited about the outcomes and can't wait to see how each group develops their idea!




BIG PARTY

From the dance floor to the beach and everywhere in between

there was COSMOS Celebrating 10 years at UCSD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