COSMOS cluster 9 got off to a rousing start with dazzling displays of technology and artistry. In the first three days, cluster 9 students were exposed to a variety of musical and technological tools. Dr. Oliveira gave an overview of the nature of soundwaves and introduced students to a sound recording and analysis software package called Audacity. Audacity generates sounds or takes sound inputs and allows the user to analyze these. Audacity also serves as a simple mixing system with which musicians can overlay multiple recording tracks. An even more challenging software package, called Pure Data that was developed at UCSD, was taught to the cluster on Wednesday by PhD candidate and Teaching Assistant Kevin Haywood. Pure Data is a drag and drop sound synthesis system that allows students to create increasing complex sound synthesizing and processing combinations. Newly matriculated PhD in Music and Teaching Assistant Colin Zyskowski gave an overview of Arduinos, Raspberry Pi, and other microcontrollers that cluster 9 students will use in creating their capstone projects. During the Tuesday session, Teacher Fellow Jeff Mellinger led students through a few Audacity projects. During the Wednesday session students were introduced to UCSD’s state-of-the art recording facility. The session was highlighted by performances from Hannah H., A.J. S., Grady F., Sam N., Isaiah C., Sarina S., and Erin T. In addition, a number of students experimented with instruments from Dr. Oliveira’s homeland, Brazil.
The Cluster Nine’s second week ramped up the technology that the students will be using for their projects. On Friday, students learned to program and control electronics using the Arduino Teensy microcontroller, a slimmed down version of the widely used Arduino series. Monday students were introduced to the Python programming language. Python has gained popularity due to its ease to learn and its versatility of use. On Tuesday, Grad Assistant Kevin Haywood began brainstorming different project ideas with the students. Also, on this day students downloaded and executed several musical applications written in Python. On Wednesday students were treated to the audio spatial lab wherein asymmetrical walls and 28 speakers allow different sound effects to be generated. The group also did several additional projects using Arduinos. The weekend was also filled with activities. On Saturday, students visited the San Diego Zoo Safari Park, an open environment wildlife habitat wherein animals of different species cohabitate in a recreation of the African Serengeti Plain. On Sunday, the cluster visited Balboa Park, an area near downtown San Diego originally built for the 1915 Pan Pacific Exhibition that has preserved the architecture of that era. The trip featured a visit to the Reuben H. Fleet Science Center. Next week, students will form groups and begin their capstone Music and Technology projects.
This week’s lectures and essays give way to brainstorming, creativity, and collaboration as the Cluster 9 team members formed groups of three and began work on their capstone projects. Essays explored an ethical issue related to sound, related technology, or the music industry. The essays submitted by the Cluster 9 students were of high quality. A number of essays were forwarded to the COSMOS administrators to be considered for COSMOS awards that will be presented at the closing ceremony. Teacher Fellow, Jeff Mellinger, selected the three for intramural awards. The essays selected for further judgement were those by Hannah H., Allison Z., and Tasmin K.

Among the most popular technologies used by Cluster 9 students are Pure Data, Arduinos, and the Python computer language. Pure Data is a visual programming language that provides users with the capability to create a wide array of musical sounds and general sound effects. As one of the first systems presented to the cluster, several of the groups are using this program extensively in their projects. Of the microcontroller systems available, the most readily comprehensible is the Arduino. While an Arduino does not have digital signal processing capability useful in producing audio sound, it has many uses as a general-purpose control of automated functions. The functionality of Arduinos is enhanced when it is connected to external circuitry. Python, though a relatively new computer language, is rapidly gaining popularity for its ease of use.

The week included a visit to the Museum of Making Music sponsored by the National Association of Music Merchants. The cluster was treated to a tour of the facility which included a number of antique instruments as well as displays of various eras of American music dating to the 19th century. The visit was capped by an address from NAMM President Joe Lamond.

Students will be devoting some extra hours over the next week to complete their projects for the August 4 presentation.
UCSD COSMOS is in the home stretch and students in cluster 9 have been immersed in their capstone projects for the past ten days. Professors Oliveira and Dubnov along with grad students Colin and Kevin have been providing technical expertise with a 5-to-1 student to instructor ratio. Much of the learning, however, has been autodidactic with students scouring the internet for resources and information to aid them in their work. Below are the student project descriptions in their own words.

We sought to invent a modified and mechanized clarinet. We programmed the potentiometer to enable users to adjust the instrument’s pitch to play any musical octave. In all, Project Box is a versatile and portable wind-instrument that can be conveniently tuned to play any musical note. (Jonah, Tasmin, Cartee)

Rhythmech is a drumstick that can play the basic sounds of a drum set by waving the mechanism around. The accelerometer controls the volume of the sound and pressing different combinations of buttons will yield different sounds. (Allison, Vivi-anne, Shreya)

The purpose of this project is to accurately reflect the mood evoked by an image or painting. It utilizes python programming algorithm and color-emotion associations paired with music theory concepts to achieve this. (Do, Grady, AJ)

This project is inspired by the idea of having a ukulele that runs entirely on lasers and sensors. This system will allow for a combination of notes played by different simultaneous fingerings to form chords, like an actual ukulele. (Stephen, Nathan, Kevin)

We are creating an audio-visual product so that the music experience can be felt through more than one sense. With a running pattern through the LED, the music seems to flow through your body like through the strip. (Hannah, Harim, Sarina)

AiM is a tech project based with the objective to create a hands-on music experience designed for cardio workouts. In order to encourage the exercise of the whole body in a workout, the system plays different portions of a song. AiM will become a source of motivation, bringing a hands-on experience to any workout. (Sam, Isaiah, Bernice)

HarmoME is a vocoder that modifies the pitch of voice input in real time, creating effects that can transform a voice or harmonize with it. HarmoMe transposes pitches and applies effects, such as tremolo and ring modulation. (Jane, Allison, Erin)