Week 1 of Cluster 9 really started with a bang! Professor Mauricio de Oliveria and Professor Shlomo Dubnov brought a lot of energy and passion for music and technology. We began by seeing a demo on littleBits, which makes an open source library of electronic modules that snap together with tiny magnets for prototyping, learning, and fun. We were introduced to four different modules included in the Synth Kit: power supply, oscillator, speaker, and keyboard, then got a demo from Dr. Shlomo of the IPython Notebook, which imports various audio files and shows the visual differences in sound waves by plotting on a graph. IPython is a web-based interactive computational environment combining code execution, text, mathematics, plots and rich media into a single document. Professor Shlomo continued by discussing “What is Sound?” Is it noise, silence, an art form, enjoyable sounds, a form of expression, a form of communication, or organized sound? Is it a combination of multiple things? A bike guitar instrument used a strobe light to make standing waves on a guitar string more apparent to the human eyes. A strobe light at the same frequency of the string vibration can make the string appear to be stationary, rather than moving. Continuing with wave visualization, students had a chance to see the difference between a longitudinal wave and a transverse wave. Movement of waves through a metal spring was displayed by hitting the spring vertically, creating a transverse wave to the other end, and then the wave was inverted and returned.

Then a part of the spring was compressed to send a longitudinal wave through the spring. When one end was left unfixed, the wave returned without being inverted.

Looking ahead, we are so excited to be going to the Digital Media Arts Gym in North Park next Wednesday July 16th!
We are singing along in Cluster 9! Week 2 was highlighted by our first field trip to the Digital Media Gym and Iacon. Students were able to explore how projects could live on past their time at COSMOS and learn from those who are working in the music and technology field. Professor Shlomo and Professor Mauricio have pushed students thinking with our study of circuits, Audacity and harmonics. Students continued their work with littleBits by connecting oscillators to the oscilloscope via breadboard and wires. This allowed them to see a sawtooth and square waves on the display. Afterwards, students used the frequency on the oscilloscope to tune the littleBits oscillator to a specific pitch. Students learned how to utilize the multimeter in order to measure voltage from a power source and resistance. Students then created their first circuits consisting of resistors, capacitors, a button, and a light bulb, while also connecting the littleBit’s oscillator to a potentiometer through a breadboard. Afterward, Joe began a visual demonstration where he introduced the Raspberry Pi, a credit card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. By connecting it to the workstation computer via Wi-Fi, he was able to control the transducer’s vibrations. After learning how to remove vocals in a song, the class began an impromptu karaoke session, complete with solos, duets, group performances, and an awesome rendition of “We’re All in This Together” from High School Musical. Your students were amazing! Looking ahead our students are going to be starting their projects soon and we are excited to see all the amazing work that our students will do.
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!
Week 4 of Cluster 9 has been less about content and more focused on pushing students to work on their projects. Our professors introduced the class to sampling and aliasing in order to give the students more content knowledge and before finishing the projects. The first step of getting a physical sound into the computer is translating airwaves into electrical signals. In order to use a computer to synthesize or edit sound, we need to digitize sounds, or in other words to represent continuous waveforms as a series of numbers. This is called sampling and it has specific rule to it - for instance, how often or at what rate should we sample the signal? And how many bits are needed to represent effectively the sound? The first step in creating a digital audio signal is to convert or capture the numerical representation from a continuous signal, such as an electric signal that comes from a microphone. We call this continuous signal analog, to distinguish it from numeric or digital. So the first step in digital audio system is a converter commonly called A/D or Analog to Digital converter. We have seen adc- and dac- in Pd already. The simplest way to think about it is so called ’sample-and-hold’ method. The sample-and-hold circuit captures, or samples, the instantaneous voltage of an analog audio signal and holds its value until the A/D converts it into a binary number. Professor Mauricio de Oliveira and Professor Shlomo Dubnov wanted to let groups pursue their passion for each project so groups were arranged by interest and idea. We have groups composing their own song, building instruments, creating vocals for their own song, and developing music generators. We are excited about the projects and can’t wait to see each group present their idea!