PI TAU SIGMA ANNUAL CHAPTER REPORT
2017-2018
Cooper Union Pi Phi

A. Initiations

For the 2017-2018 academic year, Cooper Union Pi Phi held two initiation ceremonies for Pi Tau Sigma, one in October and one in April. The Fall Initiation was held on October 26, 2017 and seven members were inducted, including 2 seniors and 5 juniors. The Spring Initiation was held on April 12, 2018 and one junior was inducted. Both initiations were invitation-based and all students interested in joining Pi Tau Sigma were asked to submit a statement of intent explaining their qualifications and why they would like to be admitted to Pi Tau Sigma. The students who were inducted met the GPA requirement of 3.5/4.0 and ranked in the top 33% of their class. The initiation ceremony was held in a dimly lit room and the president and vice president read the standard oaths. Currently enrolled Cooper Union Pi Phi members, including members who have moved on to Cooper Union's Master's program, attended the ceremony. The ceremony concluded with a meal of pizza.

B. Chapter Activities

i. STEM Days

The flagship program for the Pi Phi Chapter is the STEM Days program. The objective of this program is to inspire students from grades 4 to 12 to become engineers. Particularly aimed at under-represented students in engineering, the program draws over 375 students to Cooper Union every year. This year, we had six schools attend, with some schools attending more than once. Table 1 provides insight into the schools that attended.

Table 1: List of all schools that attended STEM Days

School	Grade Level	Number of Students	Date(s) Attended
NEST +M	5th	115	03/2/18 + 03/9/18
Lasalle Academy	11th + 12th	150	04/27/18 + 04/28/18
Long Island School for the Gifted	11th + 12th	65	10/27/2017
Chapin School	12th	8	11/17/2017
BEAM Math Group	9th + 10th	37	2/23/2018
Individual	10th	4	4/27/2018

Each STEM Day was tailored to the school attending based on a survey sent to the chaperones about the students' knowledge/interest in various subjects in STEM all all of the activities and projects the students undertook immersed them completely into Cooper Union. By using the lab spaces, technical staff, and tools available to current college students at Cooper Union, the students who attended STEM Days were carefully guided through tasks that sparked their creativity and helped them develop the problem solving

skills necessary in STEM. Some of the activities that the students participated in included:

- DC motor lab- students were taught to build a DC motor with household supplies
- Vibrations Demo- students were taken to the Cooper Union Anechoic chamber and studied the difference in sound when balloons popped.
- Instron Demo- students were asked to give their best estimate of how much force it takes to break a steel rod; the rod was then crushed using an Instron to determine the winner

Figure 1: A student watches the intron lab's results in awe.

- Flashback Lab- a vertical flame tube was set up inside a fume hood as shown in Figure 1. The flame tube was connected via a hose to the building air and to a bottle of propane. Students used a lighter to light a flame at the top of the flame tube and used a stopwatch to measure how long it took for the flame to travel down the tube. Afterwards, students adjusted the flow of air and gas repeated the experiment. Through the experiment, students learned about the relationship between air, gas, and combustion.

Figure 2: A student from Lasalle Academy conducting the Flame Lab.

- Acetone Engine Demo- students saw the inner workings of a clear acrylic engine and were taught the four stages in a combustion cycle. The purpose was to introduce students to the world of combustion and automotive engineering.
- What is engineering? A miscellaneous activity in which the instructor taught students about a wide array of topics from “Why planes why?” to “Why is Cooper Union shaped so funny?” to any STEM course from college

Most important, the STEM Days were spearheaded by PTS members, who had to volunteer at least 3 hours a semester to the program, though few went above and beyond and contributed over 25 hours during the year. Sometimes, PTS collaborated with the Society of Women Engineers, American Society of Mechanical Engineers, or the Formula SAE team to get a more diverse team to teach students.

Figure 3: Professor Delagrammatikas and a Lasalle Academy student use the acetone engine.

Figure 4: Professor Baglione teaches students from Chapin school how to use instruments in the anechoic chamber.

ii. STEM Saturdays

STEM Saturdays is a 10 week long program in which students are given a general open ended question and asked to bring solutions to the table. Each Saturday starting at the end of January until the end of April, 16 high school students come to Cooper Union to learn about various aspects of engineering and STEM and participate in related activities. The teachers were either Pi Tau Sigma members or other engineering students from Cooper Union. Pi Tau Sigma members were responsible for designing the 10-week curriculum, teaching the classes, and finding additional teachers. The curriculum and activities included lessons on coding, microcontrollers (Arduinos), SolidWorks, and 3D printing. The students learned coding by programming Arduinos and working through the educational workbook/project book that came with the microcontrollers. They learned about CAD and 3D printing by designing, printing, and building their own flashlight operated light sabers. Last, the students were tasked with developing some invention using virtual reality. At the end of the 10 weeks, judges, typically junior or senior engineers, help improve, critique, and prototype the product the students came up with. During one 5 hour event, six PTS members provided their insight on the student solutions and then stayed after to share any advice on getting into college. Figure 4 shows an image from that event. Many of the students wanted to come back again next year.

Figure 5: Students present their final projects in STEM Saturdays and PTS judges evaluate them.

iii. Fundamentals of Engineering Review Questions

The Pi Phi chapter also ran a Fundamentals of Engineering Exam Review Questions of the Week program. The program consisted of sending out review questions to students who expressed interested in studying for the FE exam. Each week, two PTS members selected approximately eight review questions from various review books and emailed them to participants. The participants were asked to submit their answers and the PTS coordinators kept track of the number of correct answers each student submitted. As an incentive, the PTS coordinators offered a prize to the student who submitted the highest number of correct answers. The following week, the PTS coordinators sent out the solutions to the previous week's questions in addition to the new questions for the week. At the end of the semester, the participant with the most correct answers received a $20 Amazon gift card.

Next, Pi Phi helped Cooper Union's mechanical engineering faculty gather feedback from students about the current ME curriculum. The president, Nikhil Iyengar, and VP, Hou Chong Chan, even sat in on faculty meetings to determine the necessary procedures for curriculum changes, share input on departmental issues, and serve as liaisons for the entire ME student body. After that, Cooper Union Pi Phi members met with Professor Delagrammatikas to share feedback and provide insight into programs that the Cooper Union can try to develop. In particular, this year, PTS spearheaded, along with Joint Student Council to bring concentrations/minors into the engineering majors. Though this is just the beginning of a long process, the initial seeds have been placed and the ideas have been planted for future students to take hold of.

Aside from outreach, Cooper Pi Phi participated in other events such as the Pi Tau Sigma National Convention at the University of Miami in Miami, Florida. This year, Cooper Pi Phi sent four students to the National Convention who enjoyed their time meeting with students from other colleges.

iv. Meetings

On May 7th, 2016, Pi Tau Sigma members met once more for pizza and garlic knots to celebrate the end of the semester (before finals). Elections also took place at the meetings. PTS members who were juniors nominated and voted for next year's board members. The current board members used the time to answer questions about the roles and expected responsibilities. The meeting was a great way for PTS members to destress, get some free food, and give the chance for juniors to ask questions about what to expect during their senior year.