PI TAU SIGMA ANNUAL CHAPTER REPORT
2018-2019
Cooper Union Pi Phi

A. Initiations

For the 2018-2019 academic year, Cooper Union Pi Phi held two initiation ceremonies for Pi Tau Sigma, one in the second week of October and one in the last week of February. The Fall Initiation was held on October 9, 2018 and five members were inducted, including 4 junior (third year) mechanical engineering students and one honorary inductee. The Spring Initiation was held on February 21, 2019 and one junior was inducted. Both initiations were invitation-only and all students interested in joining the honor society were asked to submit a statement of intent explaining their qualifications and why they would like to be admitted to Pi Tau Sigma, along with their resume/CV. The students who were inducted met the GPA requirement of 3.5/4.0 and ranked in the top one-third 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.

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 300 students to Cooper Union every year on average. **However, this year, the Pi Phi chapter is proud to have hosted 482 students for the STEM days program during the 2018-2019 academic year, beating our goals by a huge margin.** Furthermore, an important update that took place was to issue liability waiver forms to all individuals who attend STEM days, and this was coordinated with the assistant director of STEM affairs at Cooper Union, Dr. Elizabeth Waters. 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

Date	HS or MS	**School**	**Number of Students**
9/21/18	HS	La Salle Academy	100
10/10/18	MS and HS	Quad Prep	5
11/2/18	HS	Aviation HS	20
11/9/18	MS	Thompson MS	6
11/30/18	MS	The Blue School	22
12/7/18	HS	Quad Prep	6
1/18/19	MS	Chapin	22
1/22/19	HS	Truman	4
2/8/19	MS	BSI	30
2/22/19	HS	Intrepid	13
3/1/19	MS	BSI	30
3/5/19	HS	Quad Prep	7
3/8/19	MS	BSI	30
3/12/19	MS	BSI	30
3/13/19	MS	BSI	30
3/22/19	HS	Brooklyn Tech BSE chapter	4
3/29/19	HS	La Salle	14
4/5/19	HS	Bronx Center for Science and Math	27
4/8/19	HS	Frederick Douglas (up to 20 students)	22
5/3/19	MS	George Jackson Academy	20
6/5/19	MS	IS 584	40
TOTAL			**482**

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
- Flashback Lab- 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 1: Students (seniors) observing electromagnetic effects using coiled wires

- Building and testing windmills- students observe the power that can be harnessed from renewable sources of energy such as wind, and how to convert this into mechanically useful energy
- What is engineering? A miscellaneous activity in which the instructor taught students about a wide array of topics from “Why planes fly?” to “Why is Cooper Union structurally stable?” to any STEM course from colleges

Figure 2: Students explore the nature of light waves, with Prof. Baglione

Figure 3: Building windmills, using fans to simulate the wind flow

Figure 4: Demonstrating laser cutting and making cool shapes (monkeys) using Acrylic

Most important, the STEM Days were spearheaded by PTS members, who had to volunteer at least 4 hours a semester to the program, though few went above and beyond and contributed over 20 hours during the year. Sometimes, Pi Tau Sigma collaborated with the Society of Women Engineers (SWE), American Society of Mechanical Engineers (ASME) and the Formula SAE (SAE) team to get a more diverse group of students to inspire the next generation of budding engineers.

ii. 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, one PTS member selected approximately five 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 VP, Skylar Eiskowitz, 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.

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

C. Other

i. PTS Convention

The convention held at Colorado State University was defined by great keynote speakers, chapter initiations, job fairs and an Autodesk® design competition. The campus was beautiful, and it was quite magnificent to see the engineering facilities and resources at Colorado State University, where we took a campus wide tour amid the freezing sub-30's weather. Throughout the convention, we had several high-profile speakers including the likes of Dr. James Turner, the associate director of engineering at NASA, as well as the President of the national Pi Tau Sigma board. Dr. Turner's talk on the difficulties in developing spacecraft capable of manned travel to Mars was incredibly stimulating and drew upon various concepts learned in classes such as heat transfer and the fundamentals of aerodynamics.

It was very helpful to get an overview of the research being conducted at NASA, as well as gaining insight into the vast sea of opportunities within the aerospace and fluid dynamics sectors. Furthermore, the keynote address was delivered by Dr. Bryan Willson, who directs the energy institute at Colorado State, and who talked about various research projects being undertaken by the institute including oil and gas technology, clean energy solutions, and high-risk energy research.

The convention featured an Autodesk® design competition in small teams of no more than five people, each presented with a design problem related to space travel. The attendees gained skills in using Autodesk Fusion 360, and attended presentations where teams presented their solutions toward a potential habitable environment on Mars. Furthermore, a career fair and resume review was held at the event. Attendees spoke with representatives from Wolfe Robotics and University of Colorado-Boulder for positions in systems engineering and graduate programs respectively, and had their resume reviewed by a representative from Raytheon.

There was also a panel discussion featuring industry professionals including Dr. Matthew Todd, Dr. James Turner, Dr. Wade Troxell and Dr. Mitchell Stansloski- the panel fielded several questions from students on topics ranging from engineering ethics to graduate school, and was particularly helpful for graduating seniors. The chapter is glad to have attended this convention as it helped get a better understanding of the opportunities in the mechanical engineering field, and to indulge in the brilliance of the speakers and attendees at this conference. Furthermore, as the leadership of the chapter is interested in learning more about how Pi Tau Sigma operates, the convention helped gain a better understanding of how to transition leadership smoothly between the junior and senior members within the organization. The convention also helped teach networking skills with some of the professionals already working in the field, as well as many of the best mechanical engineering students from across the country. We also managed to get some social time in Colorado along with some friends we made, while learning more about their college culture and curriculum.

ii. Meetings

On May 7th, 2019, Pi Tau Sigma members met once more for pizza 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.