PI TAU SIGMA ANNUAL CHAPTER REPORT
2019-2020
Stevens Phi Omicron

A. Initiations

Stevens Institute of Technology follows a broad based engineering curriculum with a common core for the first three semesters and students are not required to declare their engineering major before their fourth semester. In addition, nearly a quarter of all engineering students complete 3 to 4 semesters before declaring their major.

In order to ensure that all initiates graduate as Mechanical Engineering majors, the chapter has established a policy to initiate only juniors (5th and 6th semesters) and seniors (in their 7th semester). Students who have excellent academic record (top sixth or 16.7% and who have a GPA of 3.7 or "High Honors") and who are in good standing are reviewed and invited to become members of the Stevens Phi Omicron Chapter.

During AY 2019-20, Stevens conducted one initiation ceremony during the fall on December 3, 2019 and initiated 22 members. The spring initiation ceremony was deferred due to COVID-19 pandemic related closure of the Stevens campus effective March 10, 2020 (and transitioning to online mode for the remainder of the spring term). The following is a listing of the initiates.

Fall 2019 Initiates:

Bender, Thomas Arthur	Bertussi, Sarah Elisabeth
Cimicata, Christopher John	Cottell, Siobhan Marie
DiResto, Kelly Ann	Frissora, Michael Badt
Ishikawa, Joi	Kaczynski, Joseph Stanley
Ku, Jonathan Peter	Lew, Olivia
Liu, Peter W.	Ludemann, Ryan William
Mauser, Ian Vincent	Oleksy, Ryan Augustus
Pepa, Simon Jason	Petti, Derek M.
Quinn, William Kevin	Rosado, Lorie Marie Allison Bahe
Segall, Ben Almog	Senkewicz, Jacob Edward
Shine, Brendan	Thomson, Benjamin

The chapter pays the dues for all the students who are initiated. In addition, the chapter also provides stoles at no cost to all graduating seniors, who are members of the chapter. The Mechanical Engineering Department provides funds for all chapter activities and socials.

B. Chapter Activities

Goals for 2019-20

- Initiate Members from the Senior and Junior Class during 2019-20 academic year
- Participation in the Annual Pi Tau Sigma conference, out-reach activities, and co-sponsorship of student-faculty activities.

- Participation in the 2019-20 Innovation Expo held online on May 1, 2020 (the event hosted capstone design projects and an exposition of ongoing research and innovation).
- Promotion of events associated with advancing Mechanical Engineering and involvement in the Stevens Innovation and Entrepreneurship activities.
- Continue the development of STEM club activities to encourage talented students, especially those from underrepresented communities to pursue engineering career
- Mentoring of freshmen and sophomores interested in pursuing mechanical engineering
- Sponsorship of engineering seminars, co-sponsorship and participation in professional society student chapter activities
- Participation in community and outreach activities.

The goals for AY 2019-20 were met to the extent feasible under the extraordinary circumstances associated with COVID-19 pandemic. The following is a brief summary of chapter activities.

Activities

The Stevens Phi Omicron chapter participated in the fall and spring Mechanical Engineering Advising fairs for students in their sophomore and junior years.

The chapter again successfully organized and implemented an academic tutoring program for the mechanical engineering undergraduate students during the fall term. Due to the COVID-19 pandemic-related closure and transition to online mode of instruction, the spring reviews were held online (through *Zoom*). In this context, the sessions were also recorded for students to review offline. The tutoring covered all core-engineering topics for the sophomore and junior class with special reviews during the final exam period.

The chapter assisted the Mechanical Engineering Department with the open house for accepted students, which was hosted online by Stevens using a special portal. In addition to volunteering their time for the various online demos and for online interactions with the students and their parents, several videos of senior capstone design projects were on display.

The special outreach program involving the organization of a STEM Club, which was started at the Lady Liberty Academy Charter School in Newark during spring 2014 and expanded during 2015, was continued with several events to host students in 6th through 8th grade.

Stevens celebrated the Research & Innovation accomplishments and the successful completion of the Engineering Capstone Design of its graduating class on Friday, May 1, 2020 with an online version of the Innovation Expo — an all-day event showcasing the creativity and problem-solving capabilities of student teams that reflect the university's academic approach to science, engineering, business and humanities. Various capstone design projects were on display and they included the following from the graduating class of Stevens Phi Omicron chapter.

- Active Guidewire Stroke Therapy (Qiaomu Hu)
- Autonomous 3-D Scanning Drone (Haren M. Ramani)
- Autonomous Multi-Robot Security System – *Eagle Eye* (Michael V. Alecci, Gina Dello Russo, Daniel W. Kaba, Vincent E. Russo, Timothy Shine)
- Autonomous Subway Inspection Vehicle (Noah B. Bolzoni)
- Automated Spherical Ice Maker (Jacob R. Schozer)
- Home Energy Management System – *Bia* (Allyson P. Clark)

- Industrial Co-Generation System – *Exergizers* (Michael B. Frissora)
- Instrumented Combat Boot – *Smart Stompers* (Chih-Wei Huang)
- Magnetically Coupled Ball Drive System (Anthony Bianco, Sophie Cho, Matthew Rice)
- Mini-Baja Car for SAE Competition (Joseph S. Kaczynski)
- Moon to Mars NASA RASCAL Competition (Pablo N. del Puerto)
- NASA Robotic Mining Challenge for Moon and Mars (Victor Bech-Hansen, Caralyn M. Cyr, Matthew A. Foerst, Carolyn M. Pontoriero)
- Portable Fluid Motion Energy Converter – *Hydricity* (John R. Clodfelter)
- Skin Health Evaluation Test Kit Design – *Dermatest* (Luke M. Langner, Pujan Shah, Shelby M. Stewart)
- Smart Chicken Coop (Emily R. Cooke, William K. Quinn)
- Smart Internet-of-Thing Device – *SymbIoT* (Melissa L. Barnes, Katherine R. Van Orden)
- Stevens Shock Tunnel (Samantha Schattin)
- Sustainable Offshore Farming Technology – *Kelp Krew* (Nazrin Akther)
- Tunnel Boring Robot (Rebecca L. Spirer)
- Ultrasound Identification System for Organ Deformation (Jake S. Catalano, Mark A. G. Demetillo, Jack W. Moss, Richard P. Rossbach)
- Wearable Thermoelectric Medical Monitoring System – *TherMoD* (Karina Hunstein)

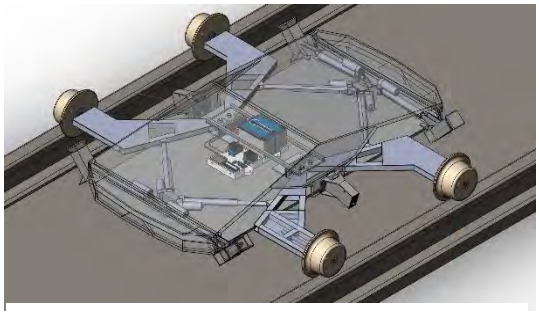
The *Bia* Smart Home Energy Management System is an all-inclusive solution to help consumers monitor, manage and reduce their electricity usage. The system consists of three major components: a machine learning algorithm based on recurrent neural network, an IoT smart plug, and a user-friendly smartphone app. Together, these components provides users with real-time insights into their energy consumption habits and recommendations for how to optimally reduce their electricity bills. A widespread implementation of this system will revolutionize the control consumers have over their energy, significantly reducing the cumulative global carbon footprint. The design concept and its validation lead to the team winning the annual *Ansary Entrepreneurship award.*

The Magnetically Coupled Ball Drive (MCBD) project aims to improve upon existing designs of ball drives to provide holonomic (omnidirectional) motion for electric wheel chairs in order to afford their users with improved quality of life. Typical wheel drives provide only forward and backward mobility, requiring a turning radius to reorient and pursue motion in any other direction. Ball drives provide the capability of moving in any direction at any time, no reorientation or turning radius required. This project specifically tackles some of the challenges that previous iterations encountered, primarily the disadvantages of using an external support structure to corral the spherical wheels and prevent decoupling.

Magnetically Coupled Ball Drive design for improving the mobility of conventional Electric Wheel Chairs

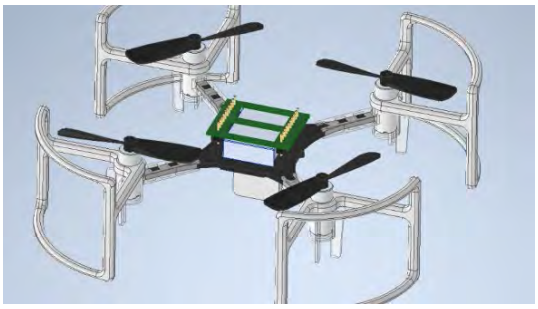
The Autonomous Subway Inspection Vehicle (ASIV) is a small-scale autonomous robot that looks to lower the expensive system of vehicles and large inspection crews previously needed for safe

inspection of the subway systems. The Stevens ASIV autonomously measures critical track geometry, with an emphasis on track gauge. The ASIV is designed to live on the tracks, recharging when necessary and retracting using our proprietary design to fold in its wheels, detach off the rails and lower itself in between the tracks. After the train passes, the ASIV extends itself back onto the track and continues its inspection of the subway system. The Stevens ASIV benchmarked its performance with the available data from the New York City (NYC) subway system, which handles 5.7 million riders per day; but still plagued by track-related issues in its 670 miles of track. The NYC subway system is currently inspected using expensive train-car mounted units, which provide full coverage only six times each year.



Autonomous Subway Inspection System

An interdisciplinary team of engineering students collaborated to design and build an autonomous 3-D scanning drone that is capable of accurately and effectively scanning objects. The novel feature of the current design is its fully-autonomous scanning feature, which is made feasible through a custom-built lightweight cage equipped with a positioning system, CPU and flightcontrol.



Autonomous 3D Scanning Drone

Members of the Stevens Phi Omicron chapter again entered in the NASA Rock-Sat-C program that focuses on design, instrumentation, fabrication, testing and launch of payloads (modeled after small sattelites) since 2011 through the sponsorship and grants from the New Jersey Space Grant Consortium — a NASA supported program to stimulate students to choose careers in aerospace science and engineering, especially students who are female or from under-represented groups. The Rock-Sat-C program mentors ten to twelve collegiate teams from all over the country through a full engineering space flight design process life cycle. The 2019-20 year's program has been cancelled due to the COVID-19 pandemic and will be rescheduled for 2020-21.

Similarly, the COVID-19 pandemic related cancellations were associated with the other NASA competitions and the SAE competitions causing the teams to benchmark the performance of their designs with available data (from completion database) and to submit technical reports in lieu of participation in the competition.

The chapter members volunteered at all the student visit days for the Mechanical Engineering department and participated in various Mechanical Engineering panels and gave feedback to the External Advisory Board.

The Stevens Alpha chapter of Tau Beta Pi and the Stevens Phi Omicron chapter of Pi Tau Sigma reached out to the chapter presidents of all engineering honor societies to co-host a few events, including a Finance After Graduation Workshop, and a "open house" for younger students to help them decide their ultimate discipline paths.

The Stevens Phi Omicron chapter continued its development of an Alumni Networking Database to track where alumni move to, work, or have previously worked, along with their contact information. This will be a living document that will continue for years to come.

Mr. Luke M. Langner (chapter president) represented Stevens at the annual Pi Tau Sigma National conference at the Rochester Institute of Technology (Rochester, January 31-February 2, 2020).

In addition, as part of social outreach, several members of the chapter, especially those associated with campus fraternities and sororities, volunteered for various community activities during the 2019-2020 holiday period.

A number of current Stevens Pi Tau Sigma chapter members are also elected members of the Alpha chapter of the Tau Beta Pi, the engineering honor society.

The chapter's web page (www.stevens.edu/pts) has been updated.

Graduates

Akther, Nazrin	Alecci, Michael V.
Barnes, Melissa Leigh	Bech-Hansen, Victor
Bianco, Anthony D.	Bolzoni, Noah Benjamin
Catalano, Jake Stephen	Cho, Sophie
Clark, Allyson Patricia	Clodfelter, John Robert
Cooke, Emily Rose	Cyr, Caralyn M.
del Puerto, Pablo Nahuel Daniel	Dello Russo, Gina E.
Demetillo, Mark Anthony Gomez	Foerst, Matthew A.
Frissora, Michael Badt	Hu, Qiaomu
Huang, Chih-Wei	Hunstein, Karina M.
Kaba, Daniel William	Kaczynski, Joseph Stanley
Langner, Luke Mediterraneo	Moss, Jack Wesley
Pontoriero, Carolyn Michelle	Quinn, William Kevin
Ramani, Haren Manish	Rice, Matthew John
Rossbach, Richard Pastore	Russo, Vincent Edward
Schattin, Samantha Reilly	Schozer, Jacob R.
Sette, Joseph Anthony	Shah, Pujan K.
Shine, Timothy M.	Spirer, Rebecca Lynn
Stewart, Shelby Mae	Van Orden, Katherine Rose

Awards & Recognition

Several of the Stevens Phi Omicron chapter members from the 2020 graduating class were recognized for their academic excellence and participation in various extra-curricular activities during the graduation.

- **Allyson Patricia Clark** and **Michael V. Alecci** are the co-recipients of the *Eugene Fezandie Award* for best overall performance by a graduating senior in Mechanical Engineering in the sequence of junior and senior year Mechanical Engineering courses.
- **John Robert Clodfelter** is the recipient of the *Kenneth J. Moser Award* in recognition of his outstanding performance in heat transfer.
- **Jacob R. Schozer** and **Timothy Shine** received the *Arthur J. Grymes award* for demonstrating greatest interest and proficiency in fluid mechanics.
- **Allyson Patricia Clark** and **Caralyn M. Cyr** are the co-recipients of the *Richard B. Cole* award for demonstrating high academic performance, integrity and personal dedication.

- **Luke M Langner is** the recipient of the *Richard S. Magee Excellence Award* for demonstrating both extracurricular involvement and leadership in departmental and campus activities.
- **Samantha R. Schattin** is the recipient of the *Fernando Sisto Award* for her outstanding performance in Turbomachinery and Aerospace.
- **Joseph Stanley Kaczynski** received the *Col. John Stevens Power and Energy Systems Award* for being the outstanding student of Power and Energy Systems.
- **Pablo N. del Puerto** is the recipient of the *Elie Fonrose Award* for his promise of advancement in the field of aerospace engineering.
- **Allyson P. Clark** was also the co-recipient of *Ansary Prize for Student Entrepreneurship* to exemplify academic entrepreneurship based on her project Home Energy Management System – *Bia.*

The following members of the Stevens Pi Tau Sigma chapter graduating class of 2020 were also members of the New Jersey Alpha chapter of Tau Beta Pi, the Engineering Honor Society: **Melissa L. Barnes, Anthony D. Bianco, Noah B. Bolzoni, Allyson P. Clark, John R. Clodfelter, Emily R. Cooke, Pablo N. D. del Puerto, Gina Della Russo, Mark A. G. Demetillo, Anthony R. Foerst**, **Karina M. Hunstein**, **Joseph S. Kaczynski, Jack W. Moss, William Quinn, Richard P. Rossbach, Samantha R. Schattin, Jacob Schozer, Pujan K. Shah, Timothy M. Shine, Rebecca L. Spirer,** and **Shelby M. Stewart. Jack W. Moss** was elected to serve as the Vice President of the Stevens Alpha chapter of Tau Beta Pi.

Michael V. Alecci, Caralyn M. Cyr, Matthew Foerst, Karina M. Hunstein, Jacob R. Schozer, Timothy M. Shine, and **Shelby Mae Stewart** received both a Bachelors degree in Mechanical Engineering with High Honors as well as a Master of Engineering Degree.

At the state level, **Pablo N. del Puerto** and **Samantha L. Schattin** were selected from Stevens to receive the *NASA New Jersey Space Grant Fellowship* for their outstanding academic record. As part of this *statewide* award, they each participated in a research project of aerospace relevance and presented a research paper and poster for the statewide *NASA New Jersey Space Grant* online meeting to highlight their work.

Plans for 2020-2021

Our plans for the upcoming year consist of educational, social, and outreach activities. Among others, it will include, among others:

- Promotion and publicizing of the Mechanical Engineering program activities within Stevens.
- Recruitment and initiation of new members and participation in the national Pi Tau Sigma conference.
- Sponsorship of engineering seminars, co-sponsorship and participation in professional society student chapter activities.
- Mentoring of freshmen and sophomores interested in pursuing mechanical engineering, and continuation of the academic tutoring program for mechanical engineering undergraduates...
- Continuation of the development of an Alumni Networking Database to track chapter alumni.
- Continued participation in the STEM club and outreach activities to expose high school and middle school students, especially those from under-represented groups, to the excitement of mechanical and related engineering fields.
- Participation in the Stevens Innovation and Entrepreneurship programs.

In addition, the chapter (with the support of the Mechanical Engineering Department) plans to distribute the stoles and recognize the graduating seniors during the annual banquet.

Chapter Officers

President:	Luke M. Langner
Vice President:	Victor Bech-Hansen
Secretary-Treasurer:	Daniel W. Kaba
President Elect:	Ryan W. Ludeman
Vice President Elect:	Jonathan P. Ku
Secretary-Treasurer Elect:	Siobhan M. Cottell

The elections for the chapter officers were held on May 17, 2020 during an online meeting of the chapter. The current group of officers explained the responsibilities and chapter activities to the officers-elect who will govern during the 2019-20 academic year. The chapter responsibilities were transferred during the last week of the term.

Chapter Advisor: Siva Thangam, Professor, Department of Mechanical Engineering**,** Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030 **(**sthangam@stevens.edu)

Chapter Website: www.stevens.edu/pts

Reporter: Siva Thangam