

Air Force Institute of Technology (AFIT)  
SPIE Student Chapter Annual Report for 2018

AFIT SPIE Student Chapter  
AFIT/ENP Bldg. 640, Attn: Michael Marciniak  
2950 Hobson Way  
Wright-Patterson AFB, OH 45433

## **Introduction**

In this annual chapter report, we highlight the accomplishments our chapter made over the past year. This year our chapter held four quarterly meetings as well as multiple community outreach events. We invited three guest speakers and celebrated AFIT's first International Day of Light.

## **Membership**

### *Leadership*

On 1 Feb 2018, the chapter elected the following officers listed below:

- Davin Mao, [davin.mao@afit.edu](mailto:davin.mao@afit.edu), President
- John Becker, [john.becker@afit.edu](mailto:john.becker@afit.edu), Vice President
- Grant Thomas, [grant.thomas@afit.edu](mailto:grant.thomas@afit.edu), Secretary
- Douglas Thornton, [douglas.thornton@afit.edu](mailto:douglas.thornton@afit.edu), Treasurer

### *Current members*

At the time of the writing of this report on 30 November 2018, the official record shows that our chapter has 8 Student Members and 3 Alumni Members. Current members and their membership expiration dates are listed in the Table 1. Alumni members are listed in Table 2. The official record currently does not accurately represent our chapter's actual student and alumni membership. For example the current chapter vice president, John Becker, does not appear on the roster, and alumni members with lifetime memberships, such as Dr. Mark Spencer, who are on the previous annual reports' rosters are also omitted from the current roster. We have been in communication with SPIE and are actively working to resolve this technical issue.

The AFIT SPIE Student Chapter maintains two chapter advisers, one military faculty member for continuity and one civilian faculty member for longevity. Our military advisor is Major Samuel Butler, Ph.D., and our civilian advisor is Dr. Michael Marciniak. Both advisers are regular members of SPIE and have written consent from their respective department heads (as required by the chapter constitution). The AFIT SPIE student chapter also elicits the participation of AFIT faculty members who are current members of SPIE or show desire in becoming members of SPIE. Their continued involvement increases chapter support and longevity.

**Table 1: Current members of the AFIT SPIE Student Chapter**

<b>Student Member</b>	<b>Membership Exp. Date</b>
James Bowers	18-Apr-19
Carlos Diaz	27-Apr-19
William Harrell	4-Feb-19
Andrew Keith	31-Jan-19
Robert Lloyd	2-Feb-19
Davin Mao	4-Feb-19
Grant Thomas	31-Jan-19
Douglas Thornton	2-Feb-19

**Table 2: Alumni members of the AFIT SPIE Student Chapter**

<b>Alumni Members:</b>	<b>Graduation Date</b>
Ben Eshel	Jun-17
Ann Lanari	Mar-17
Noah Van Zandt	Dec-17

## **Chapter Activities**

### *Chapter Meetings*

This year we hosted 4 quarterly chapter meetings. In addition to updating members on current chapter activities and upcoming events, we made it a priority to promote professional development and continuing education in our members. We invited two speakers from the Air Force Research Laboratory (AFRL) to share the results of their research. We also invited Dr. Jean-Luc Doumont back to AFIT to give his talk on ‘Making the most of your presentation,’ which was very well received during his previous visit in 2016. Lunch was provided at every meeting except for Dr. Doumont’s presentation, which was held in an auditorium to accommodate greater attendance.

The chapter held elections during the winter meeting on 1 February. Dr. Steve Zuraski and Dr. Matt Whiteley from AFRL Sensor Directorate’s EO Target Detection and Surveillance Branch were invited to present their work on atmospheric turbulence profiling methods. Their talk covered three methods for profiling atmospheric turbulence which are an ongoing collaborations with AFIT. In addition to being technically informative, their presentation highlighted the relevance of the research being conducted by AFIT students and emphasized how SPIE facilitates AFIT’s collaborative partnership with AFRL.

On 16 May, AFIT joined the international community in celebrating its first International Day of Light hosted by AFIT SPIE student chapter. During lunch, the chapter transformed the student lounge into a tribute to light and light-based technology. We provided lunch and light-related demonstrations for

student interaction. Chapter officers presented facts about the International Day of Light and also supervised the laser lethality demonstration which uses a high power laser to burn holes in paper. On the anniversary of the laser, this demonstration acknowledged the significant achievements in laser technology since its inception 58 years ago.



**Figure 1: AFIT students and faculty celebrating International Day of Light in the student lounge by engaging with optics demonstrations over lunch provided by AFIT SPIE student chapter.**

For our summer chapter meeting on 8 August, we invited Dr. Jason Stafford from AFRL Sensor Directorates' LADAR Technology Branch to share his recent findings in the area of Range Compressed Holographic Aperture LADAR, which uses digital holographic imaging techniques to produce 3D images. Dr. Stafford shared a novel image correction algorithm and demonstrated its effectiveness on experimental data.

This past fall, we invited Dr. Jean-Luc Doumont back to AFIT to give his talk on "Making the most of your presentation." His visit was made possible with support from the SPIE Visiting Lecturer Grant. Dr. Doumont shared his no-nonsense approach to giving technical presentations and constructing slides in support of presentations with AFIT students. His visit came at a critical time when second year students were beginning to write their theses and prepare for their thesis defenses. We invited the entire AFIT School of Engineering and over 70 students and faculty attended. The chapter received overwhelmingly positive from students and faculty and we intend to invite him back annually.

### *Observatory Field Trip*

In the spring, AFRL held an open house at their research observatory at John Bryan State Park. Several of our chapter members, including a couple alumni, attended the demonstrations and engaged in technical discussions of their research. The trip was very insightful and educational to see optics in action!



**Figure 2: (Left) Dr. Doumont captivates his audience of AFIT students and faculty with his presentation. (Right) Dr. Doumont poses for a picture with AFIT SPIE student chapter officers and a member of the physics department faculty.**

### *Community Outreach*

Since AFIT is an institution located on a US Air Force base, our chapter’s outreach events leverage the base’s already strong relationship with the local community. Our SPIE members supported multiple outreach events this year by deploying our educational programs and light-based demonstrations into local schools.

In the winter, Bryan Adomanis, Ben Eschel, and AJ Wallerstein led an optics lesson at the Dayton Regional STEM School (DRSS). They engaged a group of 30 middle school students with an introduction into electromagnetics and wrapped up the lesson with an exercise in diffraction using the SPIE diffraction glasses. Additionally, Douglas Thornton led a group of 20 elementary school students through an Engineers Week event at AFIT. Each year, AFIT invites over 200 students from the local community onto campus where they tour the engineering departments and receive various technical demonstrations and activities.

In the summer, Davin Mao spoke at STARBASE, a local after school STEM camp organized by the base for students attending nearby schools. Davin shared his experiences as a physicist in the military with 25 elementary school students and concluded the talk with the laser lethality demonstration.



**Figure 3: (Left) Davin holding the laser lethality demonstrator with students at STARBASE. (Right) AJ, Ben, and Bryan teaching basic E&M to students at Dayton Regional STEM School.**

### *Best Light-Based Master's Thesis*

SPIE Fellow Dr. Kenneth Hopkins awarded the eighth annual *Best Light Based Master's Thesis* award to Andrew Lawrence for this thesis on “*Simulation and Modeling of High Energy Laser-Induced Droplet Shattering in Clouds.*” The award was given to him during the March AFIT graduation awards ceremony. This year, we had two submissions from master's thesis advisors at AFIT. A panel of three PhD student members ranked these submissions based on the submitted application.



**Figure 4:** Dr. Kenneth Hopkins, SPIE Fellow, presenting the award to Andrew Lawrence during the graduation award ceremony.

### *Travel Grant*

This past August, Davin Mao, chapter President, received the SPIE Student Chapter Travel Grant to attend the 2018 Student Chapter Leadership Workshop and Conference at Optics + Photonics in San Diego, California. Douglas Thornton, chapter treasurer, also attended the leadership workshop as a facilitator. The leadership workshop was a valuable experience for both chapter officers because it addressed how to effectively resolve interpersonal problems using effective communication techniques. The quality of Dr. Doumont's workshop cemented our plans to invite him to AFIT later in the fall.

In the evening Douglas, Davin, and alumni member Dr. Mark Spencer from AFRL debuted the Digital Holography Demonstration (DHD) prototype, at the Outreach Olympics. The DHD was the latest upgrade to the chapter's Laser Propagation Demonstration (LPD) and was jointly developed by AFIT SPIE and AFRL, and funded by a SPIE Outreach Grant. We are excited to improve the demonstration using feedback from students and teachers as we take it into classrooms and local STEM events over the next few years. Douglas later gave a presentation with a written paper on the DHD during the conference.

### *Future Activities*

Moving on to the next year, our chapter has a couple of ideas to increase membership, involvement, relevance, and outreach as described below:

- Outreach: We will continue to improve the DHD as we field it at STEM events
  - We plan to deploy the DHD to TechFest, a STEM festival hosted by a local community college for K-12 aged students
  - We also plan to maintain our relationship with STARBASE by supplementing their program with introductory optics lessons and demonstrations like the DHD
- Invited speaker: We intend to invite Dr. Doumont back to AFIT in 2019 to give a different presentation. We plan on applying for the visiting lecturer grant come the new year.

### **Financial Information**

Our financial records for January through December 2018 are shown below in Table 3.

**Table 3: Financial records for the AFIT SPIE Student Chapter**

<b>2018 Financial Records (Through 30 Nov 2018)</b>	
<b>Balance as of 1 Jan 2018</b>	\$1,204.74
<b>Thesis Award</b>	\$(35.00)
<b>2018 SPIE Outreach Grant</b>	\$3,900.00
<b>Food &amp; Supplies</b>	\$(500.51)
- <b>Food/drinks/supplies for 1<sup>st</sup> Quarter Meetings</b>	\$(193.56)
- <b>Food/drinks/supplies for 2<sup>nd</sup> Quarter Meeting/IDOL</b>	\$(185.70)
- <b>Food/ drinks/supplies for 3<sup>rd</sup> Quarter Meetings</b>	\$(121.25)
<b>Chapter Coins</b>	\$(591.70)
<b>Outreach Grant Supplies (order pending)</b>	\$(3,900.00)
<b>2018 SPIE Activity Grant (approved, transfer pending)</b>	\$700
<b>Balance as of 30 Nov 2018</b>	\$777.53

### **Summary**

In closing, this has been a successful year, particularly with the completion of the DHD prototype. We greatly appreciate the continued support of SPIE and look forward to continued success in 2019. Thank you!

Davin Mao  
President  
SPIE Student Chapter  
Air Force Institute of Technology (AFIT)  
30 November 2018

**SPIE**  
Student Chapter  
Air Force Institute of Technology

