Submitted by SOck, the Student Optics Chapter at the University of Arizona, to SPIE as part of the reporting requirements as an SPIE Student Chapter

Prepared by:

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President

JOHN BREWER  
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JILIAN NGUYEN  
Treasurer

Submitted to SPIE on February 4th, 2018

The University of Arizona  
College of Optical Sciences  
1630 E University Blvd  
Tucson, AZ 85721-0094
1. EXECUTIVE SUMMARY

The Student Optics Chapter at the University of Arizona (SOCK) was established on the 15th of April, 2004, as a student club for both graduate and undergraduate students. SOCK is a student chapter both with the International Society of Optics and Photonics (SPIE) and The Optical Society (OSA). Below is our mission statement:

The purpose of SOCK is to support the students of optics by providing valuable academic resources, facilitating social networking, and representing the study of light to the public.

This mission statement highlights the three areas of focus for SOCK: Academics, Social, and Outreach. This breakdown for our focus will also extend to the structure of this report. The report will list the officers for the 2017-2018 Academic year, as well as give a roster of members. The bulk of the report will detail our events for the year. A financial summary will be given, followed by plans for future events.

Notable milestones from this year include:

- Running our popular outreach event for the 8th time, Laser Fun Day.
- Bringing aboard almost entirely first-time officers to our chapter's board and training them for the club's future organization and leadership.
- Creating up to 5 new regular social events for students and faculty in our community to network in.
- Revamping our website for more up-to-date information to be accessible to our community.

SOCK can be reached by email at sock@optics.arizona.edu. More information on SOCK and our current activities can be found on our website.
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2. STU​DENT MEMBERS

2.1. Officer Board

The following includes the list of officers for the 2017-2018 Academic Year.

Matthew Noyes  
President  
Senior B.S.E. Student  
mrnoyes@email.arizona.edu

John Brewer  
Vice President  
Senior B.S.E. Student  
johnbrewer@email.arizona.edu

Lennon Reinhart  
Secretary  
Senior B.S.E. Student  
lennonreinhart@email.arizona.edu

Jilian Nguyen  
Treasurer  
Senior B.S.E. Student  
jiliannguyen@email.arizona.edu

Dawson Baker  
Academic Chair  
5th Year Ph.D. Student  
rbaker@optics.arizona.edu

Joshua McDonald  
Academic Chair  
Sophomore B.S.E. Student  
jpmcd@email.arizona.edu

Jarod Weber  
Social Chair  
Senior B.S.E. Student  
jweber@optics.arizona.edu

Christian Syson  
Social Chair  
Junior B.S.E. Student  
nikolass@email.arizona.edu

Allison Richter  
Outreach Chair  
Senior B.S.E. Student  
aricht@email.arizona.edu

Adriana Mitchell  
Outreach Chair  
Junior B.S.E. Student  
adrianamitchell@email.arizona.edu

R. John Koshel  
Faculty Advisor  
Optical Sciences Professor  
jkoshel@optics.arizona.edu
2.2. Student and Community Membership

The following includes the SPIE Member Roster. The Student Optics Chapter considers all students in the College of Optical Sciences as members of the chapter. Thus, the number of members is approximately 400. The number of active and paying members varies. As stated on the chapter website on the SPIE website, there are 31 current SPIE student members.

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3. ACADEMIC COMMITTEE SUMMARY

3.1. Chair Declarations

Dawson Baker, Academic Chair (first-person below is written from his perspective)

In 2017, the academic committee had a general winding-down of student participation, which served as useful data in answering a few questions:

Q: How much do cash prizes affect student turnout? 
A: Almost not at all. The VIP series cash reward did not attract any students to volunteer their research in Spring of 2017. Those students that did present did so because of pleas for research presentations.

Q: What is the most effective means of convincing students to participate in an academic community?
A: Certainly the highest chance of succeeding in this has been realized by one-on-one interactions. According to my experience, the idea of incentives for participation has been beaten to death as the Poster Sessions and Research Presentation require a fair amount of hype for them to be popular. Money is not a substitute for work here. Networking through colleagues and friends had the greatest chance of enticing students to present their research. This is an interesting problem. Every good graduate student is constantly analyzing the risk/reward of every academic program or idea. The social result is that an infrastructure that rewards social academic engagement is completely inferior to social engagements that demonstrate effectiveness academically. That is, we will have to work with Social Committee to solve many of these problems.

As a 5th year graduate student I apologize for the slack that has emerged in Academic Committee as I have shifted to prioritizing research outcomes. Our new Academic Chair Josh McDonald has joined on and is already helping to clear up some of the logistical issues that have emerged.

Joshua McDonald, Academic Chair (first-person below is written from his perspective)

After joining in the fall of 2017, I have been working with Dawson Baker and the rest of the SOCk leadership in order to understand my role and to define how we want to rev-up our academic program again as well as increase our communal impact on the UofA College of Optical Sciences and the greater Tucson area.

As a sophomore, I hope to help Dawson with logistical issues during this transitional period as he completes his graduate studies. I also hope to take the next year to increase the academic committee's impact on the students of the college.
3.2. Academic Activities Report

3.2.1 Poster Sessions

This year’s poster sessions were hosted in the College and catered by campus catering as part of the Industrial Affiliates program. This gave students the opportunity to talk to members of industry face to face about their research. As with the VIP series, the cash prizes and free memberships were not compelling compared to the social influence of a couple professors.

**Spring 2017**

*People: 8, Cost: 160$*

**Fall 2017 -- Nacho Average Poster Session**

*People: 12, Cost: $240*

Similar to the poster presentation in the spring, but this time with the inclusion of nachos.

3.2.2 Community Speakers Forum

This year we had far fewer than the ordinary biweekly schedule would suggest. I volunteered to give some talks, and it is now incumbent on us to figure this out. The talks we did have in 2017 met their goals, but we need a higher volume to sustain the sense of community we are after.

In order to increase the number of talks we have during the semester we are taking action to redefine the proceedings of the community speaker events. With this new definition of the event, we hope to increase our active community by merging and blurring the location of social communal activities based around the community speaker event.

**VIP Series Awards:**

$250 to Jenna Bergevin (Spring 2017), and name recognition to Logan Graves (Fall 2017). Since recruitment was lagging I wanted to reframe this as an experiment in what happens when we merely emphasize the financial incentives. In both semesters I had to rescue this program by asking for student involvement. This is a good lesson and I think the data will help us to be better organized in the future.

**Spring Semester Forums:**

*Travis Sawyer, "Identifying the spectral fingerprint of disease: a multimodal imaging system for tissue analysis."

*February 10th. People: 60, Cost: 0$*

Travis Sawyer, who was an Outreach Committee Chair in 2015 gave a talk on what he was doing since he went to Cambridge on a scholarship. The talk was a good combination of optical science and applications to medical imaging.
David Aziz, PhD "Optical engineering as an employee & as a consultant."
March 10th. **People:** 95, **Cost:** $0

This talk was very well attended, since many students are interested in consulting. David Aziz received a PhD from the Optical Sciences Center in 1995. He worked as an employee from 1995 – 2006 and has been working as a consultant from 2007 – the present. He spoke about his experiences in both settings – what needs to be considered as a consultant – for which graduate school and engineering work don’t generally prepare you. This included stability, pay, contracts and NDAs, intellectual property, indemnification, lawyers and engineers, expenses, priorities, references, resumes, flexibility, being part of a team, equity compensation, fixed price quotes, overhead (time and money), sales, and probably a few other items which will come up.

Liliana Ruiz Diaz, "Modeling the sky radiance in LightTools"
Jenna Bergevin, "Dual-comb spectroscopy of laser induced plasmas"
April 14th. **People:** 60, **Cost:** $0

We accomplished the central goal of sharing student research in the community. The research presentations were excellent. Liliana Ruiz-Diaz did a good job of describing her sky radiance model which could be applied using non-sequential ray tracing software. Jenna Bergevin's presentation on dual-comb spectroscopy of laser induced plasmas highlighted many of the technical challenges in the research as well as some interesting experimental results.

Caleb Gannon, "Freeform Illumination Design Using a 3D Surface-Target Map"
SOCK Officers, "Election Information"
April 28th. **People:** 75, **Cost:** $0

For the final CSF event of the spring, Caleb Gannon talked about Freeform Illumination Design research that he was doing, and we discussed the SOCk election for the fall. This was a highly interesting and impressive technical talk which grabbed the attention of roughly 70-80 students.

**Fall Semester Forums:**

**Community Speakers - “Kicking off the year”**
September 8th. **People:** 60, **Cost:** $0

To start off the year we began with a CSF presentation on what SOCK has planned for the year. We talked about the myriad Academic, Social, and Outreach events.

**Travis Sawyer, “How to Apply for the NSF Graduate Research Fellowship”**
Dawson Baker, "Tools to streamline research and study"
September 26th. **People:** 45, **Cost:** $0

At this CSF presentation, Travis Sawyer talked about the steps required for preparing a good NSF GRF application. Dawson Baker then discussed undergraduate scholarships, how to typeset in LaTeX, use Python as an alternative to MATLAB and how to use Zotero to organize bibliographic references. Many students were familiar with the NSF, but Travis gave a lot of helpful advice here. Most of the audience was undergraduate and had not seen some of these most-common research tools.
Lindsay Loebig, "How to apply to Graduate School" - Graduate Student Panel

November 17th. People: 30, Cost 0$

We gave an audience of interested undergraduate students a discussion on how to apply for graduate school. We discussed GPA requirements, lab work, internships, and a variety of other important dimensions of the application process. After the presentation, we had a panel discussion on the nature of the differences between masters and PhD programs, how to find an advisor, and how to prioritize in graduate school.

Dawson Baker, "Tech Launch Arizona: Patents & IP as a student"
Logan Graves, "The Experience of Graduate School"

December 1st. People: 40, Cost: 0$

A talk more centered on graduate students, Dawson Baker talked about prior art and market research in the innovation ecosystem at UA and how graduate students can be involved in the patent process. Then Logan Graves presented some results of surveying and interviewing a number of graduate students with the aim of sharing advice and lessons learned about how to approach life in graduate school. The talk was generally well received with students asking a variety of specific questions about both subjects.

3.2.3 PANOPTES Project

Over the summer, Academic Committee wrote a proposal for and obtained an Education Outreach grant of $4500 to build an exoplanet survey instrument for the PANOPTES network. Over the course of the fall (2017), we worked with 4 local high school students to build the device. Though it was scheduled for first light in December, specialized electronics from the collaboration in Chile held up completion of the electronics system. The mechanical and optical subsystems have been completed however. In the spring 2018 semester we plan to do first light experiments and do outreach events at local Tucson high schools.

The photometry unit of the PANOPTES instrument on its way out of the machine shop.
4. SOCIAL COMMITTEE SUMMARY

4.1. Chair Declarations

The academic community of optics is always focus on their studies and expanding their knowledge. Every now and then SOck likes to organize events for people to slow down and relax with one another. This allows the group members to let off a little steam and get to know each other a bit more. We facilitate events for all members of SOCk where the larger ones are enumerated below.

4.2. Social Activities Report

Below is a list of the social events our committee has hosted this year:

**Ice Cream Social**
Jarod Weber, Christian Syson, Social Chairs  
*April 14th. People: 30, Cost: $50*

This event is held every semester during the week of Industrial Affiliates. During one of the days of IA is a big job fair and dinner with the affiliates. We consider this event to be the “cool down” part where the students can relax from the pressure of the professionals and talk to each other about how things went. This event is always successful in dishing out large amounts of ice cream.

**SOck Camping Trip to Mt. Lemmon**
Allison Richter, Social Chair  
*August 27th. People: 25, Cost: $200*

This year instead of going to Mt. Graham, we went to a nearby camping location on Mt. Lemmon to give the students a time to relax. This allowed some students to take themselves up the mountain to hang out for the campfire even if they didn’t wish to spend the night.

**Welcome Back BBQ**
Jarod Weber, Social Chair  
*August 16th. People: 75, Cost: $300*

This event brings out the most grad students from their laboratories and gives the incoming sophomores in optics to see them for the first time. This BBQ is what allows the most grad student and undergrad student networking out of the fall semester while giving everybody a nice meal to enjoy.
**Game Night**  
Christian Syson, Social Chair  
*March 4th. People: 15, Cost: $0*

This was a bit more directed to the competitive members in SOCK. There was a provided array of video games and party games. Sometimes a little adrenaline can go a long way.

**Evening of Pups**  
Jarod Weber, Social Chair  
*January 20th. People: 20, Dogs: 6, Cost: $40*

If food doesn’t bring out the students, the pups definitely will. All the students were able to bring their dogs out to meet the SOCK group and the other member’s dogs. The pups just tend to bring the joy out for everybody.
5. OUTREACH COMMITTEE SUMMARY

5.1. Chair Declarations

In 2017, SOCk participated in 11 outreach events, bringing the world of optics to 1,209 people in the local Tucson community. Our impact reached many educational institutions, and we are able to keep in contact with these institutions to bring outreach events to new and different schools. Below is a listing of the events we engaged in this year.

5.2. Outreach Activities Report

Below is a list of the Outreach Events our committee has hosted this year:

**Esmond Station K-8 School Event**
Benjamin Cromey, President

*People: 45, Cost: $0*

We presented to three classes of students at Esmond Station school, a school for high performing students in STEM. Each presentation, one for 6th, 7th, and 8th graders, focused on how engaging optics can be. Several demonstrations were shown to prove how much these students use optics without thinking about it, from a laser radio to show how the internet works, to examining the display on their smartphones. The IR camera and diffraction glasses with light sources were also showcased during the class periods. The students were very interested, and many of them took Laser Fun Day fliers at the end of each class period.

**Mansfeld Middle School Event**
Allison Richter, Outreach Chair

*People: 38, Cost: $0*

For this event we presented the hollow Einstein mask which gives the illusion that the face is convex while it is concave. We gave the students printouts, so that they could make their own concave dragon illusions. Because it was so close to Halloween, we also showed the same effect with a hollow plastic pumpkin. We showed how different light sources are composed of different elements using light sources and diffraction glasses. We also electrocuted a pickle and a pickled pumpkin. When viewing them through the diffraction glasses, it was easy to see how the emission lines matched that of the sodium emission. Our goal was to get middle school students excited about optics.
**STEM Night at Innovation Academy**  
Adriana Mitchell, Outreach Chair  
**People:** 100, **Cost:** $0

Our goals were to teach both elementary age students and their parents facts about optics, when they stopped by our table at the event, and to impart knowledge quickly and efficiently in the limited time frame we were given to speak with each student and their families. We were able to explain basic optical science concepts to both elementary students and their families. We successfully taught participants about white light, geometrical optics, different wavelengths, and everyday polarization. We were also able to solidify our connection with the Innovation Academy for future outreach events.

**STEAM Camp at Esmond Station**  
Adriana Mitchell, Outreach Chair  
**People:** 42, **Cost:** $0

We successfully met our goals of introducing basic concepts of optical sciences to elementary age students. We were able to give demonstrations of geometrical optics, polarization of LCD screens, an infrared camera, and diffraction glasses with different illumination sources. The students were very excited to participate in all of our hands on activities, and were happy to take home their very own optical lenses. We were able to introduce students to the world of optics in a way that will allow them to apply optics to the world they live in.

**Sahuarro High School Event**  
Emma Landsiedel, Outreach Chair  
**People:** 120, **Cost:** $0

Our goals were to educate 5 high school classes in engineering, AP physics, and physics I in optical engineering by presenting about the behavior of light, the College of Optical Sciences, and showing many demonstrations. We presented to two engineering classes, two AP physics classes, and a physics I class. We spoke about different features of light, explaining the electromagnetic spectrum, the Doppler effect, and the use of spectroscopy. We also explained refraction, reflection, and diffraction, and we did experiments with each of them. We demonstrated spectra with gas discharge tube and diffraction glasses, showed a fiber optic and demonstrated the acceptance angle, and used an infrared camera to show how bodies give off infrared radiation.
**UBRP Middle School Outreach Event**
Adriana Mitchell, Outreach Chair

*People: 100, Cost: $0*

Our goals were to teach middle school students what optics is and some applications of optics that they have seen before at home or at school, but not fully understood. Middle school students on a field trip to the UofA were able to view and understand daily optical phenomena on a different level. They dissected fluorescent light bulbs they see at home with diffraction glasses, viewed transfer of information across great distances, like how they use the internet, and saw themselves in the infrared, just like airport security. We made good use of the twenty minutes we had for each group to introduce these students to the world of optics, starting with phenomena they see on a day-to-day basis.

**Tucson Festival of Books**
Adriana Mitchell, Outreach Chair

*People: 100, Cost: $0*

Our goals were to use the Tucson Festival of Books as a way to reach the tucson community and expose them to the wonderful world of optics. Specifically targeted at teaching children the physics behind optical phenomenon. The Tucson Festival of Books is a yearly occurrence where the Tucson community explores the multitude of booths set up on the University of Arizona campus. The east end of campus was devoted to Science City, a place where children and their parents could explore the land of the scientific community. The College of Optical Sciences opened its doors, allowing participants to visit the sculptures and history museum in the lobby. The college had multiple stations set up where children and adults could learn through hands-on activities about optical phenomenon. There was a 3D TV that used polarization, there were gas emission tubes that could be viewed through diffraction glasses, and there was an infrared camera that guests could stand in front of and see the heat distribution throughout their bodies. Tucson was able to visit the College of Optics and be educated on the study of light.

**Visit to Pima Community College**
Benjamin Cromey, President

*People: 26, Cost: $0*

Our goals were to tell the Engineering Freshmen about optics. We visited the ENG102, or Introduction to Engineering, class at Pima Community College. We presented about his own experience of transferring from Pima to the University of Arizona to pursue optics. The IR Camera and the Laser Radio were shown as demonstrations of the useful things that can be accomplished with optics.
OVMS Science Showcase Night
Josh McDonald, Academic Chair

**People:** 30, **Cost:** $0

While at the event, we showed demos to students at a middle school science showcase to educate and excite them about optics. The demos included diffraction glasses, IR optics, & Holography. Afterwards we informed their parents about Laser Fun Day and encouraged all of them to come to the event to see even more cool examples of optics.

University High School Physics Class
Allison Richter, Outreach Chair

**People:** 8, **Cost:** $0

We held a presentation about what optics is during a study hall period in a physics class. We taught about lasers and how they are used with fiber optics. We have a large acrylic rod with a 3 inch diameter that does a great job of showing total internal reflection. We bought a radio transmitter that sends audio signals with a laser pointer. We also used an optical fiber to show how it could send the signal along a curved path.

Laser Fun Day
Adriana Mitchell, Outreach Chair

**People:** 600, **Cost:** $2000

We hosted our yearly Laser Fun Day event, which is the largest optics outreach event in North America. The College of Optical Sciences opened three floors to the Tucson community, and the members of the UA OSA chapter demonstrated optical phenomenon to participants.

The goal of Laser Fun Day is to open a door for the Tucson community to sample our research and developments, and for them to ask questions to learn the impact of optics on society. Laser Fun Day allows families to explore the world of optics with hands-on interactive demonstrations. The little hands that learn physics return every year to continue their education. We hope that from a young age these students will grow up to appreciate the world of optics they live in, and that it will encourage them to pursue higher education and careers in optical science. We primarily target younger students with our activities, but the engaging educational demonstrations attract visitors of all ages, spreading the joy of learning throughout the Tucson community.
6. **TREASURY REPORT**

6.1. Chair Declarations

This section was prepared with the help of Treasurer Jilian Nguyen.

6.2. Account Summary

Below are two tables including our sources of funding and expenditures:

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6.3. Future Funding

No future funding will be filed in this report as we submitted this report after the financial year.
7. Future Plans and Conclusions

7.1. Future Plans for SOCk

7.1.1 Succession Targeting

As most of our officer board is comprised of primarily Seniors in the undergraduate program, we will be reaching out to more Sophomores and Juniors in the undergraduate program, as well as first year graduate students as potential future officer boards. This will assure the longevity and prosperity of our student chapter.

7.1.2 Laser Fun Day 2018

Planning for our 8th LFD has begun. We have set the date for April 7th from 10am-3pm. We had our first Committee meeting February 2nd, 2018. We were granted a $1500 Activity Grant by OSA for LFD, and plan on allocating these funds for new and exciting optics demos.

7.1.3 Travelling Lecturer

We hope to continue what we started last year of having more travelling lecturers come to our community and present their work and ideas.

7.2. Report Conclusion

This report has detailed the activities of the Student Optics Chapter at the University of Arizona. It has summarized the officer and student involvement, detailed the events done in support of our mission statement and academic, social, and outreach activities. It has given a brief financial update, as well as a few future plans.