



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Marsh W. White Award Proposal

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Project Proposal Title	Improving Outreach Through Illuminating Optics
Name of School	University of Central Florida
SPS Chapter Number	SPS 1076
Total Amount Requested	\$500

### Abstract

While the University of Central Florida features several physics outreach events throughout the year, the demonstrations for optics have always been limited. This project seeks to replace outdated demonstrations with new displays of optical phenomena and techniques such as imaging and diffraction in order to bring exposure to optics.

# Proposal Statement

## Overview of Proposed Project/Activity/Event

The Physics Department at the University of Central Florida hosts two primary outreach events every year: Physics Career Day, for a group of around 140 high school students, and iSTEM day, intended for an audience of around 50 K-12 students. These events feature a wide variety of demonstrations on physical principles, run by faculty and student volunteers. Among the principles demonstrated is optics. Our optical demonstrations currently consist of: refraction through different media using a laser pointer and water; diffraction patterns using a diffraction grating; and a demonstration of curved mirrors. While these current demos can be informative, they are not particularly engaging to view, and thus are not very popular with audiences. In addition, some of the mirrors and apparatuses used for these demonstrations have become old and less functional, further weakening the presentation. For these reasons, we hope to use the Marsh W. White award to improve our optical demonstrations to be more engaging for audiences while also involving understandable concepts from geometric and fourier optics to enrich their learning. To accomplish this, our SPS officers will form a committee of student volunteers and faculty to brainstorm new optical demonstrations, including imaging, concave and convex lenses, converging and diverging lenses, and perhaps even Fraunhofer and Fresnel Diffraction.

## How Proposed Activity Promotes Interest in Physics

If funded, the “Improving Outreach Through Illuminating Optics” project will allow our outreach events to better demonstrate to students the wonders of physics. While a volunteer can explain how water causes a laser to bend due to its index of refraction, this does not do enough to engage and excite audiences. In reality, optical physics has a wide variety of amazing applications and experiments, but this incredible field is not showcased well with the current demonstrations. With the Marsh W. White Award, we will be able to invigorate these outreach events with brand new demonstrations and optical set-ups that will amaze and excite our student audiences, and could be the last push they needed to consider taking a physics course in high school. Through these improved demonstrations, we will be able to better inspire the next generation of physicists by showing them some of the fascinating principles of optics and thus better communicate the wonder of the field of optics.

## Plan for Carrying Out Proposed Project/Activity/Event

- Personnel - The project will be directed by the SPS appointed Programs Director, a position appointed by our officer board. The Programs Director will then organize interested students and faculty to form a group to discuss the specifics of the demonstrations, which will then be executed by student volunteers when the outreach events occur.
- Marketing - The Physics Career Day and iSTEM Day outreach events are annual, and allow a period of time for students from the community to enter a separate room and observe physics demonstrations. Students will thus be able to witness the exciting physics on display and hear the scientific explanation from the volunteer.
- SPS member participation - Both of these outreach events utilize a number of student volunteers, organized jointly by the department and the SPS officer board. The demonstrations will be created such that, at

maximum, only two volunteers will be needed to run them, which is well within the expected number of SPS volunteers to have on standby.

- Expertise - We have several SPS members who currently work in an optics based research group, study as an optical engineer, or are otherwise passionate about optics and who are interested in assisting with the planning and creation of these demonstrations.

### **Project/Activity/Event Timeline**

- Dec 20 A group is organized to brainstorm specific optical set-ups for the demonstrations.
- Jan 7 Create a list of demonstrations and all necessary components.
- Feb 1 Order all optics required for demonstrations.
- Once optics arrive Check to ensure everything works correctly, no scratches, dents, etc.
- Mar 1 Test all demonstrations and ensure they are consistent and clear.
- iSTEM Day (End of March or beginning of April ) Present at outreach event.

### **Activity Evaluation Plan**

Our Activity Evaluation Plan will consist of two primary components. First, the number of participants who engage with the demonstrations will be counted and compared to the total number of participants. Secondly, a short survey will be given to each of these participants, simply asking them if they enjoyed the demonstration, and if they are more interested in physics after seeing it. Every time these demonstrations are run, our chapter will see how many students we have impacted, if the demonstrations were engaging, and most importantly, if they are successful in their goal of promoting interest in physics.

### **Budget Justification**

As can be seen in our Proposal Budget, the funding requested is focused upon purchasing lenses and mirrors. An important aspect of our budget is to ensure that these lenses and mirrors will be functional for years to come, which necessitates proper storage and proper tools when handling. While there are a number of other components necessary for optical demonstrations -- breadboards, lens mounts, etc. -- we plan to request these items from the physics and engineering departments before the outreach events. With the assistance of these other departments, as well as the lenses and lasers purchased with this award, we will be able to create and subsequently execute these optical demonstrations into the foreseeable future, and thus continue to promote interest and engagement in physics.