SOCIETY OF PHYSICS STUDENTS
An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	Catch That Wave! The Physics of Waves
Name of School	University of the Sciences
SPS Chapter Number	5619
Total Amount Requested	$500.00

Abstract

The SPS chapter at University of the Sciences plans to participle in The Philadelphia Science Festival as an exhibitor at the science carnival. As exhibitors at this event, we will be able to engage community members of all ages in understanding physics concepts in an interactive and hands on manner.

Proposal Statement

Overview of Proposed Project/Activity/Event

The Philadelphia Science Festival is an annual nine-day, community-wide event that aims to engage the city into understanding and appreciating science through lectures, hands-on activities, special exhibitions, and more. Over 120,000 community members participate in the festival. Our plan is to be an exhibitor at their science carnival event where many participants will be wandering around and exploring a variety of different sciences. This will be our chapter's second year hosting a table at the festival and it is our goal to continue the tradition in order to be a part of our community and help to promote physics throughout our city of Philadelphia. We recognized the most successful parts of our event last year to be the hands on interactions with physics and because of this we plan on engaging the participants as much as possible this year. Other improvements would be more SPS participation so that our members could have volunteer shifts and better execution of the plan through more training sessions for our volunteers.

Traditionally, there is a slight stigma when it comes to understanding physics and it is usually thought of to be out of reach for the general public. Our goal in hosting this event, is to help eliminate the stigma and to engage the community in understanding physics, and more specifically, the physics of waves. Waves are present in everyday life, they are how we hear and see things. Demonstrations and hands on experiments are an excellent way to bridge the gap between the physics and the experience of everyday interactions with waves. Therefore, we are planning on having many demonstrations and hand on experiments to help visualize different types of waves and how they interact with the world around us. Participants will be encouraged to think about how the demonstration is working and how they can apply it to their lives.
The list of demonstrations is as follows:

1. "The Voice Changer": balloons with helium, a high density gas, are inhaled by trained SPS members to show how to velocity of sound travels through the different density gases
2. "The Silent Bell": An alarm is placed inside a vacuum sealed bell jar and when the air is removed, there is no longer any sound; this demonstrates how air needs a medium to travel
3. "Types of Waves": a rope and two types of helical springs helps participants to visualize transverse, longitudinal, and standing waves
4. "Visualizing Gravitational Waves": A self-constructed apparatus will show the ripples of gravitational waves that will aid the general public in understanding the recent discovery of gravitational waves
5. "Make Your Own Music": With simple arts and craft tools participants will be encouraged to make musical instruments and then explain how it is making sound
6. "Sympathetic Tuning Forks": The vibration of one tuning fork will elicit the vibrations of one close to it demonstrating how sounds is a ripple in the air. This helps participants understand how our ear allows us to hear
7. "Doppler Ball": A ball with a speaker inside is thrown to demonstrate the Doppler effect. Participants can link this to the sounds of police and ambulance sirens to further understand the world around them

8. “Wave Pendulum”: Helps participants to visual the period of a wave, a fundamental property of a wave
9. “Standing Waves”: Helps participants visualize the standing wave pattern that they commonly see in musical instruments
10. “Chladni Plate”: visualization of a 2-D standing wave pattern into impressive sand patterns that demonstrate the nodes and anti-nodes of a standing wave
11. “Sound Tubes”: When whipped in a circle, these tubes produce a tone that illustrates a standing wave
12. “Talkie Tapes”: The vibrations of the tape produce a noise that sounds like “science is fun”, these help demonstrate how we hear
13. “Oobleck Dance”: A colorful, non-Newtonian fluid, or Oobleck, is placed on a speaker and dances to the beat of music
14. “Illustration of Sound Waves”: with many different instruments and boom whackers, the participants can produce sound waves that can be picked up by an I-Pad app that lets you visualize the sound waves, this will be made into a game of who can create the largest amplitude

How Proposed Activity Promotes Interest in Physics

With an ever growing curiosity of life, physics helps unfold some of the answers of how the world works. With waves being a common aspect of daily life, it is our goal to educate the general public on the fundamentals of waves so that they can better understand the world around them. There is no doubt that hands on demonstrations promote a huge interest in physics. Physics is no longer a thing just for a select group of people, it becomes attainable to everyone. We hope that we can instill a passion for physics by participating in the carnival.

Plan for Carrying Out Proposed Project/Activity/Event

Personnel: The project leader for this event will be Katee O’Malley. SPS chapter members will participate in the event, each helping to engage participants and help them understand the demonstrations. There will be three training sessions so that volunteers are well equipped to explain the demonstrations. The progress will be monitored throughout or SPS chapter meetings and our chapter advisor will be present to suggest any improvements.
Marketing: This event will be marketed through our student activities office through a campus wide email about the event to invite the entire campus to volunteer. In addition, it will be marketed through internal SPS communications, including at meetings and social media. The Philadelphia Science Festival has its own form of marketing and has always had a good turnout of community members.
SPS Member Participation: About 7-10 SPS members are expected to volunteer with execution of the event. Volunteers from the University of the Sciences will be asked to join us.
Expertise: Many experienced outreach members of SPS, specifically those who have attended the festival in the past will be there to aid in the execution of the event.

Project/Activity/Event Timeline

January 23rd- Register as an exhibitor for table in the Science Carnival
March 1st-Have all items ordered
March 14th- Have a training session to teach SPS members how to execute demonstrations
April 11th- Second training session for demonstrations
April 27th: Final training session
April 28th: Package all materials safely
April 29th: Attend Carnival

Activity Evaluation Plan

The primary mode of determining the success of the event will be the response we get from participants. We will encourage our participants to fill out an evaluation after they have seen all of the demonstrations. The evaluation will assess their previous interest in physics, what they liked the most about our table, improvements we could make, and their interest in physics after they have seen the tables. We will also have our volunteers talk with participants about their interest in physics and keep a record of the responses.

Budget Justification

The budget proposed will help contribute to the supplies needed for the demonstrations. The demonstrations provide a visual and hands on interactions with physics in which is essential for making an impact on the participants that attend the carnival. The helium balloons will be used for "The Voice Changer" experiment. The speakers will be used for the "Oobleck Dance" demo, our department already has access to corn starch and food coloring. The Wave demonstrator set will be used for the "Types of Waves" demonstration. The Vacuum Bell Jar Set will be used for the "The Silent Bell" experiment. The Lycra sheet, clamps, PVC pipe, and wheels will be used to make an apparatus to demonstrate the visualization of gravitational waves. The Sand will be used for the "Chladni Plate" demonstration and the chladni plate apparatus, including the function generator, will be borrowed from our physics department. The material for making instrument crafts will be used to have participants make their own instruments so they can learn how to manipulate objects in order to produce sound. The sound tubes, talkie tape, and standing wave machine will each be used for their respective demonstrations. The musician tool kit and the maracas will be used for the "Illustration of Sound Waves" game, the IPad will be borrowed from an SPS member and boom whackers will be borrowed from our SPS chapter.

Other sources of money are going to come from the budget our chapter of SPS has allotted to outreach. Our chapter of SPS will look to our Student Government Association for transportation funds for volunteers to get to the event via public transportation.

Finally, some additional demonstrations are currently owned by the chapter or our physics department and will be borrowed for this event.