



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Marsh White Award Report

Project Proposal Title	Physics Demonstrations for Educational Outreach
Name of School	University of Minnesota Twin Cities
SPS Chapter Number	4339
Project Lead (name then email address)	Rebecca McLaughlin mclau227@umn.edu
Total Amount Received from SPS	\$291.64
Total Amount Expended from SPS	\$291.64

## Summary of Award Activities

The purpose of this project was to create a well balanced and thorough physics educational program for elementary to high school aged students. The University of Minnesota Twin Cities SPS chapter has been developing a physics outreach program that demonstrates physics in every day life. However, we were missing key demonstrations to make our program the best it can be, and with the generosity of SPS national we were able to expand our demonstrations and present them at an afterschool program for elementary age children.

## Statement of Activity

### Overview of Award Activity

In our original proposal we had claimed that we would be presenting these demos at the annual CSE Expo. Unfortunately, our chapter ran into a snag when planning out the event. There was an issue with providing enough volunteers because the attendance at CSE Expo was much larger than what was anticipated (over a thousand). A good portion of our members were busy presenting their individual projects, and did not have time to present SPS provided demos. This was an unforeseen event, and hopefully in the future we will be able to gain more members so this does not happen again.

However, we mitigated this issue of not presenting SPS provided demos at the CSE expo by presenting them in our following outreach event. The name of the event was Waite House, and this is an after school program that encourages students to learn about STEM. On March 16, our SPS chapter did a 1 hour presentation that included topics on sound, optics, electricity, and thermodynamics. At this event we presented the demos that SPS national provided for us, and you can see some examples of the demos shown in the descriptions and photos below.

At Waite House, our group carried on a long tradition of promoting STEM topics to elementary age students. From this presentation the students got a chance to learn about how light travels and interacts with its surroundings, how light is similar and different from sound, how to build circuits, and a myriad of other topics showing students how physics fits in to their everyday life.

One huge accomplishment in my eyes is that one child got very excited about liquid crystals in the process. After the presentation, students got a chance to be hands on with some of our demos, and one child choose to inspect our liquid crystal paper. While she was studying it one of our volunteers explained to the child that this is the same technology that goes into your TVs and laptops, and she found that very cool. She then proceeded to make a TV show in the liquid crystal paper by drawing smiley faces on the sheet.

### Impact Assesment: How the Project/Activity/Event Promoted Interest in Physics

Even though we did not present at the CSE Expo I still believe that we kept the spirit of the Marsh White award in our event. Our event's, actually all of our events, sole purpose is to get elementary to high school age student interested in STEM. We did this by showing students how physics applies to their everyday life. We showed them that Physics is in their musical instruments, TV's, their glasses, in the water they drink, and so much more. All the students that attended this event walked away with a greater understanding of how the things that surround them work.

Our usual assessment plan at our outreach events is to make sure that at least one students walks away with a greater appreciation of STEM. Our group feels like this was accomplished at Waite House because we saw students get excited about our demos and the new demos SPS national provided us. Our next goal would be to inspire more the next time we present.

## Key Metrics and Reflection

Who was the target audience of your project?	Elementary to High School Students
How many attendees/participants were directly impacted by your project? Please describe them (for example “50 third grade students” or “25 families”).	There was approximately 25 elementary age students.
How many students from your SPS chapter were involved in the activity, and in what capacity?	6 volunteers from our chapter were involved in this outreach program, and they all presented the demos to the elementary students.
Was the amount of money you received from SPS sufficient to carry out the activities outlined in your proposal? Could you have used additional funding? If yes, how much would you have liked and how would the additional funding have augmented your activity?	The funding that we received was sufficient for the event.
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	We are constantly doing more outreach events, and we could always use new demos to show. So there is a strong chance that we would participate again in the near future.
What new relationships did you build through this project?	We meet 25 bright, young students, and 3 passionate educators.
If you were to do your project again, what would you do differently?	We would allow more time for shipping so that we could comfortably handle any damaged demos.

## Expenditures

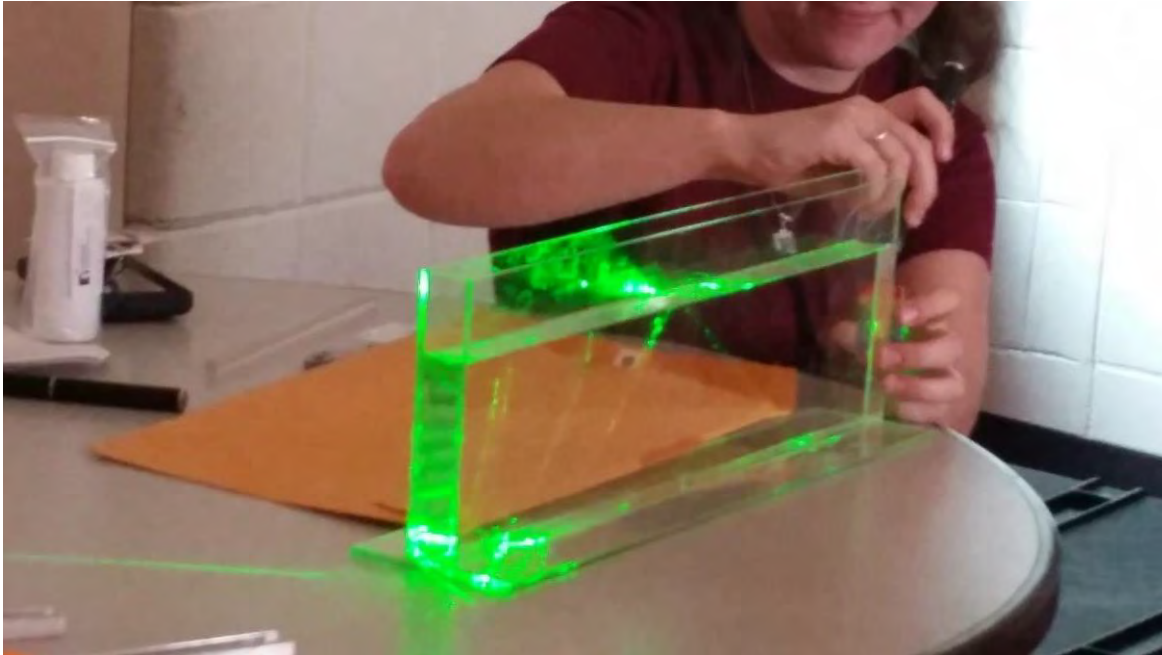
With SPS funding we were able to buy 6 demos for our outreach program. Most of the demos focused on thermodynamics and waves (optics and sound). Here is a quick description of each demo:

- **Liquid Crystal Paper:** By heating up the liquid crystal paper the color of the paper changes. This demo provided a hands on way to discuss crystals and orientation on a molecular level. See photos below for example.
- **Galileos Thermometer:** A thermodynamics demo that shows that liquids with different densities when heated up will float at different heights in a glass cylinder.
- **Laser Viewing Tank:** This demo allows viewers to see the path that a visible light source takes when experiencing total internal reflection. The path is made visible by adding cleaning solution to the water in the tank. See photos below for example.
- **Bell Jar and Ringer:** This demo uses a vacuum pump to suck air out of a jar with a bell in it. This demo shows that a medium is necessary in order for sound to travel.
- **Energy Stick:** This demo is an open circuit, and in order to close it you have to form a human chain to complete the circuit. When you do so the circuit lights up and makes sound. See photos below for example.
- **Gravity Ball:** This demo times the falling time of a dropped ball. With this demo you can show that gravity is constant by calculating  $g$  by the time falling.
- **Shipping and Handling:** We ordered all of our demos from Arbor Scientific, and we had them shipped to our campus.

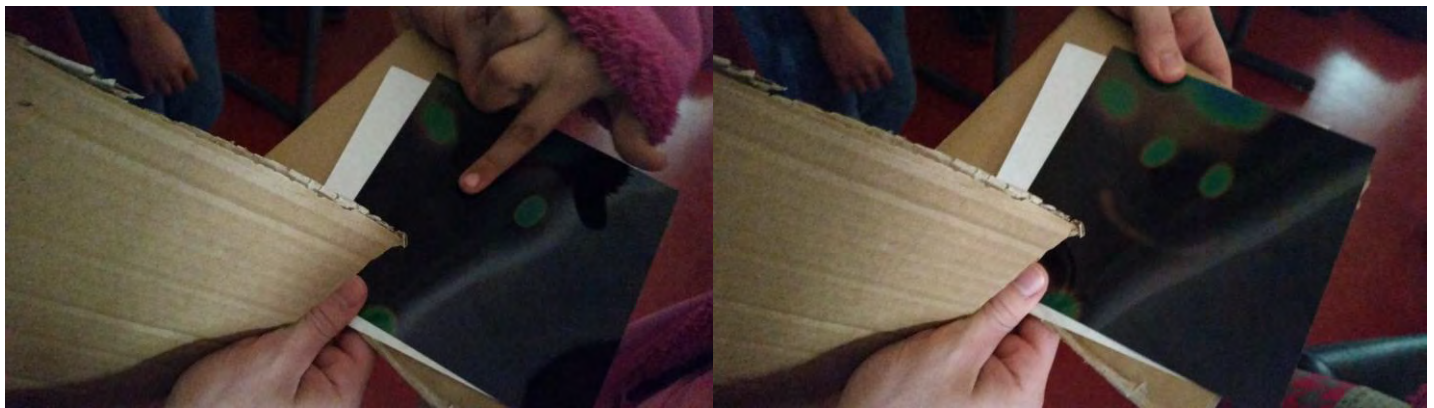
### Expenditure Table

Item	Please explain how this expense relates to your project as outlined in your proposal.	Cost
Liquid Crystal Paper	Thermodynamics Demonstration	\$10.95
Galileos Thermometer Fahrenheit	Thermodynamics Demonstration	\$19.00
Laser Viewing Tank	Optics Demonstration	\$85.00
Bell Jar and Ringer	Sound Demonstration	\$99.00
Energy Stick	Circuit Demonstration	\$23.97
Gravity Ball	Kinematics Demonstration	\$35.00
Shipping and Handling	Price to ship demos to Minneapolis	\$18.72
<b>Total of Expenses</b>		<b>\$291.64</b>

## Activity Photos



Demonstration of total internal reflection using a laser viewing tank.



A young volunteer learns about heat activated liquid crystal paper by making a smiley face with her finger.



Outreach Coordinator, Rebecca McLaughlin, demonstrates how to complete a circuit by using the human body as bridge for the current to pass through.

