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

Marsh White Award Report Template

Instructions: Please complete each section after reading the purple text describing what should be in that section. Then delete the purple text.

Project Proposal Title	Sounds Around
Name of School	University of Maryland- College Park
SPS Chapter Number	4155
Project Lead (name then email address)	Kevin Cheriyan, cheriyan@umd.edu
Additional Project Leads (two lists: names then emails)	Donna Hammer, dhammer@umd.edu
SPS Chapter Advisor	Donna Hammer
Total Amount Received from SPS	$300
Total Amount Expended from SPS	-

Summary of Award Activities

The University of Maryland SPS chapter was asked by the Port Discovery Museum in Baltimore, MD to help them develop a physics section to add to their Percussion Garden exhibit. Since the museum didn't have any means to fund this, our chapter used the Marsh W. White Award to buy materials and tools to build several demonstrations that will introduce the physics of sound to children under the age of 10. Due to the prolonged nature of this project, and difficulty in assigning meeting times that are convenient for both museum officials and our students, this report only covers the project as it exists now, incomplete. As the project is expected to be done around January, we will submit a more complete version of the report then.

Statement of Activity

Overview of Award Activity

The project consists of 3 different demonstrations. These will be displayed in the Percussion Garden exhibit at the Port Discovery Museum. As it exists now, the Percussion Garden consists of found objects that Daveed Kurup, the person in charge, has repurposed as musical instruments. Children who are visitors to the museum have been using it to make various sounds and noises. The demonstrations that we install will supplement the theme of the exhibit by explaining how sound is made and heard. We are also developing and providing signage for the demonstrations in order to explain the physics of the exhibit.
The three demonstrations we are building are:

1. Wave machine
   This is a Shive machine that demonstrates how waves travel in a medium. We have ordered packets of wooden dowels and rubber plugs, along with other accessories that would help us build this machine. A sign that we designed and wrote would accompany the demo, explaining how it works and what it shows.
2. Standing Chime
   This is the demonstration that would greet visitors to the exhibit. This consists of chimes that are of various lengths and diameters. Visitors can whack the chimes to hear the different tones and notes. A sign next to the demo would explain how this demo works and why the lengths and diameters of the tubes affect the notes that they produce.
3. Human Ear/Sound Wave demo
   This is a demonstration that helps the viewer connect the concepts of propagation of sound waves and perception by the ear. We will have a slinky that is attached to a case barely touching a model of the human ear. The slinky represents sound waves that are traveling in the direction of the ear. Children will have the ability to move the slinky to watch it move. The model ear will be printed from a 3D printer. The entire demo will be cased in a Plexiglas box, with an opening to control the slinky by hand.

   The target audience will mostly be children under 10 years old, and their parents. We were very cautious in picking which physics concepts to emphasize in our demonstrations, since children could get discouraged by more abstract topics. We made sure to pick the most fundamental ideas about the physics of sound, all of them dealing with the wave nature.
   The SPS chapter teamed up the American Meteorological Society chapter at UMD to design signage for some of the weather-related percussion pieces at the museum. These pieces were already a part of the exhibit and included rain sticks, ocean drums, monsoon poles, etc. We thought it would be helpful to have the science behind the related weather concept explained by students who are as passionate about weather as SPS is about physics. Hence, we decided to ask AMS to help with our project.

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

The demonstrations that we are building for the Percussion Garden will reach thousands of children who visit the museum on a yearly basis. We hope that by showing demonstrations that explain how sound works, children will be more encouraged to ask how other aspects of nature works.

Key Metrics and Reflection

Please answer the questions below. Please indicate if a question is not applicable to your project.

Who was the target audience of your project?	Children under age 10 and their parents
How many attendees/participants were directly impacted by your project? Please describe them (for example "50 third grade students" or "25 families").	Since the museum gets thousands of children as visitors each year, we estimate that all of them should be directly impacted by our project. A more accurate number can be given in the final report.
How many students from your SPS chapter were involved in the activity, and in what capacity?	4 students were actively involved with attending weekly meetings that discussed planning. As we start installing our demonstrations at the museum, we expect more of our members to get involved.
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?	Although we have not used all the provided funding yet, it is probable that having access to more funds would have allowed us to make the project bigger with more demonstrations and lessons.
Do you anticipate repeating this project/activity/event in the future, or having a follow-up project/activity/event? If yes, please describe.	We expect this project to be done no later than two months from submission of this report. Afterwards, we plan on making periodical visits to the museum to gauge the visitors' satisfaction, and to perhaps host shows that demonstrate other concepts in physics.
What new relationships did you build through this project?	The SPS chapter at UMD is now acquainted with our friends at the AMS chapter. We hope to collaborate more in the future.
If you were to do your project again, what would you do differently?	N/A

Press Coverage (if applicable)

This will be determined at the time of installation, which has been pushed back due to commitments here as well as the timing of the exhibit moving spaces within the museum in the spring.

Expenditures

Please provide a brief explanation of your expenses. Include a written description of your expenditures below, those covered by your SPS funding and by other funding sources, and then fill in the table with the name and cost of each item purchased with your SPS funding. Add rows as needed.

Expenditure Table

Item	Cost
Birch Dowels (1/4 inch diameter) Pack of 25	$14
Tapered Round Plugs pack of 50	$13
Erlenmeyer Flasks	$30
3D Printed Human Ear	$10
Aluminum rods, hollow (1/4 inch)	$25
Aluminum rods, hollow (1/2 inch)	$28
Aluminum rods, hollow (1inch)	$30
Aluminum rods, hollow (2 inch)	$45
Carabiner Hooks	$7
Transportation costs, gas to-and-from museum	$60
Plexiglas	$40
Addiitonal tech shop time, materials, and labor	Matched
Total of Expenses to Award	$302

Activity Photos

Figure 1: Planning for the Percussion Garden. From left, Kevin Cheriyan, Austin Gerrety, Robert Rienstra, AMS liaison Grace Duke, Kevin Dunlap, Delilah Gates, and SPS faculty advisor Donna Hammer

Figure 2: Rain sticks and Monsoon poles ready for play at the Percussion Garden.

Figure 3: Percussion Garden Director Daveed Korup demonstrating the Tubulum Tree to visiting SPS members.

Figure 4: The rest of Percussion Garden, as it is now.

Figure 5: We plan on hanging our chime demo from this balcony. Visitors will immediately be greeted with the hanging chimes demonstration.

Figure 6: 3D-printed ears to be used for slinky/ear demo.

Figure 7: A prototype of the slinky for the slinky/ear demo.

Figure 8: Delilah Gates cutting metal bars for use as stands in the slinky/ear demo.

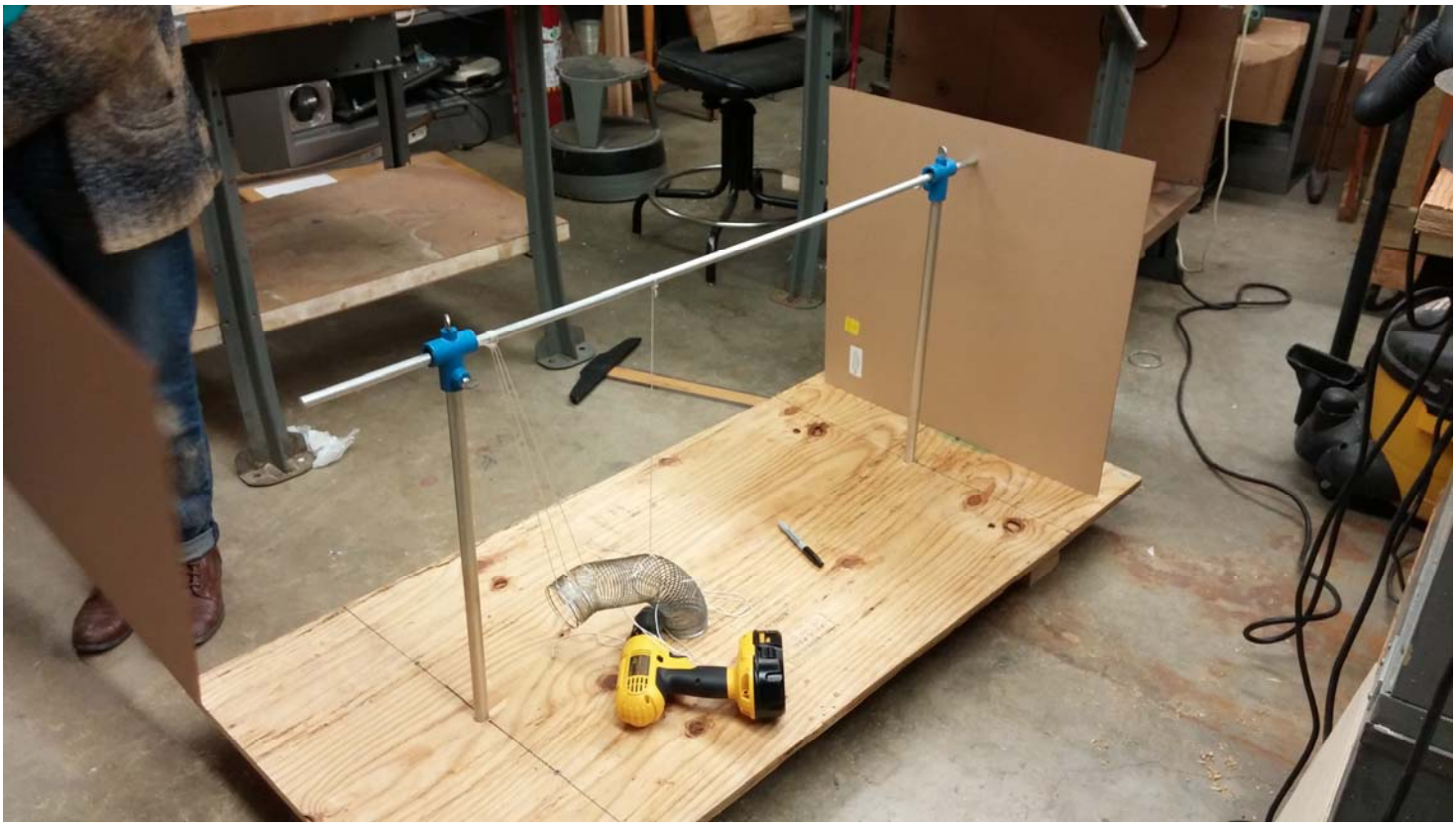

Figure 9: The demo, almost finished. Yet to complete is a plexiglas casing and stronger strings for the slinky.

Figure 10: Austin Gerrety and Delilah Gates holding the completed wave machine.

Figure 11: Delilah Gates constructing the base for the slinky/ear demo.

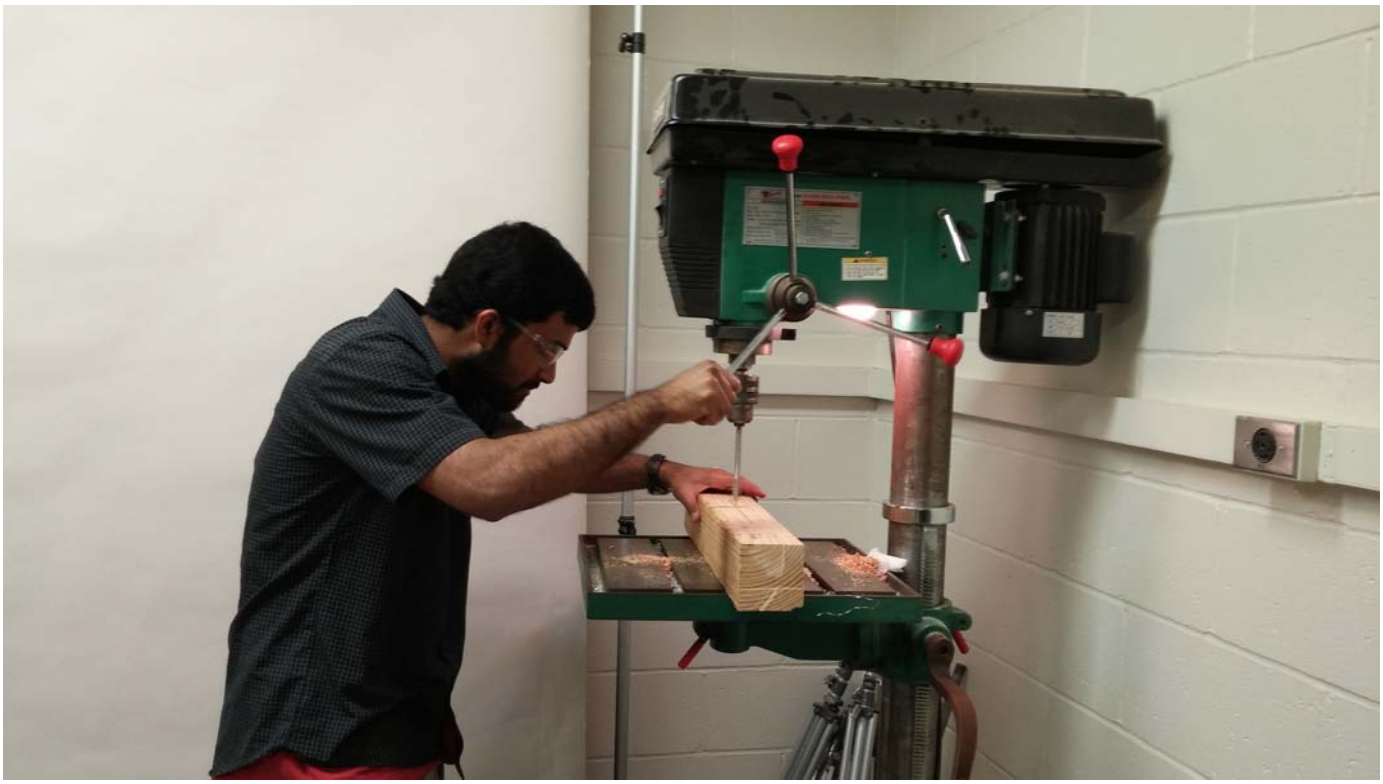

Figure 12: Kevin Cheriyan drilling holes into the plywood used as base in the slinky/ear demo.

If you have any questions, please contact the SPS National Office Staff
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