



# SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

## Future Faces of Physics Award Proposal

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Project Proposal Title	Undulating into the Future of Public Pendulums
Name of School	University of Texas at San Antonio
SPS Chapter Number	Chapter# 7272
Total Amount Requested	\$100.00

### Abstract

Building and demonstrating pendulums in partnership with the Society for Advancement of Chicanos and Native Americans in Science chapter will expand our reach of science to a minority within the physics community. We will focus on making a positive impact in the student demographic here at the University of Texas at San Antonio with these public demonstrations.

# Proposal Statement

## Overview of Proposed Project/Activity/Event

### Description:

This project can be split into two sub projects: A short term project, the wave pendulums and a long term project, the short Foucault pendulum. The wave pendulums would be a current project that will be in partnership with the local SACNAS chapter, while the short Foucault pendulum will be a longterm research and developmental project. The wave pendulums will be portable pendulums that can be easily moved to a location where it is needed. For example, a volunteer event at a local library or science fair to exhibit the concept in physics. The short Foucault pendulum is a project that will establish the SPS chapter, and the SACNAS chapter at the university and be a public installment to inspire the beauty of the sciences to all those on campus.

### Goals:

The main goal for our chapter at The University of Texas at San Antonio is to inspire even the most timid of the student scientists to be more involved in the scientific community. UTSA is a Hispanic Serving Institution (HSI) and we would like to build on that idea to include an under represented minority here at UTSA. The minority is only about 20% of the physics community, based upon [UTSA student demographics](#). Building these demonstrations will allow this chapter of SPS to network with other student organizations, such as SACNAS, expand its reach to the general student populace, and allow current members to acquire the skills of leadership that they will need later on in their future. A simple daily demonstration or permanent installment will build a relationship between the scientific community and the general student body and increase general knowledge of science to our community. Helping to inspire others will allow the SPS chapter to grow, which in turn, will expand the horizons of the chapter.

### Intended Audience:

The simple yet informative nature of this project will be focused toward the general student populace hoping to draw more minorities into the science community. With partnerships like SACNAS, the chapter will have resources to help aid in accommodating to that minority. The chapter hopes to build a positive relationship with the community, and the most opportune time to do so is between classes. A simple, yet interesting, demonstration will draw students to the chapter giving us the opportunity to extend our services of tutoring, leadership, and scientific opportunities. Bringing science to the people will allow us to impact a greater portion of population and establish a routine that will help to connect with the general student populace.

### Background and Motivation:

The wave pendulum has been a popular demonstration amongst the scientific community for its display of concepts in physics. It has sparked motivation within the chapter to build this project because of its simplicity and effectiveness to captivate any audience. It is a project that we can expand upon within the near future as well. Adding LED diodes for displaying phase change and building a battery system for a more long term display will allow the project to be passed on to the future members and officers. The wave pendulum will be the basis for a future, more permanent project, the Foucault pendulum. The Foucault pendulum is a major motivation for the chapter to leave a positive mark on campus for the future of all students. Not only will it be a beautiful installment, it will be a meaningful donation to the university from the students. This portion of the project of course will need more than what is stated here, but the idea would help to build a stronger community that can be drawn from those that help with the wave pendulum. Our chapter has great potential for growth as does our University. We are in the process of becoming a tier-one school, and what better way to add to the university than having a beautiful permanent installment to commemorate science and our SPS chapter.

## How Proposed Activity Promotes Physics Across Cultures

The STEM fields, not only the field of physics, is a tightly knit community within any university. Our goal is to bridge the gap and invite other fields of study to participate in our organization and expand the demographic to equally represent the general student population within the physics community. Science should be open to all those that are interested, and not restricted to those that are brave enough to tread the STEM path.

Having an array of demonstrations that are simple, yet effective to demonstrate a topic in physics, will invite others to inquire more about them and help to break a barrier between the scientific community and the general student populace. Being able to communicate with the general population about scientific works will help to improve their understanding of physics which will improve the population as a whole. Sparking interest within a minority can spread rather quickly. This would allow us to continue growing as an organization and in turn improving the community around us, especially within the minorities.

The wave pendulum is a simple project that is cost effective, interesting to the viewer, and will attract a wide range of audiences. This portable demonstration will help us to spread the passion of physics within our community. Future wave pendulums based upon the one we build can be built with help of the community, outside of physics, as an outreach project.

The Foucault pendulum is a investment for the future of the Society of Physics Students here and on a national scale within the science community. With help from the SPS national organization, this chapter can expand its horizons and help make a positive impact within the student demographic that will forever stand within the UTSA community. Not only would the installment be an investment to the university it will draw more attention to the sciences.

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

### Personnel:

For the wave pendulum project, the SPS and SACNAS chapter, which includes general members and officers, would be in charge of building the pendulums. If successful, it can be turned into a public project in the future where more students can be involved.

For the Foucault pendulum, it would need a much larger work force. The planning and a mock demonstration could be built by the chapter, but for a full scale pendulum one would have to work with the university and its staff. This would allow for a good partnership with other student organizations to make this project a success.

### Marketing:

The project will be a hands on experience. The participants would have a chance to view the phase difference of the pendulums. Making the demonstration hands on will allow for more opportunity to build a relationship between the student population and the organizations.

### SPS Member Participation:

The officers would lead this project in partnership with the local SACNAS chapter. Having a cabinet of 12 officers will allow us to use our resources wisely as well as have more manpower to recruit volunteers from the general members. A conservative expected head count from the general members could be in the range of 5-10 people.

If the Foucault pendulum project is approved a larger scale of students would be needed. We would like to also partner with the much larger Engineering Student Council to make this project possible. Working with the department staff (our advisor, department chair), and student activities will also be required.

### Expertise:

An officer within our SPS chapter is the president of the local SACNAS chapter. Having this officer play an important role in both organizations makes it much easier to coordinate with SACNAS. Having this opportunity to work side by side allows for a greater impact within the student demographic. Also partnering with the Engineering Student Council will allow us to present more opportunities and networking with another influential student organization on campus. There are a few officers that have hands on experience with machinery that may be required to make the larger Foucault pendulum possible. A 3D model can be generated with the expertise of other officers that possess more computer skills. Also using the research found about a Short Foucault Pendulum will help to make this project more realistic.

### Research:

A Short Foucault Pendulum Free of Ellipsoidal Precession. Reinhard A. Schumacher and Brandon Tarbet.  
<http://arxiv.org/pdf/0902.1829v2.pdf>

## Project/Activity/Event Timeline

The wave pendulum would be a short term project that would be completed within the Fall 2013 semester.

- ≡ The projected deadline would be by January of 2014 allowing for enough time to complete this project. This could be done on a weekend if proper planning is maintained.
- ≡ With the two organizations, or a mix of a few officers and a few general members from either organization, the project will take no longer than a few hours to construct.

The Foucault Pendulum would be a long term project with hopes to be completed within a year of proposal. If started in the Spring 2014 semester it would be completed within that year ending in Spring 2015.

- ≡ Funding and materials would be discussed with the chapter and our advisor. After an agreement has been reached a computational model can be made.
- ≡ The chapter will construct a model within a 3D computer program during the first month of the timeline.
- ≡ A consult with the Engineering Student Council and will allow us to make any corrections.
- ≡ Within the second to third month of the project we will have a structured plan to propose to our advisor, the department chair and student activities to donate the pendulum to the university and to find a permanent place for the pendulum.
- ≡ If additional funding is needed, fundraisers and donations will be requested. We host Liquid Nitrogen Ice Cream as our staple fundraiser, and we plan to partner with the national SPS and local business to receive funding.
- ≡ By the forth and fifth months of this project we will raise funds if needed, or start on the construction of the proposed project.
- ≡ Depending on the number of hours worked, the pendulum will take five to seven months to complete.

## Activity Evaluation Plan

The success of the project can be measured in the number of new members to SPS chapter and through surveys for the general populace. Affecting the student demographic will take time, but as a start we can help find opportunities for those students, especially the minorities. Partnering with other student organizations, like SACNAS, will allow us to improve the relations with a portion of the minority population. Having a routine and recognition within the community will allow us to build a relationship with the students and faculty. Since the wave pendulum project will be a hands on experience we can communicate with the participants right then and there.

The Foucault Pendulum project's success will be measured in the impact it has on the community. Showcasing the partnerships with other student organizations may help to invite minorities into the STEM fields. Having the installment in a public place will draw more students to the area as well as inform them about physics and those student organizations. A survey can be completed before and after construction to poll how it has impacted the community and student demographic.

## Budget Justification

The materials required are listed below:

Steel Orb ( $\frac{3}{4}$ " diameter)
Aluminum Flat Bar (3ft x $\frac{3}{4}$ " )
Nylon Rope (by the foot)
Handles for carrying
2x4 Wood Lumber (for frame)
Plywood $\frac{3}{4}$ ' x 4 x 8 Pine (for base)

- ≡ The orbs will act as the masses for the pendulum.
- ≡ The aluminum flat bar is the support bar where the pendulums will be hung.
- ≡ The handles will make it portable to carry and will be attached to the plywood base.

As described in the budget spreadsheet, one wave pendulum should cost around \$50.00. Requesting \$100.00 will allow two pendulums to be built to expand the uses of these pendulums for both the SPS chapter and the SACNAS chapter. Several members of this chapter have power tools and work space available to cut down on the cost of other needed supplies.

With the remaining funds, we can start to plan for the Foucault Pendulum. With the future in mind, our chapter in partnership with other student organizations, can help spread the passion we have for physics to the surrounding community, positively impact the student demographic, and grow as an organization.