



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	Outreach and Inreach - Building the TLU SPS Phenomenal Physics Outreach Program
Name of School	Texas Lutheran University
SPS Chapter Number	7209
Total Amount Requested	300.00

Abstract

TLU's Society of Physics Students was born in 1999 when the physics department had only one faculty member. It was not until 2010 when TLU installed its own Sigma Pi Sigma chapter. With the addition of new faculty, the physics department started a "family physics fun night" three years ago, aimed at providing outreach to younger students and to the local community. This year, for the first time, the event became an SPS event, with the addition of a public lecture in physics. Family physics fun night proved to be a great success with more than four-hundred people of all ages coming and leaving more educated and having the chance to see how much fun physics is and can be. This was a great start to building community in the physics department for students and making SPS known on our campus and in the community. With this award, we hope to capitalize on this recent boost to our SPS program by expanding our capacity to do outreach in our community.

Proposal Statement

Overview of Proposed Project/Activity/Event

TLU's Society of Physics Students was born in 1999 when the physics department had only a single faculty member, Dr. Lorne Davis. It was not until 2010 when TLU installed its own Sigma Pi Sigma chapter. For the past three years the TLU Physics Department has hosted a "family physics fun night" to provide outreach to younger students and members of the local and regional communities with the goal of generating interest in physics. With a small faculty, the only way to make the event happen was to engage the efforts of many TLU students inside and outside of the physics department. This year's event was much grander than in the previous two years, with four main topical "stations", each with several hands-on demonstrations. Each of the stations were set up and facilitated by student volunteers, many of them SPS members. Students are required to present their stations to faculty mentors prior to the event. Many of the activity stations were built or created by TLU students. A crowd of over 400 people engaged with the TLU students throughout the night. The student presenters were mostly physics majors, but many have other majors, but are currently in physics course.

For the first time, our growing SPS chapter took on an ownership of this event. Students gladly gave much of their time and focus not just before the event but also during the event to make Family Physics Night a big success. The SPS officers presented large group demonstrations, something we had never done before, at various times during the night. The enthusiastic crowd of people gathered to see demonstrations such as cloud in a bottle, the nitrogen cloud and a nitrogen explosion. The night was successful, not only for the crowd of all ages who left a little more educated about physics and witnessing how much fun physics is and can be, but also for the more than 25 TLU students who volunteered as presenters and left with a new energy for being physics students.

The project we propose is to capitalize on this new energy in our SPS chapter. We have never done any outreach and now have a new faculty mentor with years of experience who can help us build up our capacity to bring physics to the community and to our campus. We propose to use the Marsh White funding for several new pieces of demonstration apparatus so that we can have a fun and educational physics presence in our community and on our campus.

How Proposed Activity Promotes Interest in Physics

Our major goals are to expand on the number and variety of demonstrations we have for events like family physics night and to be able to present physics demonstrations in other venues, like the regional public schools. Another goal is to increase the engagement of our physics students and increase the number of students that participate in SPS at TLU. Finally, we will also develop a new-to-the-demo-show Presenters Handbook with the help of our new advisor. All the participants in our recent Family Physics night got really excited about the few demonstrations that we presented. We want to increase the range of demonstrations we have in order to generate more excitement from TLU physics students, along with our audiences. Like a comedian changing his jokes we would like to increase the variability of demonstrations at different events. This will keep onlookers interested and prevent them from tiring of the same old thing. Secondly, until the last couple of years the involvement in TLU SPS has been limited. Instead of feeling satisfactory about the recent incline, we wish to push forward and keep building the

enthusiasm of students so that SPS can grow in the coming years. Due to the considerable benefits SPS gives to students we feel that this is a must.

Finally we would like to develop a presenter's handbook. This handbook would outline everything a demo-show/family physics fun night presenter would need in order to successfully present. As you may well know in physics we do not just perform events but explain why they happen. It is science and therefore it must be explained. With a handbook for people that are new to presenting, they will in turn have a good outline on how to explain to and approach different audiences. We feel this will be a long lasting benefit of our effort to grown our SPS outreach and our chapter in general.

Plan for Carrying Out Proposed Project/Activity/Event

Two of the major demonstrations that we would like to build with this funding are

- a sizeable Ruben's Tube
- a Vacuum Canon.

These would be prime additions to demonstrations that we already have.

We now have a strong cadre about 12-15 students who are regularly attending SPS meetings, and enthusiastic about growing outreach opportunities. One of our active SPS members is a machinist, and has agreed to take on the drilling of holes in the gas pipe for the Ruben's tube. During one of our recent meetings we watched some video from other SPS chapters who had made both of these demonstrations and thing that these would be exciting to add to our budding collection.

In the upcoming semester we plan on doing two outreach events, one for elementary school students and one for high school students. For the elementary school students the goal would be to get their young minds excited and curious about physics and allow them to see the exciting side of physics rather than succumbing to the rumors about how "hard" physics is. We want to show the students in Seguin and in the many surrounding rural communities the true underlying beauty of some simple physics principles, like standing waves and atmospheric pressure. For high school students the goal will be to expand their knowledge upon what they may have already learned. By doing the outreach demonstration show, they will be able to see real world application to their education and see physics from a perspective outside of a textbook. The TLU faculty has already met with local school district officials and they are very excited. We live in a region with large populations of groups underrepresented in physics, making our efforts even more important. By reaching out the community we will be able to show them that we want to play a bigger role in how it evolves and expands in its upcoming years. By being a bystander nothing gets accomplished and that is not what TLU SPS is all about!

We are also lucky to have an experienced SPS advisor join our department. With her years of outreach experience at all levels, we know that we will be successful in growing our outreach program and engaging more students to get involved with SPS.

Project/Activity/Event Timeline

We have already started planning our next outreach event. We will be making our new demos in February, with our outreach presentations in March. We hope to have elementary school students come to our department (on a field trip). We already have planned to take our outreach to Seguin High school. We think that bringing TLU SPS to the high school campus will be more impactful to students in building long lasting

relationships. If all goes well, maybe this can become a regular visit to explore all kinds of physics fun.

Activity Evaluation Plan

We will gauge our success by gathering feedback after the presentations from both students and their teachers. For the high school visits, we plan to send a pre-visit survey that we hope will give us an idea of the attitudes of the students about physics, and then a follow up survey to see if the students have any attitude shifts after interacting with TLU SPS students.

By going into the community and having the community come to us at least two times before next fall, we hope to see an increase in the number of attendees at Family Physics Night.

Budget Justification

We request funds for supplies to build two new demonstrations. We obtained cost estimates from local/online suppliers. Other necessary tools/materials will be supplied by the TLU Physics Department.

Vacuum Cannon: We will purchase schedule 40 clear PVC pipe and fittings to construct the supersonic flow nozzle. PVC pipe forms the cannon barrel; fittings enclose the pipe and connect to the vacuum pump. We have a mechanical vacuum pump and vacuum hose.

Ruben's Tube: We will purchase gas pipe, pipe fittings, a small amplifier (speaker), materials to make a custom mount to connect the speaker to the gas pipe, and a propane tank. We also request funds for safety materials, including plexiglass for a shield that separates flames from onlookers. Fittings are needed to supply gas from the propane can into the pipe. No funding is requested for services to drill holes. One of our SPS members works for a local machine shop. His employer has agreed to donate milling machine time to drill holes. The amplifier/speaker will provide the sound wave for the Ruben's tube to operate and demonstrate standing waves. The custom mount keeps the speaker in place and not in direct contact with the propane inside the tube. The safety shield reduced unwanted air currents and keep attendees from interacting with the fire.

Printed Materials: We request funds to develop and print a "new presenter handbook" for students new to outreach and to print small handouts to leave with the students we visit. We anticipate sharing the new presenter's handbook with the larger SPS community. We request \$50 for paper and printing to make about 25 handbooks and 200 handouts.

Overall Justification: Adding two exciting new demonstrations will help our SPS chapter grow as we work on a team project and allow us to start interacting more with the campus and surrounding community.