



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

Marsh W. White Award Proposal

Project Proposal Title	NMT Ballistics Bonanza, and Other Outreach
Name of School	New Mexico Institute of Mining and Technology
SPS Chapter Number	4742
Total Amount Requested	\$500.00

Abstract

The New Mexico Institute of Mining and Technology chapter of the Society of Physics Students proposes to extend the range of its outreach activities to schools in the surrounding rural communities, with intent to bring them together at a final Ballistics Bonanza featuring NMT SPS's trademark trebuchet, the LOBSTER.



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Proposal Statement

Overview of Proposed Project/Activity/Event

The project will consist of a number of outreach events brought to rural New Mexico communities (nominally three or more), concluded by a final event near the end of the Spring 2016 semester at New Mexico Tech open to the public featuring our normal plethora of demonstrations in addition to NMT SPS's newly refurbished trebuchet, the LOBSTER (Long-range Optimized Ballistic Sexy Trebuchet Extra Red). The purpose of these activities is to promote interest in and knowledge of physics among the students of southwest New Mexico. The communities of Carrizozo, Bernallilo, Ruidoso, Alamogordo, Pie Town, Truth or Consequences, Belen, Los Lunas, and Magdalena are all being considered as outreach destinations; the exact locations will be determined over winter break. NMT SPS officers will coordinate with school administrators in each of the decided locations to reach as many students in our visit as possible.

NMT SPS is already known for its plethora of demonstrations, including LN2 demos, a Van de Graaff generator, a Wimshurst machine, a Tesla coil, a Ruben's Tube, and a bed of nails + cinder block demo, among others. We regularly bring these to local schools and demonstrate them to visiting students, but due to limited funding have not been able to bring them abroad to communities outside the range of other SPS chapters. Through this award, we seek to enable ourselves to do so. We estimate that each visit will impact at least 30 students in the visited communities; assuming over three visits, this project will easily impact over 100 students in rural New Mexico, in addition to any students who attend the final Ballistics Bonanza.

How Proposed Activity Promotes Interest in Physics

Demonstrations are highly regarded by both students and instructors as an exciting and educational way to promote interest in and excitement for physics and other STEM fields. The NMT chapter of SPS is well-equipped with a plethora of demonstrations ranging from mechanics, to optics, to thermodynamics, to electromagnetism; by bringing these abroad to small communities without access to such resources, we hope to show just how exciting and spectacular physics can be, in all its forms. Our demonstrations usually consist of either booths (at discovery festivals or school recruiting/exploration events) or presentations coupled with hands-on activities such as investigating a Van de Graaff generator or building a cell phone spectrometer and can last anywhere between 30 minutes and 2 hours, depending on what topics we want to cover and how much time is available. During our outreach trips under this project, we will aim for a minimum of 2-hour interactive presentations at one or more schools in each community, covering as many topics as feasibly possible without sacrificing quality to speed. In doing so, we hope to make students familiar with and excited about physics in several of its forms.

Plan for Carrying Out Proposed Project/Activity/Event

Personnel - The NMT SPS officers (president, vice president, secretary, treasurer, and webmaster) will be in charge of coordinating the event, with minor assistance from the chapter advisor. At least a week prior to each outreach event, the chapter will be reminded of the event and volunteers will be found to help man the event.



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Our demonstrations are structured such that a single person could run a 30-minute demo with only minor preparation; we have a couple of manuals and pre-built presentations at the ready. Ideally, this will not be necessary; in the past, NMT SPS has consistently been able to man outreach events with four or more volunteers each, and next semester should be no different.

Marketing - Initial contact to coordinate the outreach events will be performed largely by the NMT SPS president and vice president; the secretary, treasurer and webmaster will keep records and put together articles for our website and Facebook page documenting our progress. The final outreach event will be advertised both at the outreach events and by fliers, Facebook posts, and community calendar postings by the secretary, treasurer and webmaster. The president and vice president will work to ensure that the event is adequately prepared for in terms of demonstrations, resources, and venue.

SPS member participation - In total, there should be at least 15 NMT SPS members involved in some capacity or another in this project, whether through volunteering in the outreach trips or helping with the final event. The Community College of New Mexico (CNM) Physics League has previously expressed interest in assisting with any trebuchet-related outreach; they will be contacted and asked to help with the final event. They are currently in the process of submitting an SPS chapter establishment proposal for CNM, so they may very well be SPS members by the time the final event rolls around.

Expertise - NMT SPS's primary purpose is, according to our constitution, science outreach. As such, our members already have varying degrees of expertise in delivering exciting demonstrations to a variety of ages and audiences, presenting them in such a way that the spectacle remains, but the mystery is replaced with an understanding of the physical concepts behind the demonstrations. This expertise will be leveraged and built upon throughout the project.

Project/Activity/Event Timeline

- Target communities will be identified by the beginning of the spring semester (Jan 17) by NMT SPS officers.
- School teachers and administrators will be contacted by email at or prior to this deadline. If there is no response, a second email and phone call will be attempted a week afterward. If these receive no response, a different official or different community will be selected and the process repeated.
- Outreach visits will be scheduled in accordance with NMT SPS's schedule and the target school's schedule as soon as possible after the school officials are contacted. The outreach trips should all be scheduled for February, March, and early April.
- Once all outreach trips are scheduled (by the end of February), the final Ballistics Bonanza will be scheduled for a weekend in April; marketing and advertisement of this event will commence immediately thereafter, ramping up as the date approaches.

Once the final event is complete, the records for all outreach activities funded by the Marsh White proposal will be collected, written into a report, and submitted to SPS National within a week of the final event.

Activity Evaluation Plan



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Administrators and teachers at the schools visited will each be asked to fill out a short survey detailing what they liked or did not like about the outreach event, whether or not they thought it benefited their students, and whether they would be interested in future visits, and if so, what they would like changed for the next visit. These surveys in addition to careful records kept by NMT SPS officers will be used to determine whether or not the outreach activities were completed to satisfaction. The final event will be judged by how many members of the public, particularly those from visited schools in Socorro and the surrounding communities, attend.

Budget Justification

- LN2 Dewar Refills: Our LN2 demonstrations will consume a considerable amount; we estimate that we will need to refill the department's dewar twice, at a cost of \$70 for 30L.
- Pumpkins and melons are used as ammunition for the trebuchet and air cannon. These will be used in the final Ballistics Bonanza to study the relative efficiency and effectiveness of the air cannon and trebuchet.
- Ping pong balls are used in both the ping pong vacuum cannon and in liquid nitrogen demonstrations; we estimate that we will consume 30 over the course of the semester.
- Racquetballs are consumed during liquid nitrogen and ballistics demos; we estimate that we will consume 20 over the course of the semester.
- Cinder blocks are used as both general-purpose weights and consumed in our bed of nails/cinder block demonstration.
- Flowers are consumed in our liquid nitrogen demonstrations.
- We require a short-range travel budget to offset gas costs; the given rate of 50c/mile will support either two vehicles or one vehicle towing the trebuchet.

Other resources necessary for the outreach activities are volunteers from NMT SPS and the demonstrations already collected over the course of NMT SPS's history, among some borrowed from the NMT Physics Department. Liquid nitrogen ice cream may be made during the final event; if so, the ingredients other than liquid nitrogen will be funded by club fundraising.