



# 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	3...2...1...Blast off! It really is rocket science.
Name of School	Henderson State University
SPS Chapter Number	<b>2798</b>
Total Amount Requested	\$400.50

### Abstract

3...2...1...Blast off! brings rocket science to low-income, minority, and female high school students, introducing them to the excitement of physics through rocketry. Henderson State University's SPS chapter will hold a workshop for 20 rural-area high school students to introduce them to the fundamentals of flight, culminating in a big launch!

# Proposal Statement

## Overview of Proposed Project/Activity/Event

We propose a project that is exciting, fun, and full of physics. Our project will involve low-income, minority, and female students. This project will be out of this world...well, almost. 3...2...1...Blast off! will introduce students to the exciting physics of rockets.

### **Description:**

We envision 3...2...1...Blast off! as a full-day workshop with 20 low-income, minority, and female high school students. We will begin our morning with an interactive discussion of rockets, rocket design, and the science of how rockets fly. We will perform simple experiments with water and air rockets to see how different variables affect flight.

Our SPS members will work with our guest students so that each student can build their own model rocket kit. Throughout the day, we will emphasize safety, teaching both shop and rocket range safety. Our day will culminate in presentations by the students to their parents and a grand rocket launch!

### **Goals of the Project:**

This project will introduce physics to demographic who does not have the opportunity to explore physics in their own high schools. We will show our guest students that physics is accessible, physics is applicable, and most of all that physics is fun!

Our goals include:

1. Introducing physics to a young audience who would not normally be exposed to this science in high school.
2. Encouraging our young audience to focus on their academic studies and pursue higher education, since many do not have role models who have achieved a college degree.
3. Encouraging expressive thinking and promoting an understanding of the scientific method.
4. Having tons of fun!

### **Intended Audience:**

Our intended audience includes low-income, minority, and female high school students. Our university is based in a primarily rural area of Arkansas. Because of this, we have an Educational Renewal Zone office that is intended to provide resources to many surrounding schools promoting a quality learning environment in districts where funds and resources are often lacking. Our ERZ holds workshops and programs and regularly reaches out to our target demographic for this project. We intend to partner with the ERZ to identify the students who would most benefit from this activity. The director of the ERZ office has assured us of her support.

We will be able to reach 20 students directly through one-on-one interaction with faculty and SPS members during this workshop. In addition, we will be able to impact the participants' families and the surrounding community through the presentations and launch at the conclusion of the event.

### **Background and Motivation:**

Our university recently became involved in high-powered rocketry. Not only is this incredibly exciting, it provides so many opportunities to explore physics, atmospheric science, and engineering design. We have held

a few local model rocket launches and even a model rocket build event. These events appeal to kids of all ages, from our youngest participants in 4<sup>th</sup> and 5<sup>th</sup> grade to our “grown-up” kids. Because of the excitement and appeal of rocketry, we believe this will be a great hook for a target audience of high-school students who generally are not encouraged to pursue science at all. This experience allows anyone to understand what it means to be innovative and scientific.

We have much of the equipment needed for this event already, including: water rocket launches, air rockets and launchers, model rocket launch pads and launch systems.

Bringing 20 underrepresented students to our campus would normally be a challenge, since many of these students live in rural Arkansas, have limited funds, and have limited transportation. We are well-positioned to provide an extraordinary opportunity to these students, since our ERZ office will handle the logistics of the day, from selecting students who would most benefit from the opportunity to ensuring that the students are able to attend. The students who would be involved are those who would normally not see physics in their high school classes. Most of these students have parents who have not attended college. Because of these factors, it is quite possible that without an opportunity like this, members of our target audience might not even know what physics is well into their adult lives.

We are incredibly excited by the possibilities this event represents.

### **How Proposed Activity Promotes Physics Across Cultures**

Our surrounding community consists of many low-income and minority families. Many students who attend our university are first generation college students. We would like to reach those people through this activity. We hope that, by showing these students that women, minorities, and first-generation college students can be successful, we will inspire those who attend.

Throughout the workshop, faculty and SPS members will share their stories, demonstrating that each student has an opportunity to be successful regardless of their background. Rather than considering our backgrounds as a hindrance, we will celebrate the diversity, as it brings new perspective and ideas to the table. Among our members and faculty, we have women, first-generation college students, students from low-income backgrounds, members with disabilities, and minorities. Each of us brings something to the table that springs from our own experiences.

Through this experience, we would like to provide exposure to the excitement of scientific investigation, awareness of a new career field, and inspiration to rural students who rarely have the opportunity to study physics. We would like to strengthen the relationship we hold with our surrounding community and show them that we are a resource. We would like to engender scientific discussion and investigation.

Because of the community we hope to serve, we feel this project is ideal for the goal of the Future Faces of Physics Award: to promote the recruitment and retention of people from groups historically underrepresented in physics.

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

- Our officers Todd Baum, Matthew Taber, and Lena Lazenby will be in charge of coordination of this event in collaboration with our advisor Dr. Clardy.
- SPS members Alex Riddell and Jessy Green are members of the National Association of Rocketry and can add expertise to the event.
- First, we will work with the ERZ office to set a date for the workshop that will work for SPS officers and members, as well as for the high school students. Once the date is set, the ERZ will fill the 20 places with high-school students who fit into at least one of the following categories:
  - Low-income families
  - Minorities
  - Female
- We will publicize the presentations and rocket launch around campus using our CampusQuad app and posters 1 month in advance. We will also publicize this around town at local schools and businesses. We will send an email out campus-wide the day before the launch.
- Next, we will order the rocket kits and engines.
- The engines come in packages of 12. When they arrive, we will use one of the extra rockets to construct it ourselves, so we are fully prepared to guide the high school students through building this particular kit.
- A few days in advance, we will talk to our local pizza place, Big Cheese, and place our lunch order, so everything is set for the workshop.
- On the day of the workshop, we will have at least 5 SPS members (hopefully 10) lead the workshop. We will ask the other science clubs to join us so they can share their stories, meet our guests, and help answer questions.
- The schedule will be set the month before and will be distributed to the participants on the morning they arrive for the workshop, so they will know what to expect for the day. It will probably be something like this:
  - 8:30-9am: Participants gather and have an ice breaker activity
  - 9-9:50am: session on the forces behind rocket flight, including water rocket demonstration
  - 10-10:50am: First model rocket building session (we will have two to allow time for the glue and paint to dry)
  - 11-11:50am: Investigate with water and air rockets – change nose cones and fins. Change fuel amounts. See how this changes the flights.
  - 12-1pm: Lunch Time!
  - 1-1:50pm: Second model rocket building session
  - 2-2:30pm: Students will work together to develop presentations.
  - 2:30-3pm: Students will finish up any last details on their rockets.
  - 3-4pm: Students will present their work and will talk about what they learned.
  - 4pm: Launch time!!!

## Project/Activity/Event Timeline

- Late January, early February – 2 months before the workshop and launch date: The ERZ office will begin contacting schools in the surrounding area and recruiting students who will participate in the workshop.
- February - 1 ½ months before the workshop and launch date: Rocket order will be placed to ensure that there is plenty of time to get it in and make sure everything is as ordered.
- March – 1 month before the event:
  - We will confirm with all student participants and notify them of the schedule.
  - Posters will be placed around campus.
  - We will take posters advertising the launch to local businesses.
- Early April – a few weeks before the event: we will build a rocket kit and make sure we have a clear, complete method for the students.
- Mid-April - 2 Days before the workshop and launch date: SPS officers will contact Big Cheese Pizza to set up our lunch order
- Day before the workshop and launch Date:
  - Email is sent campus-wide to remind everyone of the presentations and launch
  - SPS Members gather and prepare rooms and materials
- Selected Date in mid-April: Workshop and Launch Date
  - SPS Members meet 30 minutes before students gather to ensure everything is ready

## Activity Evaluation Plan

In addition to keeping track of attendance, we will ask the ERZ office to administer a short survey about students awareness of and attitude about physics both before and after the event. We will also ask the ERZ office director for feedback on the project and will use our event evaluation form to make notes about what went well and what could use improvement.

In order to be successful as a chapter event, we would like 5 or more chapter members to participate. In order to be successful for the students we serve, we want to be sure that all 20 spots are filled.

## Budget Justification

We are requesting \$330 for rocket kits and engines. These are the supplies needed, in addition to what we already have. Using model rockets (rather than just water and air rockets) adds an element of excitement and ownership to the project, since each student will be constructing and personalizing their own model rocket.

In addition, we are requesting \$70.50 for pizza and drinks to provide lunch to our workshop participants. Lunchtime serves the dual purpose of feeding hungry students and allowing more time for students to socialize with and get to know our SPS members.

We will provide the materials for water and air rockets, since our chapter already has these items on hand from other outreach activities we have completed. In addition, the ERZ office will provide funds/transportation for the participants to be able to attend the workshop.