

## Future Faces of Physics Award Proposal

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Project Proposal Title	Program for the Inspiration of Physics Students
Name of School	Colorado School of Mines
SPS Chapter Number	1287
Total Amount Requested	\$300.00

### Abstract

Colorado School of Mines' SPS Chapter will present enrichment programs that promote the merits of staying in school, beauties of math and science, the value of a college education, and STEM careers to a rural middle school and an urban high school that both serve predominantly underrepresented students.

# Proposal Statement

## Overview of Proposed Project/Activity/Event

In Spring 2015, Colorado School of Mines' SPS Chapter will make two separate outreach efforts, one to Berry Creek Middle School in rural Edwards, CO, and one to Gateway High School in urban Aurora, CO. Only a very small percentage of students from these schools tend to pursue higher education, and very few of those that do choose to major in STEM fields. We plan to promote the study of physics and STEM fields as fascinating, practical, and realistic options for these students as they begin to consider their future plans, while at the same time providing them resources and information to better consider the merits of a successful STEM academic program. During the Spring 2014 semester, a Future Faces of Physics award allowed over a dozen of our SPS members to present similar enrichment programs at both schools. Both schools, and their students, have insisted that we return again. Additionally, this outreach experience left an indelible mark on many of our senior SPS members which has been shared with many of our newer members.

At both schools, we intend to interact with the students in two principal ways: 1) through interactive and engaging demonstrations of physics principles, and 2) through a more formal presentation of our larger-scale demonstrations and our members' personal insights and advice on education, study habits, and future careers.

We will start each event with an exhibit-style arrangement of many of our smaller and more interactive demonstrations. Over the past six years, our Chapter has developed a substantial library of demonstrations and devices that demonstrate a variety of physical principles that span the physics curriculum from mechanics, temperature and heat, waves, electricity and magnetism, optics, and modern physics. Our experience reveals that having students perform these demonstrations themselves, followed by active discussions with our SPS members, does an excellent job of engaging the students, sparking their curiosity, and getting them genuinely interested in the science behind them.

In addition to these hands-on demonstrations, we will present a larger stage show that will be tailored to each student audience. At Berry Creek Middle School, our presentation will focus on the importance of well-rounded studies, staying in school, and a general overview of the kinds of opportunities available in STEM fields. At Gateway High School, we will discuss the value of a STEM education, and career paths open to STEM graduates. We will also discuss the college application process, financial aid resources, and how to capitalize on opportunities to further their education. Both presentations will be punctuated with displays and discussions of some of our larger and more impressive demonstrations, as we have found this format helps maximize student engagement.

## How Proposed Activity Promotes Physics Across Cultures

In the past decade, there has been an increase in the number of students going to college to study STEM fields. However, we think there is still room for improvement. Though the number of students in engineering schools and majors continues to grow, we have seen that a smaller and smaller percentage of these students are coming from certain demographics and school systems. These underrepresented schools are typically in urban areas where the academic environment is not wholly conducive to a successful transition to higher education. Many of these schools experience dropout rates at more than twice the state average and even lower numbers

continuing on to college. For many of these students, higher education, especially in STEM fields, does not seem like a viable option.

Building on the lessons we learned during our first visits to Berry Creek and Gateway in Spring 2014, our Spring 2015 outreach programs hope to inspire the idea that a STEM career is an attainable and exciting option. Our SPS membership consists of undergraduate and graduate students that span various ages, ethnic groups, nationalities, and race that will help us authentically relate to the middle school and high school students we meet.

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

**Personnel:** Our Vice President of Outreach, Jordan Diemer, in cooperation with our President, Logan Hillberry, will oversee the design, delivery, oversight, and planning of these two events.

**Marketing:** Both events are being carefully marketed in close communication with staff (Vice Principals, math and science teachers, facilities personnel) at both Berry Creek Middle School and Gateway High School. The general consensus is that multiple science classes will spend their class time at our event instead of their normal class activities. Attendance is expected to be about 150-200 students at each event without the need for additional advertisement.

**Member Participation:** In addition to our six SPS Officers, we expect approximately 10 additional SPS members will participate in each event.

**Expertise:** The majority of our members that have volunteered to serve the events are upper division undergraduate students in physics, or graduate students. Their technical knowledge of our demonstrations and experience with prior outreach efforts help us train our lower division SPS members as we serve the secondary school students. Many of our SPS members have been Teaching Assistants in our introductory physics courses which further facilitates our collective ability to discuss underlying principles and explain complex phenomena in simpler terms.

## Project/Activity/Event Timeline

Approximate Date	Activity
Oct 15, 2014	Submit Future Faces of Physics proposal
Nov 2, 2014	SPS Haunted Physics Lab (evaluate demos for future use)
Mid Nov 2014	Re-affirm contacts at Berry Creek MS and Gateway HS; set tentative event dates
Late Nov 2014	Construct and repair demonstrations
Early Jan 2015	Prepare draft presentations for both Berry Creek MS and Gateway HS
Late Jan 2015	Complete demonstration training for newer SPS members
Early Feb 2015	Set and confirm event dates; make logistical arrangements; reserve van
Mar 2015	Weekly planning and rehearsals
Early Apr 2015	Deliver two events
Late Apr 2015	Document activities with Future Faces of Physics report

## Activity Evaluation Plan

As we have done in our past outreach efforts, we will request letters from the students we serve, as well as their school faculty, staff, and administrators that attend our event. These letters give us a direct indication of the thoughts and opinions of our target audience – the students, as well as how we have coordinated our logistics and followed through on our plans. We will consider our efforts successful if the students tend to express not only having enjoyed the event, but a recognition of learning a new concept or idea, interest in pursuing a STEM career, and/or the desire to obtain a higher education, particularly if they had not previously considered doing so. We also intend to have as much personal interaction with the students as possible in order to gauge their response and serve as positive role models.

## Budget Justification

The most significant point of spending in our budget for this event is supplies for a "make and take" demonstration we plan to provide at both events. This will be a small electric motor that the students will get to build with our volunteers and keep after the events. We believe that leaving the students with a demonstration that they can take home with them will give the events a more lasting impact on the students, as it will serve as a reminder of their experience at our event. Funding for supplies for this make and take project comprises 56% of our proposed cost for the event.

19% of the budget is allocated towards supplies needed to run one of our more costly, but rewarding interactive demonstrations on laminar flow, a phenomenon often completely unheard of even in physics classrooms, which we believe is particularly interesting for students to observe and work with. Another 16% of the budget will be used for fuel costs to transport our volunteers and demonstrations to both schools, an obvious necessity. Finally, the remaining 9% is budgeted towards materials needed for constructing two new small demos which will supplement our current library.

In addition to the funds requested in the application, our chapter has invested a large portion of our chapter funds into maintaining and supplementing our current demonstration library. These funds have come from multiple sources, including our local physics department, student organization committee, and student-planned SPS fundraisers.