



# Engaging Tomorrow's Scientists and Engineers

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## Abstract:

There is a growing concern in this country regarding the number of students graduating from university with degrees in fields related to science, technology, engineering, and math. Relative to other nations, the number of U.S. students going into these fields is small, even while the demand for these careers is sharply on the rise. To stay competitive in the modern global economy, we need to focus on getting more children interested and engaged in these fields.

A primary focus of my community involvement at WSU has been working with children in a variety of activities directed towards getting them interested in and excited about science. I have been involved in the Department of Physics' annual Physics Open House, for which I developed an activity wherein children could build and launch their own paper rockets. I have also taken the rocket launcher to second-grade classrooms, so that more children could have the same experience. In addition, I have participated in community outreach with HARBOR, a research team that launches high-altitude balloons carrying scientific equipment to the edge of space to study the effects of particulate matter on the climate. I designed and built a high-vacuum system for the WSU Department of Physics, which has been and will continue to be used by many students for scientific research. The department also plans to use this vacuum system for outreach activities and advanced physics laboratory experiments. Finally, I have taken optics and electronics kits to elementary school classrooms to help teach children about these topics, and I have had the opportunity to judge at elementary, junior-high, and high-school science fairs.

These experiences have led me to believe that the work I am doing has had a significant impact on many children. I have had several meaningful experiences that have impacted me and solidified my commitment to continued service in generating excitement in our next generation about these fields of study.

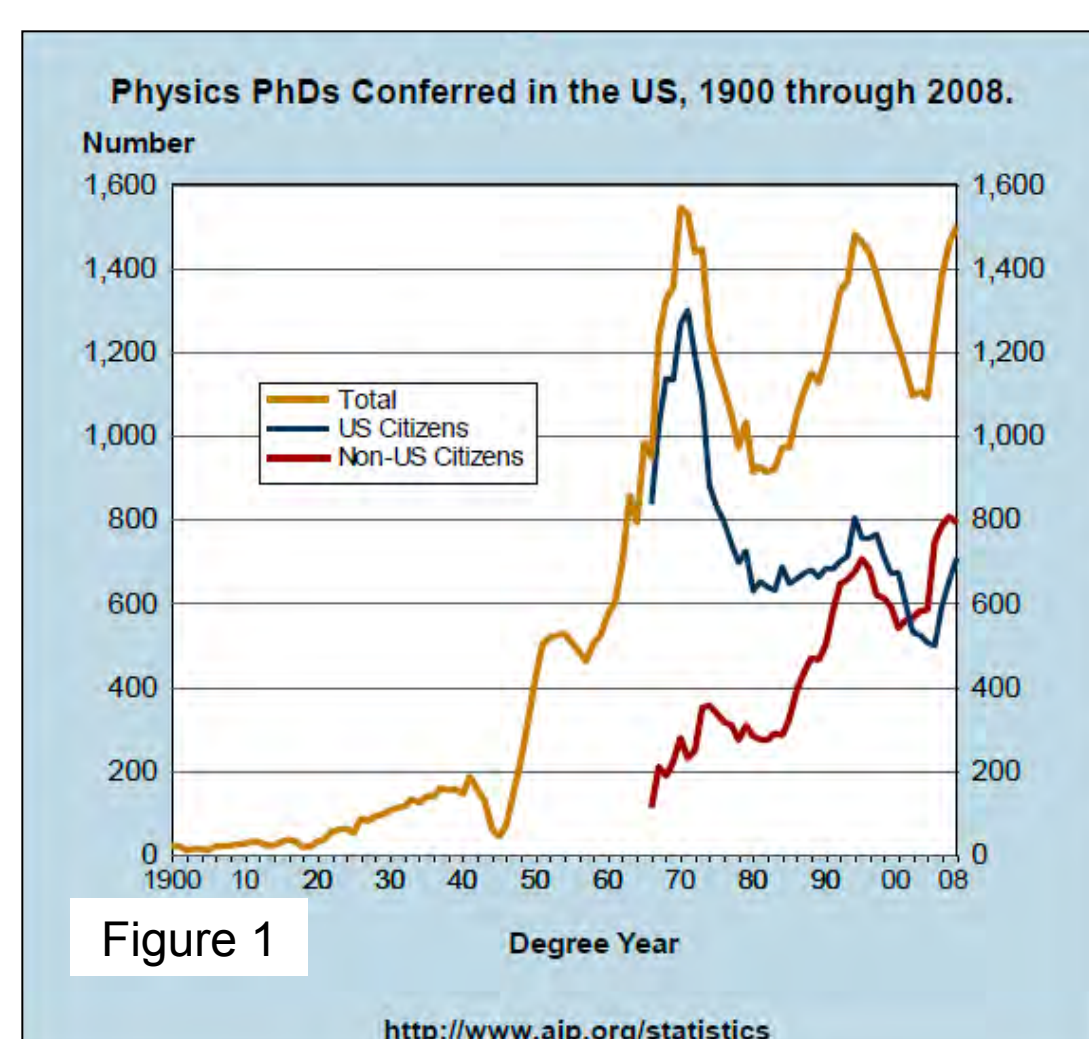
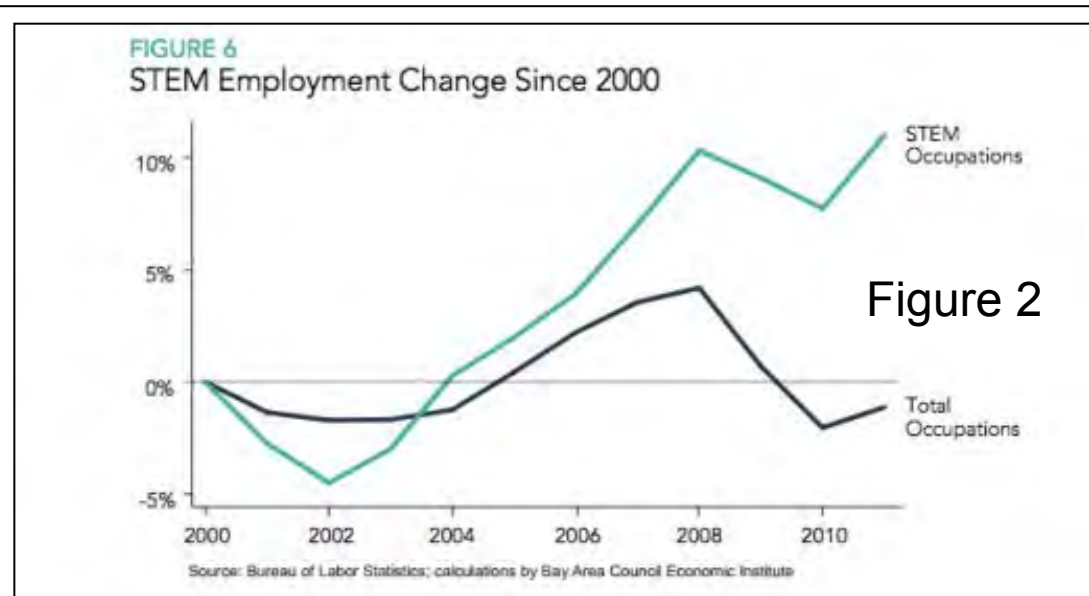


Figure 1: The number of physics graduates in the U.S. declines, while increasing in other countries.

Figure 2: The demand for STEM careers is increasing.



As our country's use of, and advances in, technology increase, so does the demand for STEM occupations. While the percentage of graduates in these fields in relation to other degrees throughout the world increases, the opposite is true in the U.S.

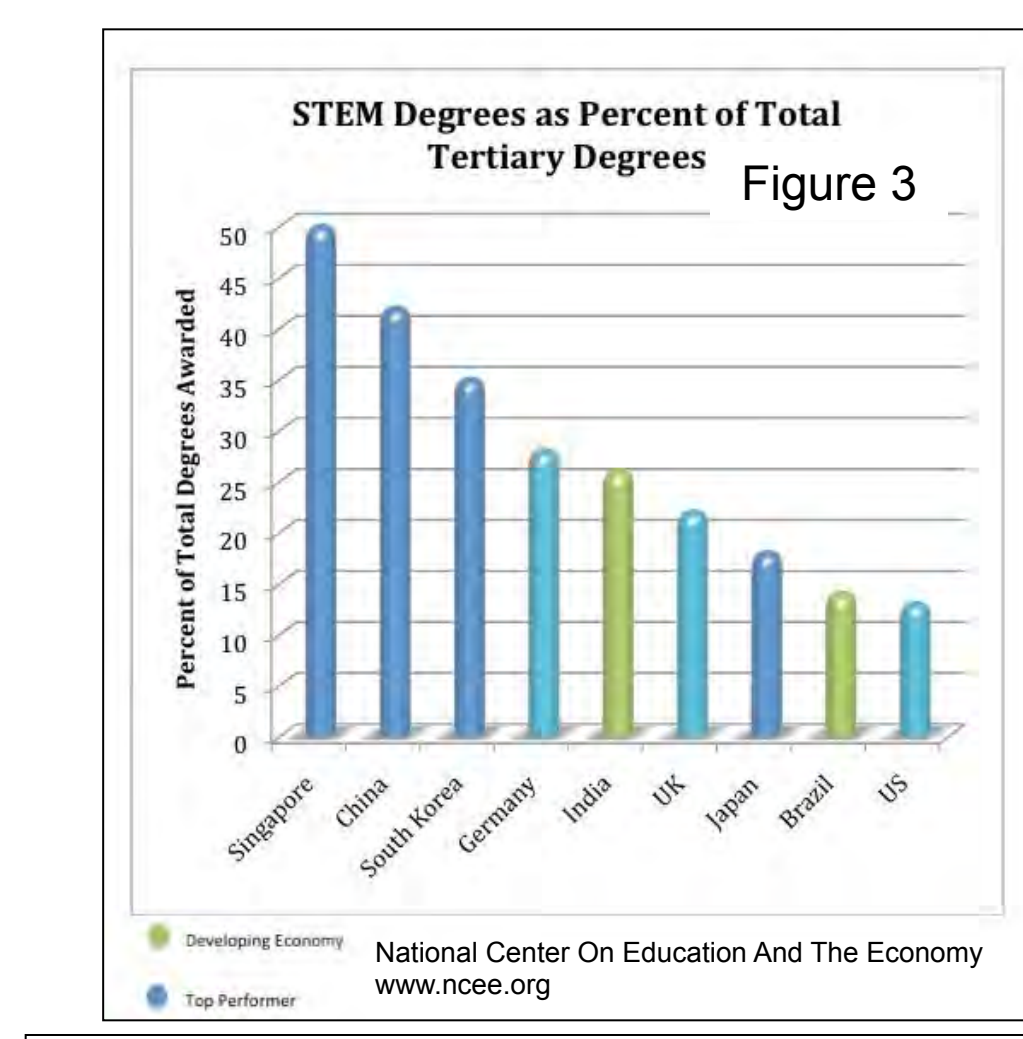


Figure 3: Contrast by percentage of STEM degrees.

## The Ritchey Science Fair

This organization is dedicated to student success. It provides recognition of achievement, opens doors through scholarships and other opportunities, and gives students experiences that lead to careers in science and engineering. It was rewarding to have the opportunity to use my knowledge of physics and engineering to help as a judge, as I believe academic interests should be celebrated. It is uplifting to see so many impressive young people be given the chance succeed.



## Physics Open House



Drawing inspiration from a design I saw during a demonstration at a local carnival, I built a launcher that uses compressed air to launch rockets. The rockets are able to go as high as 200 feet from the ground.

My wife Robyn and I developed a design for the rockets that is made of cardstock and uses a foam tip that allows for safe landings. This design also enables the children to build and their own rockets.

I have used the rocket launcher in several 2<sup>nd</sup>-grade classrooms and Cub Scout activities, as well as at the Fall 2012 WSU annual Physics Open House.

We estimated that more than 400 children built and launched rockets at the open house. According to the

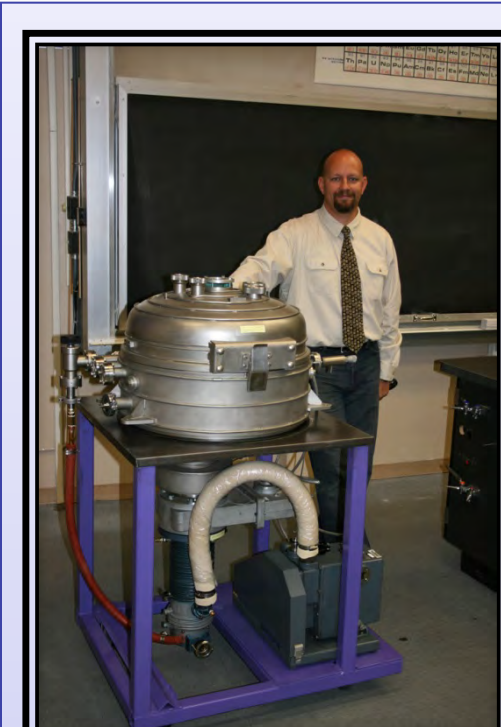
Signpost, the rocket

launch was one of the most popular activities of the entire evening.



## Sucking It Up For Science

This project was focused primarily on creating a system that would be used by other students as well as the Department of Physics. With the assistance of fellow physics major Ian Cox, I designed and built a high-vacuum system with a large and easily accessible chamber that can simulate environments at extreme altitudes.



While this was primarily a research project, the objective was to build a system that could be used by the WSU Department of Physics to contribute to the education and scientific development of university physics students for years to come. The system has already been used by several students for various individual research projects, and the department has plans to use it for lab, outreach, and interdepartmental projects as well. The most satisfying part of this project for me is the extended impact it has had and will hopefully continue to have on my fellow WSU students.

## HARBOR

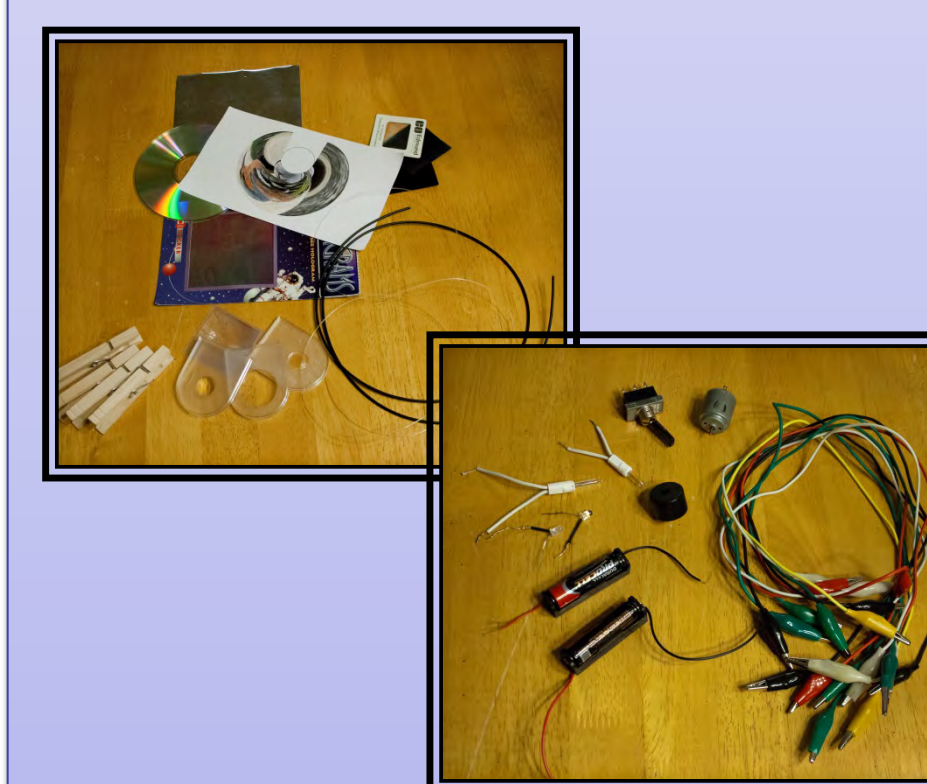


This Image was taken from an actual HARBOR flight.

The High Altitude Reconnaissance Balloon for Outreach and Research team is comprised of a large group of students from many departments who bring their individual projects and ideas together for one common purpose. The team is dedicated to collecting data to better understand the effects of atmospheric particulate matter on climate. The HARBOR team sends scientific instrumentation packages to the edge of space via weather balloon, then tracks and retrieves these packages upon return. The team is continually involved in a variety of outreach projects that promote environmental awareness and generate excitement for scientific research and STEM fields.



## Visiting Classrooms



Electric circuits are part of the 5<sup>th</sup>-grade curriculum in Utah, while 6<sup>th</sup>-graders are required to learn optics. The Department of Physics has kits for both of these subjects, which are used for the annual Physics Open House and other outreach activities.

I have taken these kits to many classrooms in Weber County to help provide an activity that is both fun and educational for children. Teachers have expressed their appreciation and reported that the children in their classes are more engaged in the subject and retain it much better after they have participated in the activity.

I have had many touching and significant experiences regarding these classroom visits, as well as a lot of extremely positive feedback from the teachers. Because of this, I still maintain commitments for many additional visits in the future.

Through my involvement as a WSU student, it has become difficult to distinguish my many extra-curricular activities from my service activities. I believe that this is how it should be in every aspect of our careers and personal lives. We are all part of a system that we depend on and which depends on us in turn, and we all have a responsibility to each other that can only be met with continued engagement and service.

## Acknowledgements:

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