

# Hollywood Physics: An Outreach Event

## Drexel University Society of Physics Students

### Final Report

The Drexel University Chapter of SPS outreach programs focuses on encouraging scientific curiosity and interest among high school students. This year, through the generosity of a grant from Sigma Pi Sigma and The Society of Physics Students, we created a Hollywood Physics event to help high school-aged students think critically about scenes in popular movies in order to separate physics myth from fact. It was our goal to use the modality of popular movies to make learning fun and encourage recognition of "good" versus "bad" physics.

On April 28<sup>th</sup>, 2010, the Drexel University Chapter of SPS visited the Abington Friends School in Jenkintown, PA, to present our Hollywood Physics Event. Five Drexel SPS members participated along with approximately 30-40 high school students. The event started off with a 20-minute movie montage consisting of scenes from the movies *Up*, *Star Trek*, *Star Wars*, *Ice Princess*, *Armageddon*, *The Mummy*, *Twister*, *The Terminator*, *The Dark Knight*, and *Spiderman*. After each scene, an SPS member talked about the physics represented by the scene and highlighted key aspects.

After the montage was viewed, we had the high school students rotate through five different stations. Each station focused in more depth on two movie scenes. The students were encouraged to draw conclusions regarding whether the scenes were feasible in terms of the physics represented. The students were provided with physics demonstrations by the SPS volunteers in order to help guide them to conclusions. Some physics concepts yielded a faster conclusion than others. For example, it was much easier to convince the high school students that the Casey Carlyle of *Ice Princess* was blatantly wrong when she stated, "Now, I am going to increase the centripetal force by tucking in my arms. This will increase my moment of inertia." We then correctly illustrated the concept of angular momentum using a bicycle wheel. The students had a very good time watching their friends' surprised faces when they sped up after drawing their arms in close. Analyzing the scene from *Up* when Mr. Fredricksen's entire house was being lifted only by balloons was more difficult. In this demonstration station, we encouraged the students to draw their conclusions mathematically. Here, we lifted a small dollhouse using about 20 helium balloons.

We provided high school students a presentation that illustrated many different physics concepts. We demonstrated Newtonian mechanics as well as introduced the students to optics, special relativity, and more. We presented concepts and demonstrations that were new to the students. Demonstrating both "good" and

“bad” physics in one movie scene was challenging, but we felt it necessary to make our event complete. For this we brought our new hovercraft to Abington Friends School to illustrate the pod-racing scene in *Star Wars*. Students came to the conclusion that hovercrafts are feasible, however, the actual pod-racers in *Star Wars* are not realistic.

The event was a great success as measured by student feedback. This event represents a branching out for our SPS Chapter beyond conducting traditional physics demonstration outreach events, to incorporating a modern twist that would grab high school students’ attention. This helps incorporate new knowledge about changes in the way kids learn in terms of greater reliance on multimedia and fast-paced action. We plan on bringing our movie montage along with related physics demonstrations back to Abington Friends Upper School, as well as other schools next year to continue this successful event.

In addition to the Hollywood Physics Project, the Drexel SPS Chapter has continued its Physics Mentorship Program at the Independence Charter Middle School, which was initiated last year using another Marsh White award. SPS members go to ICS every two weeks for two and a half hours, holding mini-experiments and teaching students about various topics in physics. This culminated in a capstone car competition, during which 30 middle school students showed off their different miniature cars designed to perform specific tasks (climb an inclined plane, turn remotely, stop abruptly, etc.). Students were limited to the materials found inside the classroom. Medals were given away to the top three teams at simple ceremonies witnessed by the Drexel community.

We would like to thank Sigma Pi Sigma and the Society of Physics Students for helping to fund this event, staff at Abington Friends School for their support, and Dr. Roberto Ramos for serving as advisor to SPS on this and other projects.

### **Expenditures**

Hovercraft	\$68.95
Set of Weights/Mirrors	\$82.05
Velcro	\$13.99
Laser Refraction Tank	\$89.00
Bar Magnets	\$21.50
Smoke Machine	\$34.24
Total	\$309.73
Award Total	-\$300.00

## Pictures From the Hollywood Physics Event



Abington Friends Upper School students and teachers watching and discussing the movie clips.



Above: SPS member Kenneth Mui explaining and demonstrating vortex motion by firing smoke rings with an air gun

Below: SPS Member Sajjan Mehta showing how a flashlight can illuminate a small room with carefully positioned mirrors, emulating a scene from *The Mummy*





Left: SPS member, Wendy Harris, explaining standing waves from the cell phone communication scene in *The Dark Knight*



Right: SPS member, Nick Kruczek, determines whether or not Mr. Fredrickson could lift his house solely with balloons in the movie, *Up*



Graduate student Travis Hoppe demonstrating the surprising properties of angular momentum





Abington Friends students enjoying the hands-on demonstrations

More photos from this and other Drexel SPS outreach events  
are available for viewing at:  
<http://www.physics.drexel.edu/students/organizations/sps/?page=album>