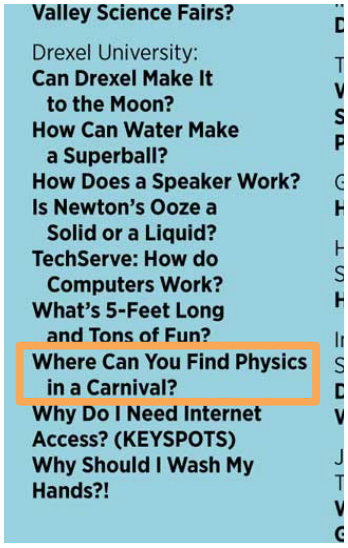
Where Can You Find Physics in a Carnival?

Drexel University Chapter of the Society of Physics Students

2012-13 Marsh White Award – Final Report

This year, the Drexel University Chapter of the Society of Physics Students participated in the Philadelphia Science Festival's Carnival on the Parkway. The Carnival on the Parkway is just one event in the weeklong annual festival that is completely free, open to the public, and engages over 100,000 people. On April 20, 2013, the Parkway featured over 150 exhibitors from all areas of STEM fields.

Drexel SPS has hosted a booth in the Carnival every year since the first festival in 2011. Each year, our booth has a different theme; this year our theme was 'Where Can you Find Physics in a Carnival?' We decorated our booth with balloons and streamers and featured three larger demos exemplifying physics concepts easily found in a traditional carnival. You can see our booth listed in the official program along with those held by other Drexel student groups.


Valley Science Fairs?

Drexel University:
Can Drexel Make It to the Moon?
How Can Water Make a Superball?
How Does a Speaker Work?
Is Newton's Ooze a Solid or a Liquid?
TechServe: How do Computers Work?
What's 5-Feet Long and Tons of Fun?
Where Can You Find Physics in a Carnival?
Why Do I Need Internet Access? (KEYSPOTS)
Why Should I Wash My Hands?!

Our first demo featured our new roller coaster set and was used to discuss conservation of energy. We set up two different tracks, both starting at point A and ending at point B. The first track followed a gradual slope from A to B while the second track dropped off sharply from point A and went through a loop before reaching B. We asked people which car they thought would reach point B first and then let both cars go at the same time. After they saw that the car with the loop reached B first, we explained that energy was always conserved but that the car with the loop converted more of its energy to kinetic energy closer to point A which allowed it to reach B sooner. Next, we brought the cars back to point A and asked them which car would be going faster when it reached point B. Using photo gates to measure the speed, we showed that the car on the gradual slope was actually going faster at point B, because it lost less of its kinetic energy to friction on the track. This demo was incredibly popular, and most people were surprised that the car that reached point B second was actually going faster at that point!

We also purchased a stand-up bottle game from an actual carnival supplier. This game features a slightly tilted platform, a glass bottle, and a 'fishing rod' with a small ring attached to the end. The bottle starts lying on its side, and the point of the game is to use just the fishing rod to get the bottle to stand up on the tilted platform. After letting kids (of all ages) attempt the game, we explained that the trick to winning the game is to spin the bottle around so that you are standing it up going uphill. We explained how that when standing the bottle up uphill, the momentum of the bottle at the tipping point was counteracted by the downhill component of gravity. This 'stabilizing force' allowed the bottle to remain upright instead of toppling back over again. In the spirit of a true carnival, all of the kids who attempted the game got to pick out a small prize.

Our final demo featured four carnival 'fun house' mirrors that each distorted the reflection in a different way. We used this as an opportunity to explain convex and concave mirrors, as well as how distorted mirrors are actually bending light. The mirrors were very popular with the younger children, and it was a great way to engage them since the concepts in our other demos were more complex.

Although we were not able to bring our carnival to a few of our local school as we had intended, our booth at the Philadelphia Science Festival was extremely successful. We are certainly looking forward to using our new mirrors and carnival game for additional outreach events in the coming years.

Below are our proposed and actual budgets. Due to Philadelphia Science Festival regulations, we were not able to bring liquid nitrogen to the event. We also decided to make our own mirrors instead of buying them. This allowed us to make more mirrors with different shapes that would also be easier for us to store and reuse. Beneath the tables are photos from the event.

Proposed Budget	
Item	Amount
Fun House Mirrors	$100.00
Carnival Games	$ 75.00
Liquid Nitrogen Supplies	$ 85.00
Small Prizes	$ 25.00
Decorations	$ 15.00
Total	$300.00

Actual Budget	
Item	Amount
Fun House Mirrors: reflective material	$ 29.01
foam board	$ 25.40
Stand-up Bottle Game	$ 71.00
Small Prizes	$ 30.99
Decorations	$ 6.26
Use of additional table in booth	$ 15.38
Total	$178.04

We used our roller coaster demo to explain conservation of energy, kinetic energy, and friction by comparing two different tracks that had the same starting and ending points.

The roller coaster engaged people of all ages!

Our SPS president explains how to win the stand-up bottle game, why it works, and how to balance forces.

Kids at the Philadelphia Science Festival examine their distorted reflections in our different fun house mirrors.