

**2007 – 2008 Marsh White Award Final Report**  
Ph<sup>3</sup> (“Physics Phun Phriday”): High-School Edition  
Ohio Wesleyan University

This year was Ohio Wesleyan’s second time bringing physics into the classroom through funding from a Marsh White Award. In the previous year we engaged a third grade class from Tyler Run Elementary School in Powell, Ohio (a suburb of Columbus). This year we decided to extend our reach to a more advanced audience in a senior-level high school physics class at Briggs High School in Columbus, Ohio. These students already had almost one full year of introductory physics so we tried to explain the physics in a more advanced way. The students were engaged in listening and understanding the demonstrations we attempted for them. Most of the demonstrations were interactive in nature, and we were very pleased at the level of participation and enthusiasm shown by the students and their teacher, Mr. Darren Greschuck.

The demonstrations we showed were:

1. The independence of vertical and horizontal motion in a classic “monkey drop and shoot” experiment.
2. Swinging a bucket of water overhead to demonstrate force and inertia in circular motion.
3. Conservation of angular momentum using dumbbells and a rotating stool, and explaining why figure skaters can rotate so quickly by drawing their arms closer to their bodies.
4. Passing a high current through a pickle and watching it glow, showing the yellow emission lines of atomic sodium.

5. Demonstrating the relationship between momentum and force (Newton's second law) by throwing an egg into a bed sheet. The egg doesn't break, no matter how hard you throw it. (And believe us, the students tried hard to break the egg!)
6. "Feeling" differing amounts of torque by hanging a 1-kg mass at varying positions along a stick held (or at least attempted to be held) horizontally. The further the mass from a person's hands, the harder it was to keep the stick horizontal.
7. Making vanilla ice cream from scratch using liquid nitrogen to quickly freeze the ice cream mixture.

The students and teacher seemed to enjoy our presentation, especially since it helped reinforce physics concepts that they had learned throughout the academic year. Of course, the students understandably appeared to enjoy the liquid-nitrogen ice cream best, and one even proclaimed, "You guys make physics cool!" (Maybe with pun intended!)

Demonstrating the usefulness of physics in everyday life and exciting the students about physics in general could be crucial at a time when they are likely choosing their college paths. Perhaps we could be an influence on students wanting to do physics in the future. During the next academic year we would like to continue our tradition of visiting local schools by venturing to a middle school (possibly in addition to another high school) so we can interact with another age group in the local K-12 education system, and to hopefully pique an interest in taking physics in high school. In fact, a recent study in science education suggests that to attract students into the sciences and

engineering, close attention needs to be paid to children's early exposure to science at the middle and even younger grades<sup>1</sup>.

We would like to thank Dr. Bob Kaye, our SPS Advisor, for setting this up, the physics class at Briggs High School, Mr. Greschuck and Ms. Linda Kennedy at Briggs for helping to coordinate the event, and all of the members of SPS who came out to help with the demonstrations. We all had a great time!

Expense Report for the 2007 – 2008 Marsh White Award:

1. Mileage for use of two personal vehicles (58 miles at \$0.485 per mile): \$56.26
2. Purchase of ingredients for making ice cream: \$12.75
3. Liquid nitrogen (10 L at about \$0.25 per L): \$2.50

Total costs: \$71.51

Note that we did not purchase a “jumping-ring” magnetic induction apparatus, as intended, with Marsh White Award funding since we were able to find an existing apparatus at Ohio Wesleyan that worked very well. Instead, we will use the remaining funds (\$228.49) for additional public outreach events during the next academic year.

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<sup>1</sup> *Planning Early for Careers in Science*, Robert H. Tai, Christine Qi Liu, Adam V. Maltese, and Xitao Fan, *Science*, Vol. 312, p. 1143–44, 2006.



Physics teacher Mr. Greshuck spinning a bucket of water to demonstrate force and inertia in circular motion.



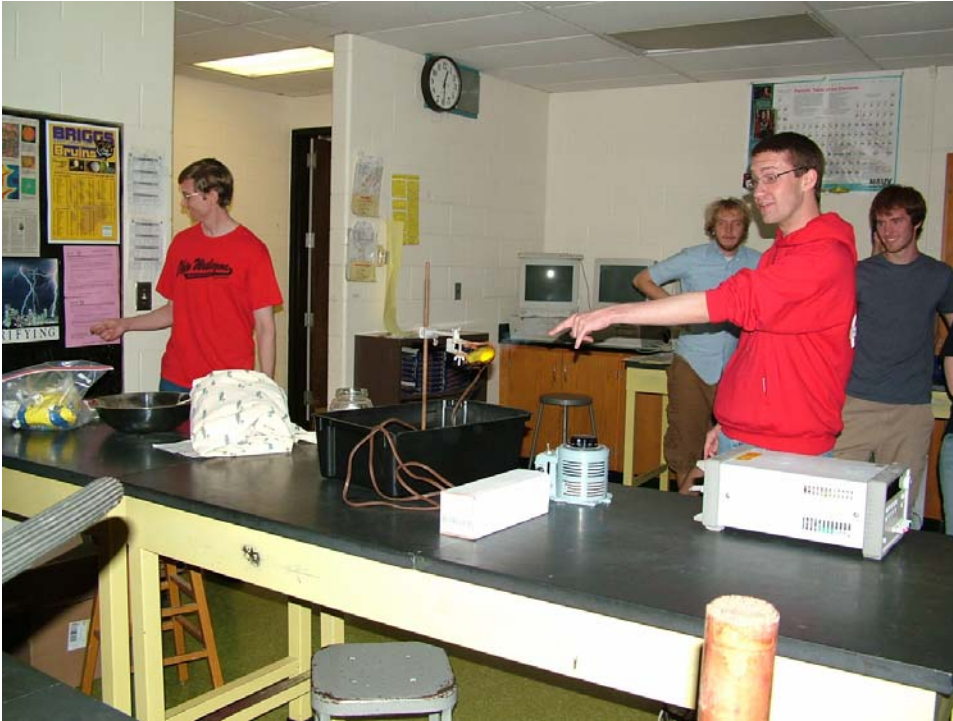
A Briggs student tries to break an egg by throwing it into a sheet held by SPS members Nick Baker (left) and William Kenny (right).



SPS Advisor Dr. Kaye (right) and a Briggs student demonstrating torque.



SPS member Stephanie Vasicek demonstrates the conservation of angular momentum holding two weights at varying distances to her body while spinning on a stool.



SPS member Cory Myers (right) and Dr. Harmon (left), Chair of the Ohio Wesleyan Department of Physics and Astronomy, demonstrate the yellow emission spectrum of sodium with a glowing pickle.



Dr. Harmon and SPS Vice President Rachel Decker (left) use liquid nitrogen to make vanilla ice cream.