

Wright State University Chapter of the Society of Physics Students (SPS)

Dayton, Ohio

2010 Marsh White Award -- Physics Then and Now

One of our chapter's biggest goals from year to year is to spark interest in physics from elementary students to high school students. This grant has aided in our efforts to improve our physics demos that we use for educational outreach to inspire in students an interest in physics, and to also show children that physics is not just another science class.

The funds from the Marsh White Award were used to purchase the following equipment:

Acoustic Analysis Software	\$132.00
<u>Microphones</u>	<u>\$50.00</u>
TOTAL	\$182.00

The microphones have yet to be ordered because the acoustic software was more expensive than originally anticipated. Additional funds will be provided from both SPS and unrestricted research funds via WSU Assistant Professor and SPS Faculty Advisor Jason Deibel. SPS would like to express their thanks for being a recipient of the Marsh W. White Award, as these funds did significantly accelerated the development of our research program.

The guiding theme of our demonstrations has been to contrast physics then and physics now. One of the general education classes and a general physics class participated in such a demonstration. The same fundamental principles of physics is shown two ways, first using an instrument that would have been used in the past, like an "old-school" prism-based optical spectrometer to observe the emission spectra of hydrogen, or a similar gas, and then re-examine the spectra again using a fiber optic cable and commercial spectral software. The students see both the spectra in the prism spectrometer and also reproduced on the computer screen. Over the summer, SPS assisted for a third time in a children's summer science camp. As part of the program, we lead the students in an exercise where they construct and test their own spectrometers using cereal boxes and compact discs that serve as the diffraction grating. While affordable/cheap diffraction-based educational spectrometers are available, we have found students, of varying ages and educational levels, are more actively engaged in the lesson when they construct their own spectrometers rather than being handed one. Using their newly built cereal box spectrometers, students see how the emission wavelengths of various light sources vary via examination of natural light, fluorescent lights, and excited gases such as hydrogen, helium, and neon. While constructing and testing the spectrometers, the students are lead in a discussion of why different substances emit light of different wavelength compositions. It's essentially Introductory Quantum Mechanics!



Cereal Box Spectrometers Activity in Summer Science Camp

A yearly outreach opportunity occurs every winter at TechFest. The Annual Dayton/Miami Valley TechFest (http://www.smedayton.org/downloads/TF_2010_Flyer_090707.pdf) is a two-day long celebration of science and engineering in which kids and adults of all ages can explore various aspects of science, engineering, and technology in over 70 demonstrations and exhibits. While in years past an assortment of various physics demonstrations were presented, now there is a unifying theme that ties all the physics demonstrations together in a fun and exciting way. Now, children and parents are able to see just how big of a role “old science” plays in current technology; for example, the optics behind polarizing sunglasses. A fun trick often employed by SPS members is to use a polarizer wheel to make the display on someone’s cell phone to disappear.



Explanation of how polarizing sunglasses work. TechFest 2010

This past spring SPS again participated in “Nanodays” at the local children’s museum. The kids are able to experience and learn several aspects of the physics behind cutting edge nanoscience and nanotechnology. This collaboration has led to the initialization of the first ever “Physics Days” at the museum due to be scheduled for fall of 2011, as well as continuing to participate in future Nanodays. At “Physics Days” we hope to present our Physics Then and Now demonstrations in full swing.



Lattice Structures of Various Forms of Carbon, Nanodays 2010

In order to increase SPS awareness within the faculty and other students in the Physics Department at Wright State, bimonthly “Tea Times” were arranged this year. Tea Time became a regular event hosted by SPS where students and faculty were able to take a thirty minute break from homework and grading to socialize in an informal relaxed atmosphere. These Tea Times lead to the induction of several new members to SPS, including four of the five officers for next year.

Our intention with the funds from the Marsh White Award was to utilize them to purchase the software and equipment necessary to add additional demonstrations to our “lineup.” Specifically, we wanted to add acoustic and the physics of sound and music to our repertoire. Our chapter has several musicians in the group who are developing an active learning experience where the software is utilized with a demonstration of musical instruments to explain the science of sound. Due to heavy academic loads this past year, the SPS members who were chiefly involved in this effort were not able to devote as much time as originally hoped to this development. Progress has been made and we hope to unveil our new “Physics of Electric Guitars” travelling demonstration tour this fall with our own incoming SPS president leading the guitar playing.

Our goals for this year include re-initializing trips to visit local high schools and science classes to present the Physics Then and Now demos and to encourage them to investigate how the world around them really works. This will include our optical spectroscopy activity, the physics of electric guitars, and more. In fact, we have several local schools already interested in arranging visits from our SPS chapter. In addition, we will be hoping that Physics Days at the children’s museum becomes a yearly event. Tea Time will be continuing in the upcoming year as well to continue to unite the department as a whole and to encourage involvement in SPS as well as departmental events. SPS is also going to devote some time and effort to membership education including preparation for careers in industry, government, and academia.