Marsh White Final Report
The Impact of Physics in the Medical Field
Indiana Wesleyan University, 2013

For its second Marsh White award, the Indiana Wesleyan University Chapter of the Society of Physics Students (IWU-SPS) held a physics outreach event on April 10, 2013, 6:30-8:00 pm, focusing on the impact of physics in medicine. The outreach was directed towards the local rural community of Grant County of Indiana and students at IWU, an institution which has a strong history in preparing pre-med students but has no physics major. The purpose was to demonstrate to the public, students, and the IWU community the importance of physics in the development of modern medicine, with the hopes of leaving the largely rural community with a higher regard for the field. Currently, members of IWU-SPS come from multiple disciplines including Biology,. Chemistry, Pre-med, Nursing, Math, and Theology. This outreach event consisted of multiple physics stations, most with a medical physics flavor, and was held at the IWU Student Commons because of its central location for students and community guests. Several area high school physics teachers were invited to advertise the event to their students, with most agreeing to offer extra credit for student-attendees. The event was heavily advertised to IWU students, faculty and staff through flyers and campus wide emails and announcements. The IWU Director of Grants Management was present, went through all stations, talked to presenters, and praised the event.

Six different stations manned by SPS members and volunteers demonstrated different physics principles impacting medicine. These included:

1. **Laser/Optics Station** – included a description and demonstration of lasers, and how it is used in laser keratomy and other eye surgeries. Included laser scattering off aerosol particles to expose a laser beam, a demo of Infinity Mirror and other laser-based optical illusions.

2. **Microwave Station** – included an explanation and demo of microwave heating of metal films, polar molecules, and other experiments using a microwave oven. Audience members learned how microwaves can be used to kill cancer cells with functionalized metallic nanoparticles.
3. **Electron Beam Station** – included a demo of magnetic deflection of an electron beam, to illustrate how medical physicists use magnetic fields to direct charged particle beams to bombard diseased tissue.
4. **High-Voltage Station –** included electrostatics demos using a van de Graaf generator. Audience members learned about charge induction, transfer, and polarization, and how electrostatic filters in hospitals work to remove bacteria in the air. This demo excited students from all age groups to form a human link to demonstrate charge transfer over human bodies.
5. **Ultrasound Station –** An inexpensive fetal ultrasound device, in tandem with a whirled speaker, was used to show how the Doppler effect is used for medical diagnostic imaging. Audience heard their heart beat using the fetal ultrasound probe, amplified by a large speaker.
6. **Endoscope Station -** An inexpensive endoscope was purchased to teach the audience about fiber optics, total internal reflection, and their use in medicine. SPS set up a game to simulate the use of the endoscope to study the body by moving an endoscope in a tortuous, darkened shoebox to locate an "organ".
7. **Hovercraft Station** - Always a favorite, a one-man hovercraft was available for participants to ride and learn about frictionless motion.

Overall, the outreach event was a success. We were able to reach out to the many of IWU students, particularly those pursuing nursing or pre-medical science who acquired a new appreciation for medical tools made possible by physics. Many pre-meds expressed their amazement at how physics underlies modern medical tools they know they will use. We shared the successes of our SPS chapter and attracted new membership. Despite a sudden, severe thunderstorm that threatened the

success of the event, a number of high school students and their families were able to make it to the event.

The success of the event is noteworthy because IWU does not have a physics major and yet the enthusiasm of a multi-disciplinary group interested in physics overcame that intrinsic limitation. The event attracted media attention when the student newspaper ***The Sojourn*** ran an online feature article on it (See enclosed article). This can be found online at ***The Sojourn Online***: http://www.iwusojourn.com/2013/04/10/society-of-physics-students-hosts-event-major-also-in-works/ More photos of the outreach event can be found at the **IWU-SPS Facebook**: https://www.facebook.com/groups/364104810283679/?ref=ts&fref=ts#!/media/set/?set=oa.598453623515462&type=1

We would like to thank the Society of Physics Students for providing our chapter with the funds to complete this outreach event.

Budget:

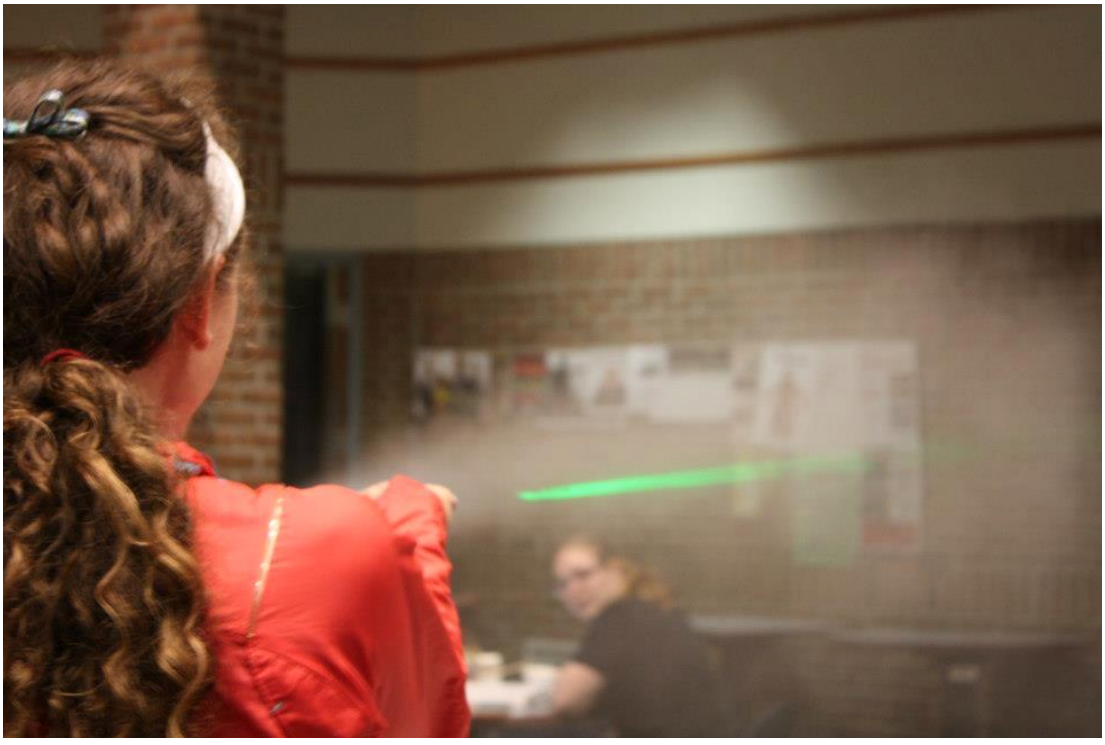
USB Endoscope	$18.55
Used Deflection Bridge	$20.00
Fetal Ultrasound Kit	$56.35
Stethoscope	$15.72
Fiberoptic Lamp	$ 3.18
Batteries for One-man Hovercraft	$60.62
Fog-in-a-Can	$18.95
Microwave Oven	$50.00
Banner	$30.00
Duct Tape, Assorted Supplies	$26.63
Total:	**$300.00**

IWU Director of Grants Management Office Dr. Ken Bielen whirls a ball with a speaker inside it to experience the Doppler effect, the basis of ultrasound imaging.

IWU-SPS turned the Student Commons, a high-traffic area into a venue for physics outreach to the Grant County community and university students, with seven demonstration stations that delighted participants.

IWU-SPS Member Kaley Necessary demonstrates how ultrasound can measure this student's heart rate, aided by a fetal ultrasound kit and a speaker.

IWU-SPS President Robert Burchell demonstrates to IWU Grants Management Director Dr. Ken Bielen the physics principles behind endoscopes, total internal reflection and fiber optics. Searching for a "dummy organ" was simulated in a packed container.

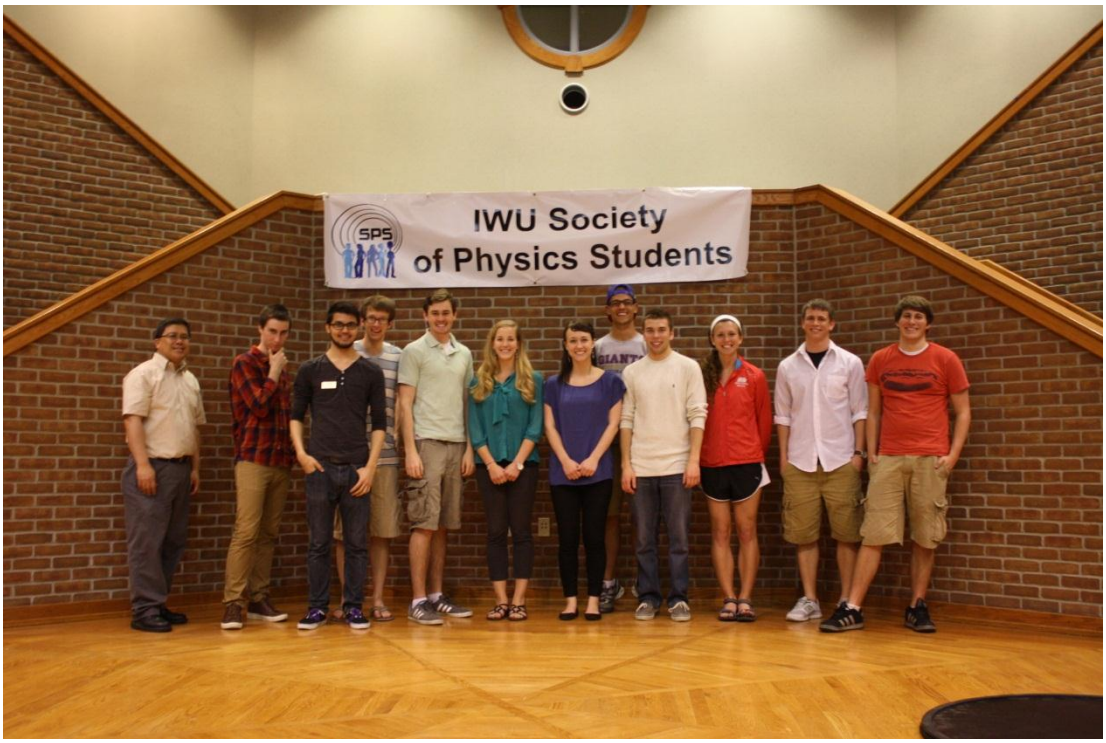


IWU-SPS Secretary Amanda Wolfe shows how a laser beam scatters off aerosol particles to create a visible beam.

IWU-Vice President Joshua Ostrander demonstrates the use of microwave physics in medicine.

Electrostatics was used to demonstrate how hospital air filters work. Here, the principle of charge transfer at high voltages is experienced by a grade school student.

Participants fall in line at the Ultrasound Station to listen to how the Doppler Effect makes them hear their heart beating.



IWU – SPS members, student volunteers and Prof. Ramos, SPS Advisor, pose for a post-activity picture.

Categorized | **News**

Society of Physics Students hosts event, major also in works

Posted on 10 April 2013. Tags: new physics major, President Robert Burchell, Roberto Ramos, Society of Physics Students

Indiana Wesleyan University's Society of Physics Students hosted its fourth event 6:30-8 p.m. Wednesday, April 10, in the Commons. Dr. Roberto Ramos, associate professor of physics, said the SPS headquarters in Maryland gave IWU's chapter its fourth award since starting up two years ago. Ramos also said IWU's Natural Sciences Division is working on making physics a major.

"If you graduate people who have at least a basic understanding of [physics], then they will be up to par with other graduates [at other universities]," Ramos said. "They will be ready to face a world that's heavily based on technology. It's important for future health professionals to understand the physics of diagnostic and clinical techniques if they are to compete in the 21st century job market."

IWU's SPS won the Marsh White Award back in February for the event called "Physics in the Medical Field." The society's website says the award gives $300 to chapters for supplies to use in outreach events. Ramos said this is the second time IWU's SPS has won this award; the first was in January 2012, not long after starting up.

IWU SPS President Robert Burchell (so) said chapters often host these events for students to boost interest in physics. Some of the events have experiments such as liquid nitrogen ice cream and frozen flowers students can then smash to pieces.

"Physics is one of the most underrepresented careers in the science realm of jobs, and it's also one of the most top-paying jobs," Burchell said. "If we can get kids into physics and science through fun demonstrations to show them physics and science isn't all just about crunching numbers, that it can be fun, … then we've done what we could to show [that] and for them to be interested."

IWU's SPS set up five stations with physics experiments in the Commons, along with a hovercraft that levitated participants. Society members at each station explained how the experiment worked and its connection to physics.

An endoscope, a tool Burchell said physicians stick down patients' throats to check for health issues, showed students the inside of plastic containers through a cutout hole. At a nearby station, the audience could hear the loud thump of the heartbeat using an ultrasound device. One SPS student spun around a styrofoam ball with string to show how wave frequency changes for an observer when an object moves away.

Many experiments showed the properties of light and how it can bend, using optical illusions or special spray that made the path of a laser beam visible. Others showed how electromagnetic waves can influence the environment. A microwave oven lit up a light bulb in a jar filled with water (to keep it from exploding), and an electromagnetic generator forced metal plates off its surface and made the hair of anyone who touched to stand on end.

Some middle school students also attended the event and had fun showing their friends how some experiments worked.

Ramos said he enjoys working with the SPS students and that they do a good job of working together even though they're a really diverse group.

"There isn't a physics major here, and yet we've had a group of people coming from biology, chemistry, mathematics, psychology and nursing banding together to promote physics," he said. "That's novel. I don't think you can find that in any other institution, any other university in the country."

But both the chapter and Ramos hope to soon see physics majors on campus as well. Ramos, who spearheaded starting up IWU's SPS, has also started the process for making a physics major a reality.

Natural Sciences Division Chair John Lakanen said getting a major is a complex process, but it's important to make sure a good and workable plan is in place. Lakanen received Ramos' proposal last October and presented it to his entire division, which liked the idea.

Associate Dean Dennis Brinkman said the division prepared a formal proposal for him, and he sent it to the Academic Affairs Council for approval. Brinkman said the council has to look at the proposed major to see if there are redundancies or overlaps with already existing majors. The council needs to make sure IWU's finite resources are used wisely, he said.

But since the council did give its approval, Brinkman sent it over to the Assessment Committee. He said that committee examines goals, then forwards the proposal to the Curriculum Committee to look at the possible courses, making changes where needed.

Lakanen said he hopes the Curriculum Committee will examine the course list by September. If all goes well, he thinks the entire proposal will "sail through smoothly" back to the Academic Affairs Council to evaluate it in October or November.

The last stage involves the faculty senate, with 29 members representing all majors and departments voting on the proposal. University faculty senate President Lisa Dawson said the senate receives the proposal, then reviews it over the course of a month. She said members meet a month later and vote on the proposal. A majority vote of members present gives the stamp of approval for the new major. Lakanen said the board of trustees is informed, and the proposal becomes a reality.

"If all goes well, hopefully the major will start in fall of 2014," Lakanen said.

"We [physics students and division faculty] want to contribute to the community consistent with what God gives us and what He commands us," Ramos said. "I want to see how students here can contribute [to serving the community and wider world]. So far I'm amazed. There are some really fantastic students I've been working with."

This post was written by:

Tim Gutai - who has written 22 posts on The Sojourn.

Contact the author

« Hobby Lobby CEO: 'We're not planning on shutting any stores down'
McConn's coffee-roasting source anti-slavery »

Facebook comments: