

Physics Outreach using Modern Medical Physics

Indiana Wesleyan University Society of Physics Students

Indiana Wesleyan University
Marion, IN



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Statement of Activity:

The Indiana Wesleyan University (IWU) SPS chapter proposes to promote physics among pre-college and college students, and citizens of rural Marion, Indiana through a community outreach event focusing on how physics impacts modern medicine. The event features stimulating, hands-on demo stations that mix modern physics with real-world medical physics technologies.

On its second year, the Indiana Wesleyan University (IWU) chapter of the SPS proposes to promote physics to pre-college students, college students, and the citizens of the rural community of Grant County, Indiana by capitalizing on the strong connection between physics and modern medicine. While the average American knows of and appreciates the tools of modern medicine (ear thermometers, MRI, endoscopy, cancer treatment), most do not see the link to physics. This is partly due to the lack of connections made to real-world applications when physics is taught, giving the impression that physics is abstract and is only about balls, pulleys, masses, and exotic things like electrons. This leaves many high school and middle school students losing interest in physics. Recognizing that 20th and 21st century diagnostic and treatment techniques in modern medicine are largely based on physics ideas, IWU-SPS plans to use ideas and demonstrations of medical physics as a vehicle to raise interest in modern physics and physics-related careers among pre-college students in the surrounding community and the college community as well.

IWU is a liberal arts university with historical strengths in the Health Sciences, Nursing and Pre-med education. IWU has no physics major although a proposal for it is underway. Despite this, our multi-disciplinary team of 15 SPS members from Nursing, Psychology, Exercise Science, Biology, Chemistry, Computer Science and Pastoral Studies, were successful in our physics outreach last year, as described in our Marsh White Outreach Final Report. This year, our SPS will use a potent mixture of modern physics topics (optics, materials science, quantum physics, superconductivity, nuclear physics) and high-tech medical physics technologies and demos to enhance appreciation for physics. We will pay particular attention to modern physics-based demos because these are more novel and potentially exciting to the average student.

IWU-SPS therefore proposes to hold a community outreach event titled “Physics in Modern Medicine: Fun with Real-World Demos” directed towards pre-college and college students. IWU-SPS will use the knowledge we obtained from running a similar event last year. While using our

contacts with principals and teachers at Marion High School, Oak Hill High School, and McCulloch Middle School, we plan to reach out to other area schools. For maximum impact and high visibility, SPS will stage the event at the Student Center Commons of the IWU campus due to its central, high-traffic location. Stations will be manned by SPS members and student volunteers who will be trained a few weeks in advance so as to explain the relevant physics in *inquiry-style*. Examples of possible stations with visually-stimulating and interactive format include:

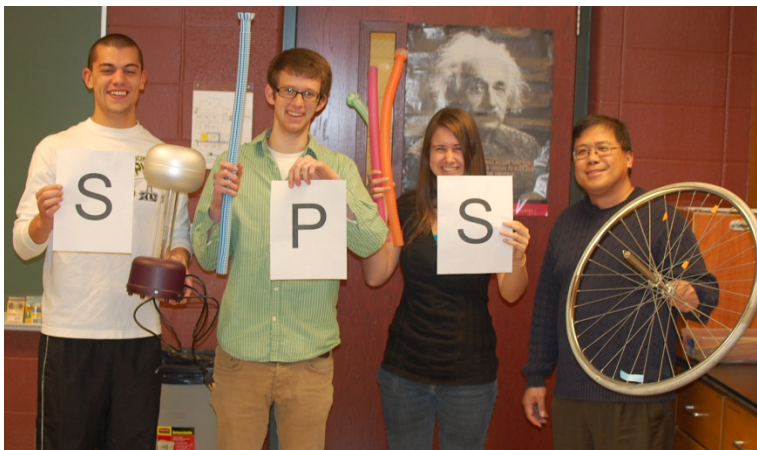
1. **Fiber Optics Station:** Waveguide physics, Laser Scattering, Real Endoscope demo
2. **Ultrasound/Doppler Station:** Doppler Effect Demos, Real Ultrasound Monitor demo
3. **Optics/UV/Radiation Station:** EM Spectrum, Sunscreen Physics, Diffraction, thermometer physics
4. **Microwave Physics Station:** Microwave heating demos, RF shielding,
5. **Quantum Physics/Low Temp Station:** Quantum Dots, CCD physics, superconductivity, MRI
6. **Electricity Station:** Heart Rate/EKG demos, van de Graaf-powered air filtering
7. **Nuclear Physics Station:** Geiger counters, modeling tracers, Physics of accelerators

By going through the different stations, students will then have the opportunity to learn about the physics behind devices and phenomena. They will understand the physics underlying fiberscopes, the EKG, ultrasound monitors, and tagging using nanoparticles or quantum dots. Using the award money, IWU-SPS will purchase equipment, supplies, and second-hand medical devices. The IWU Physics department will provide support by lending some of its physics demos to this event. When demos are unavailable, we will put up videos or colorful posters illustrating the physics behind the technology. At the end of the event, participants will be asked to fill out a feedback form.. Students will be given the IWU-SPS Facebook page which contains links to SPS, physics resources, and physics career information. Pictures will be posted on the SPS Facebook.

The timeline for this proposed event is as follows: After receipt of the award in late January 2013, IWU-SPS plans to contact the principals and science teachers at local high schools and middle schools to arrange for participation by their students. We will work with IWU's Marketing Department to advertise these events to the general public via IWU's TV and radio stations. Within the university, we will send out attractive flyers. By February, we will have a confirmed list of demo stations and will have purchased the proposed equipment. By March, the schedule of the event will be confirmed, demonstrators will be trained by our SPS Faculty Advisor and senior SPS members, and advertisement will begin. We will schedule the event to occur in mid-April.

The following is our proposed budget:

Itemized Budget	Cost
UV Flashlight/UV Beads	\$15.00
UV filters	\$10.00
Used fiber optic endoscope on ebay	\$130.0
Heart Rate Sensor (PASCO)	\$85.00
Fetal Ultrasound Kit	\$60.00
Total Funds Requested	\$300.00



From left: Robert Burchell (SPS President), Josh Ostrander (SPS VP), Jaki Richter (SPS member), and Dr. Roberto Ramos (SPS Advisor)