2019 Meeting of the Appalachian American Association of Physics Teachers

A-AAPT 2019: Space Explorations

Marshall University, November 7-9, 2019

Space Exploration: Next Giant Leap!

Celebrating 50 Years

from the Moon Landing

Time	Thursday 11/7/2019	Friday 11/8/2019	Saturday 11/9/2019
9 – 10 AM	Travel Time	Invited Talk	Invited Talk
10 – 11 AM		Workshop	Parallel Workshops
11 – 12 PM		Workshop	Contributed Talks
12 – 1 PM		*Lunch*	Contributed Talks
1 – 2 PM		Contributed Talks	*Business Lunch*
2 – 3 PM			Tour of AFM
3 – 4 PM			Meeting Adjourns Travel Time
4 – 5 PM			
5 – 6 PM			
6 – 7 PM		*Dinner*	
7 – 8 PM	**Public Keynote Talk**	**Keynote Talk**	
8 – 9 PM	*Refreshments*		

We look forward to seeing you at the 2019 A-AAPT Meeting

Detailed Schedule

Web page: http://appalachian.aaptsections.org/a-aapt2019/
Meeting registration: https://forms.gle/FoJzJqEk9j1PLL5i7
Email abstracts for contributed talks to: babiuc@marshall.edu

Thursday 11/7/2019

7:00 p.m. *Smith Hall, Room 154* → Public Keynote Talk by Don Thomas, former Astronaut: **Overcoming Obstacles and Reaching for the Stars!**

8:00 p.m. *Birke Art Gallery Foyer* → Refreshments (complementary provided)

Friday 11/8/2019

8:30 a.m. *Robert C. Byrd Biotechnology Science Building, Room 102*→ Registration ($30 for faculty, $15 for teachers, no charge for presenters and students)

9:00 a.m. *Robert C. Byrd Biotechnology Science Building, Room 102*→ Brief opening from Huong Nguyen, chair of Physics Department

9:15 a.m. *Robert C. Byrd Biotechnology Science Building, Room 102*→ Invited Talk by Tamara Westfall: **Population Education**

9:45 a.m. *Science Building, Room 276* → Coffee Break

10:00 a.m. *Science Building, Room 166* → Workshop by Jeff Chaffins and Robert David McCloud: **Pulsar Search Collaboratory**

11:00 a.m. *Science Building, Room 103* → Workshop by Tim Hamilton: **Flying Apollo: Space Flight Simulator**

12:00 p.m. *Science Building, Second Floor* → Lunch

1:00 p.m. *Science Building, Room 276* → Contributed Talks, Chaired by Curtis Foltz, Marshall University

1:00 p.m. – 1:15 p.m. David Facemyer: Hybrid Excitations in Organic-Inorganic Core

1:15 p.m. – 1:30 p.m. Dillon Buskirk: Analytical Waveforms for Eccentric Binary Black Holes

1:30 p.m. – 1:45 p.m. Ellie White: Solar Flare Detection with a Classroom Radio Telescope

1:45 p.m. – 2:00 p.m. Xiaojuan (Judy) Fan: From Sunlight to Electricity

2: 00 p.m. – 2:15 p.m. Ryan Vincent et al.: Size Selective Filtration Using Gold Nanoparticle Self-Assembled Monolayers on High-Flux Silica Nanoparticle Substrate

2: 15 p.m. – 2:30 p.m. Jayden Leonard: Electronic Structure of Negative Trions in Semiconducting Quantum Dots

2:30 p.m. *Science Building, Second Floor* → *Coffee Break* (complementary provided)

6:00 p.m. *Marshall Student Center*, *John Marshall Dining Room* → Dinner (provided to registered participants)

7:00 p.m. *Smith Hall, Room 154* → Keynote Talk by Bo Lowrey, NASA Solar System Ambassador: **Apollo at 50, A History of NASA Manned Spaceflight**

Saturday 11/9/2019

8:45 a.m. *Science Building, 2nd Floor* →Registration ($30 for faculty, $15 for teachers, no charge for presenters and students)

9:15 a.m. *Science Building, Room 277* → Invited Talk by Tamara Westfall: **GamEd**

9:45 a.m. *Science Building, 2nd Floor* → Coffee Break (complementary provided)

10:00 a.m. Parallel Workshops:

1. *Science Building, Room 166* → Workshop by Jeff Chaffins and Robert David McCloud: **Pulsar Search Collaboratory**
2. *Science Building, Room 103* → Workshop by Tim Hamilton: **Flying Apollo: Space Flight Simulator**

10:45 a.m. *Science Building, Room 277* → Contributed Talks, chaired by Howard Richards, Marshall University

10: 48 a.m. – 11:00 a.m. Rae Stanley: Checking Your Answers: The Opaque Process of Accessing Open Source Data, Exemplified by the Kepler Space Telescope

11:00 a.m. – 11:12 a.m. John J. Lynch: Speed of Sound: the gStrings App with a Graduated Cylinder

11:12 a.m. – 11:24 a.m. Joseph E. Wiest: Wave Theory through Complex Functions for the Diffraction of Light

11: 24 a.m. – 11:36 a.m. Tracey DeLaney: Using Toys for Physics Education

11:36 a.m. – 11:48 a.m. Taylor Jones-Martin and Marek Krasnansky: WVSU Suborbital Payload for RockSat-X 2019

11: 48 a.m. – 12:00 p.m. Sachiko McBride: How to Demonstrate Optical Refraction and Faraday's Law in The Classroom

12: 00 p.m. – 12:12 p.m. Richard Calo: Hyperfine Spectra of Rare Earth Elements

12: 12 p.m. – 12:24 p.m. Baylee Senator: Single Hole Based Magneto-Impedance Biosensor for Particle Detection

12: 24 p.m. – 12:36 p.m. Nate Chalmers: Cesium excited states with tunable diode lasers

12: 36 p.m. – 12:48 p.m. Eric Roy and Virginia Martin: Undergraduate Outreach

12: 48 p.m. – 1:00 p.m. Spencer Rodgers: Magnetic Fields in Thin Ferromagnetic Films

1:00 p.m. *Science Building, Room 277* → Business Lunch (provided to registered participants)

2:00 p.m. *College of Science, 1st Floor*→ Tour of the Atomic Force and the Scanning Electron Microscope

3:00 p.m. →Meeting Adjourns

Lodging:

A block of room has been reserved for the special rate of $109.00 (without taxes) at Hampton Inn Huntington University Area, 177 Kinetic Dr, Huntington, WV 25701 until October 24. To book, please call (304) 523-8001 and mention that s for the A-AAPT.

Directions:

From I-64 Westbound

Use Exit 11 (Hal Greer Blvd) Turn right at the end of the ramp toward Hal Greer Blvd. Continue along Hal Greer Blvd.

From I-64 Eastbound

Use Exit 11 (Hal Greer Blvd) Turn left at the end of the ramp toward Hal Greer Blvd. Continue along Hal Greer Blvd.

From US 52 (Ohio)

Follow US 52 eastbound into Chesapeake. Cross the Ohio-West Virginia Bridge. Turn left onto 5th Ave. and continue along 5th Ave. to the Hal Greer Blvd.

A map of the campus is located at: https://www.marshall.edu/map/index.html

Parking:

Friday please use the 6th Avenue Parking Facility. For parking please see: https://www.marshall.edu/parking/visitor-parking-info/
Saturday parking is free everywhere in campus. The general parking lot or the Parking Garage on 3rd Ave are the closest ones to Science Building.

Organizers:

Maria Hamilton, Department of Physics, Marshall University
Sean McBride, Department of Physics, Marshall University

Public Keynote Speaker: DR. DON THOMAS

Overcoming Obstacles and Reaching for the Stars!

Thursday - November 7, 2019 7:00 pm – 8:00 pm

Smith Hall, Room 154

We are delighted to announce that our opening Keynote Speaker for this year's conference is Dr. Don Thomas, a former NASA astronaut and a veteran of four Space Shuttle missions. He spent 44 days in space and orbited the Earth 692 times, traveling 17 million miles in the process. In his presentation he will discuss his journey to become an astronaut after first dreaming of going into space when he was only six years old. Through hard work, persistence, and determination he finally achieved his life-long dream. He will also discuss what it is like to live and work in space and share some of his favorite views of Earth taken from above.

The talk is open to the public!

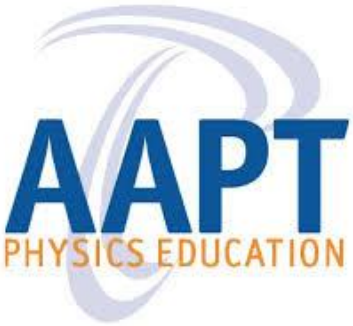
BIO

Dr. Thomas was born in Cleveland, Ohio. He received a B.S. in physics from Case Western Reserve University, followed by a master and doctorate degrees in materials engineering from Cornell University. From 1982-1987 he worked at Bell Laboratories in Princeton, and was awarded two patents for inventions related to the packaging of semiconductor devices. In 1987 the joined the NASA Johnson Space Center in Houston, as a materials engineer for the space shuttle program. In 1990 he was selected in NASA's 1group of astronauts and flew as a mission specialist on four space shuttle missions. During these missions he performed hundreds of microgravity sciences experiments and helped deploy a large communications satellite.

From 1999-2000 Dr. Thomas was the NASA director of operations at the Gagarin Cosmonaut Training Center in Star City, Russia, where he coordinated the training of NASA astronauts for missions aboard the International Space Station. From 2003-2006 he was the International Space Station Program Scientist and was responsible for the selection and scheduling of experiments to be performed aboard the ISS.

From 2007-2015 Dr. Thomas headed up the Hackerman Academy of Mathematics and Science at Towson University, an outreach initiative that targeted elementary, middle, and high school students to encourage them to pursue careers in math, science, and engineering. Today he is a professional speaker and continues his outreach efforts inspiring students to reach for the stars.

Special acknowledgements to the following sponsors for making this event possible!



Sponsorships are still available. For more information, contact Maria Hamilton at babiuc@marshall.edu

Guest Speaker: BO LOWREY

Apollo at 50, A History of NASA Manned Spaceflight

Friday - November 8, 2019 6:00 pm – 7:00 pm

Smith Hall, Room 154

This presentation will use the Apollo 11 Anniversary as an example of the programming available to physics teachers. The Solar System Ambassador program will be highlighted as a resource.

BIO

Bo Lowrey has over 40 years of involvement in space science, ranging from the Amateur (Ham Radio) Satellite Program (AMSAT) where he was the area coordinator for Kentucky, to his most recent outreach activity as a contributor of all things related to space science in the non-formal and informal education community. He frequently speaks to local after school astronomy and engineering clubs, to groups at public libraries, and has spoken at several educational and scientific conferences on STEM topics. He works with middle and secondary students to place experiments on the International Space Station, and is a volunteer at the University of Louisville Gheens Science Hall and Rauch Planetarium. He retired from the Jefferson County Public Schools where he was the Director of Telecommunications. He attends NASA and JPL training opportunities, and is pursuing a Ph.D. in Curriculum and Instruction at the University of Louisville.

Special acknowledgements to the following sponsors for making this event possible!

SOLAR SYSTEM AMBASSADORS

MARSHALL™ PHYSICS

Invited Speaker: Tamara Westfall

Session A: Population Education

Discover interdisciplinary lessons that connect K-12 learners with relevant global issues and real-world data. The presenter will model simulations, hands-on demonstrations, and discussion questions that explore human population growth and related social and environmental issues such as biodiversity loss, pollution, and equitable resource use around the world. Attendees will receive a code to access an online library of over 50 classroom-ready, standards-aligned lesson plans.

Session B: GamEd

Level up your lessons by learning ways to incorporate gamification into your classroom. Learn some of the science behind what makes video games so successful and how you can take some of those qualities and transfer them to a learning environment in order to increase achievement and engagement. The presenter will demonstrate some of the tools available to transform your own classroom as well as walk participants though their own gamified adventure!

BIO

Tamara Westfall is a Physics, Computer Science, and Earth and Space Science teacher at Poca High School with a master's in education from Marshall University on the subject of gamification in the secondary education classroom.

Workshop Presenter: Timothy Hamilton

Flying Apollo: Space Flight Simulator

Come test the Apollo space flight simulator I have built to let beginning physics students apply what they have learned. The simulation applies introductory physics skills in forces, momentum, orbital mechanics, thermodynamics, and fluid mechanics. This project does not only simulate the motion of the spacecraft; it includes several flight controller positions in a Mission Control who receive telemetry from the spacecraft, as well as orbit designers who plan the spacecraft's trajectory to the Moon and back. The flight controllers and astronauts must work together to overcome failures and errors thrown in by the simulation director and return the crew safely to Earth.

BIO

Timothy Hamilton grew up on a farm in the Smoky Mountains of East Tennessee, where he first picked up stargazing. He majored in physics at Rhodes College, Memphis and earned his Ph.D. in Astrophysics from the University of Pittsburgh in 2001. After two years as a postdoc at NASA/Goddard Space Flight Center, he got a faculty position at Shawnee State University in Ohio, where is a professor of physics and astronomy. Although the only astronomer there, he keeps his research active and is a member of the CANDELS research team, the biggest collaboration on the Hubble Space Telescope.

Workshop Presenter: Jeff Chaffins

Pulsar Search Collaboratory

An introduction to the Pulsar Search Collaboratory will be presented. The PSC is a combined effort of high school students, professional astronomers, astrophysicists, and the Green Bank Observatory in Pocahontas County, West Virginia. The PSC is a research-based organization in high schools that focuses on radio astronomical research. Teachers and students will form a PSC organization at their school or other venue. PSC teams will conduct original research by analyzing data from the Green Bank Telescope (GBT) with the expectation of discovering new pulsars and characterizing changes in previously-known pulsars. Students have actually discovered several new pulsars, and have become published authors, before they leave high school. The PSC also provides a quality enhancement for any science class and a means to provide instruction for the Science Literacy Standard

Jeff presently teaches Chemistry, AP Chemistry, and Physics at Spring Valley High School in Huntington, West Virginia, where he has also taught Earth & Space Science and Physical Science. Jeff has been employed by the Wayne County, WV Board of Education since 2004, and has been Adjunct Faculty at Mountwest Community & Technical College (General Chemistry) and for Salem University (Environmental Science, Physics). Jeff was a professional chemist for Ashland Petroleum and Marathon Petroleum Companies of Catlettsburg, Kentucky from 1985-2004, where he assisted in the quality control and development of various petrochemical products. Jeff graduated from Marshall University of Huntington, WV in 1988 with a B.S. Degree (Chemistry); in 1996, with an M.S. Degree (Safety Technology); and in 2016, with an M.A. Degree (Education).

Contributed Talks

David Facemyer (graduate student), Marshall University

Title: Hybrid Excitations in Organic-Inorganic Core

Abstract: In this work electronic structures and optical properties of organic-inorganic polariton, a new elementary excitation existing in heterostructures combining both organic and semiconductor materials, are studied. In those systems, the Wannier-Frenkel hybrid exciton has unique and interesting properties that can improve the efficiency of optical materials. When an organic-semiconductor combined heterostructure is illuminated by high-intensity electromagnetic radiation with the frequency of the photons at or near the resonance frequency of the Wannier-Frenkel exciton, we obtain a macroscopically occupied system of hybrid excitons that further interacts with photons. This light-matter interaction will in turn generate the hybrid polariton. We will theoretically determine electronic structure, energy and dispersion relation of polaritons. By analyzing the interactions between the hybrid exciton, photons, it may be possible to discuss the best conditions for polariton formation.

Dillon Buskirk (graduate student), Marshall University

Title: Analytical Waveforms for Eccentric Binary Black Holes

Abstract: The orbital evolution of black hole binaries is described by two main phases: the inspiral and the merger. Using the post-Newtonian (PN) theory for the inspiral phase of the binary, we build up a Mathematica script to obtain strain waveforms for the inspiral. We expand our previous inspiral formulation to include eccentric orbits, which greatly complicates the calculations. Since this model breaks down as the two bodies approach merger, a separate model for the merger and ring-down is required. Our previous work used the implicit rotating source (IRS) formulation. We have built a BOB model and check to see how it compares with the IRS model. A complete waveform is built by matching the merger models with the inspiral model when it begins to break down. Using the Simulating Extreme Spacetimes (SXS) data for the first gravitational wave detection (GW150914), we see how our complete waveform compares.

Ellie White (student), Marshall University

Title: Solar Flare Detection with a Classroom Radio Telescope

Abstract: The Small Loop Antenna Project is a new educational initiative developed in partnership with the Green Bank Observatory and West Virginia Alliance for STEM and the Arts (WV AllSTAR). The goal of the project is to increase interest in STEM fields among West Virginia students by providing engaging hands-on radio astronomy research opportunities. A loop antenna kit, curriculum, and supplementary activities and experiments have been developed as part of this project; the kit consists of all of the materials necessary to construct a small-scale radio telescope which is capable of detecting solar activity. This project is an excellent teaching tool to introduce students to concepts like engineering, computer science, astrophysics, creative problem solving, and many other related skills. By engaging students' imaginations with the excitement of doing real-world radio astronomy research, our goal is to help students find their passions and develop skills that will prepare them for their futures.

Xiaojuan (Judy) Fan, Marshall University

Title: From Sunlight to Electricity

Abstract: The talk focuses on the progress and outlook of the research activities on photovoltaics. Various solar cell fabrications and their work principles will be reviewed. Some of the new results from my recent work will be presented.

Ryan Vincent (graduate student), Jon Keaton (student), Arka Chattopadhyay, Sean P. McBride, Marshall University

Title: Size Selective Filtration Using Gold Nanoparticle Self-Assembled Monolayers on High-Flux Silica Nanoparticle Substrate

Abstract: Hydrophobic thiol coated gold nanoparticles have recently been investigated for their ability to self-assemble into robust, ultra-thin, porous sheets with unique mechanical properties at a liquid-vapor interfaces. The 2-dimensional hexagonally close packed arrays formed by the nanoparticles during the self-assembly process create a uniform membrane with a well-defined pore structure that can be utilized in filtration. In this work, tightly packed arrays of larger silica nanospheres are being explored as a possible high-flux supporting substrate for the gold nanoparticle membrane. Monodispersed silica nanospheres were synthesized with modified Stöber methods to make the supporting high flux substrates. The gold nanoparticle self-assembled monolayers have been observed to span across the hexagonally close-packed arrays of silica nanoparticle of various sizes. Scanning electron microscopy and atomic force microscopy were used as the primary means of characterization for this project and the experiments done here aim to lay the groundwork for a high-flux, size-selective filtration membrane design using gold nanoparticle self-assembled monolayers supported by a tightly-packed silica nanoparticle substrate.

Jayden Leonard (student), Marshall University

Title: Electronic Structure of Negative Trions in Semiconducting Quantum Dots

Abstract: A trion is a system that includes an exciton pairing with either an electron (called a negative trion) or a hole (called a positive trion). Trion systems have been a topic of extensive theoretical and experimental study, especially those contained within bulk-semiconductors. Trions in this system typically contain very infinitesimal binding energies, but recent research has used the fact that a trion within a quantum well will have its binding energy increased by an order of magnitude, to produce measurements of the photoluminescence spectra of the trions in a single, self-assembled quantum dot. This data could now be used to show how dependent the photoluminescence lines are on the size and geometry of the quantum dot. In this project, we will theoretically investigate the electronic structure of negative trions in a quantum dot of a direct band gap semiconductor. We will also study the effect of an electric field on negative trions. We will obtain the splitting of negative trion energy levels under the electric field. The respective wave functions of the resulting states have been obtained as well.

Rae Stanley (graduate student), Marshall University

Title: Checking Your Answers: The Opaque Process of Accessing Open Source Data, Exemplified by the Kepler Space Telescope

Abstract: Access to open source data has been a huge step in advancing all scientific disciplines. It has removed the need for competition, and encouraged communication and collaboration, while simultaneously producing more results from a single data set than one research group ever could. The name 'open source' invokes thoughts of easy-to access interfaces that offer neatly packaged and ready-to-analyze processed data. Unfortunately, open source data takes quite a bit more work for the user to get it into a useable state, but even more unfortunately, sites offering open access data don't often acknowledge this to the user. What gets left to the user is often advertised as ready-to use and easy to access data, when the reality is the opposite. More worrisome though, is that it can be difficult to tell whether or not you have accessed the data you need without careful examination and reading through mountains of documentation. In this talk, I will use the Kepler Space Telescope's open access data retrieval device to exemplify this problem, and use this example to make an appeal for more transparent and universally accessible open access data.

John J. Lynch, Frostburg State University

Title: Speed of Sound: the gStrings App with a Graduated Cylinder

Abstract: In this work a graduated cylinder is used as a whistle to produce a tone. The frequency of the tone--the fundamental--is measured with the gStrings app for Android smartphones. From this frequency and the height of the column of vibrating air the speed of sound is obtained. The necessary equipment is readily available at no cost and yield very good results.

Joseph E. Wiest, West Virginia Wesleyan College

Title: Wave Theory through Complex Functions for the Diffraction of Light

Abstract: In many introductory Physics courses and often continuing on into the second year of study, multi-slit diffraction is often taught in a traditional trigonometric manner. This approach works adequately for only two-slit diffraction, and still only for angle and distance calculations. Single-slit diffraction discussion often involves a combination of a trigonometric approach and some hand-waving to again produce only a partial description of the resulting diffraction spectrum. In order to present a complete description for light diffraction for any number of slits, one can employ complex variable functions which will be explained in this talk. Infinite methods of wavelet summing as well as finite summing of wavelets will be presented. The complete single-slit method of determining angles for minima intensity and related angles, and for the complete intensity spectrum will be demonstrated. A complete N-slit method will be presented for determining minima and maxima intensity angles, and a complete intensity spectrum will be shown. Both major maxima and minor maxima intensities will be accounted for, as well as the minima intensity positions. Writing computer code for generating intensity spectra of both single-slit and multi-slit diffraction will be discussed, with results shown for typical parameters. Comparison laboratory results will be shown using laser light sources, gratings of multiple slits, and a digital spectrometer.

Tracey DeLaney, West Virginia Wesleyan College

Title: Using Toys for Physics Education

Abstract: Simple toys are often based on some pretty cool physics concepts and thus provide a wonderful mechanism for demonstrating physics in everyday life. Sometimes the underlying concepts are rather simple to work out and other times the physics is quite complex. Several toys will be shown to demonstrate concepts such as the Magnus Effect, momentum, friction, etc. These toys were used to teach children in the Wesleyan Summer Gifted Program and also for the Engineering Design class at West Virginia Wesleyan College.

Taylor Jones-Martin (student), Marek Krasnansky West Virginia State University

Title: WVSU Suborbital Payload for RockSat-X 2019

Abstract: A team of five WVSU students worked to design and construct a payload for NASA's RockSat-X program as part of the West Virginia Collaboration. The experiments included a temperature/pressure sensor, inertial measurement unit, optical orientation, direction of radiation, and Geiger counters to detect the amount of radiation and test performance of each GeigerMueller tube. All experiments were controlled by a microcontroller and the data transferred to telemetry by a Raspberry Pi Compute Module. I will present on the design and results of the experiments.

Sachiko McBride, Marshall University

Title: How to Demonstrate Optical Refraction and Faraday's Law in The Classroom

Abstract: Showing visual demonstrations is helpful for students to put the concepts into a 3-dimensional reality since many topics in Physics are difficult to imagine. Showing many demonstrations also can make for a very memorable class and many students like to see them and become more engaged with the class. I try to show numerical demonstrations for each topic in my classrooms as well as physical demonstrations. In this talk, I will show three demonstrations for Refraction and Faraday's Law.

Richard Calo (student), West Virginia Wesleyan College

Title: Hyperfine Spectra of Rare Earth Elements

Abstract: I am studying the atomic hyperfine spectra of rare-earth elements using tunable diode lasers, hollow cathode lamps, and a lock-in amplifier. This topic is important to West Virginia because the tectonic collisions that formed the Appalachian Mountains are thought to have brought up rare-earth elements as well. This research will help with the extraction of different rare-earth elements from coal and other materials found throughout Appalachia.

Baylee Senator (student), West Virginia Wesleyan College

Title: Single Hole Based Magneto-Impedance Biosensor for Particle Detection

Abstract: This report involves research on enhancing the sensitivity of biomedical sensors to monitor heart rate, eye movement, and potentially to treat cancerous tumors.

Nate Chalmers (student), West Virginia Wesleyan College

Title: Cesium excited states with tunable diode lasers

Abstract: The presentation will be on the use of the use of tunable diode lasers for the multi-photon excitation of Cesium-133. Specifically, the 6S, 6P, and 6D energy transitions. Two photon spectroscopy is used in order to follow the excitation paths of cesium which correspond to specific wavelengths. This goes on to prove the known transition rules, and energies needed to make the energy state jumps.

Eric Roy and Virginia Martin (students), West Virginia Wesleyan College

Title: Undergraduate Outreach

Abstract: This presentation will review our work on the West Virginia Science Public Outreach Team (WV SPOT). Eric and Virginia developed and gave science-themed presentations to students K-12 in West Virginia. It will discuss the program's impact on the students. A major portion of this summer was dedicated to improving WV SPOT and translating difficult concepts into words that an elementary school students can easily understand. WV SPOT is proven to spark a genuine interest in science. The presenters gain a valuable experience delivering scientific presentations and analyzing concepts at a level that they can explain to children and adolescents.

Spencer Rodgers(student), West Virginia Wesleyan College

Title: Magnetic Fields in Thin Ferromagnetic Films

Abstract: This report involves research on magnetic fields in thin ferromagnetic films embedded in superconductors. The results can be used to make improved non-volatile computer memory.