

American Association of Physics Teachers

Appalachian Section Fall 2022 Meeting

West Virginia Wesleyan College
Hyma Auditorium
Christopher Hall of Science, 1st floor

Friday, October 21, 2022

5:00-7:00pm Registration, Refreshment, Light Food, and Tour of Teaching Labs – Christopher Hall 1st floor

6:00-8:00pm Dinner at local restaurants

8:00-9:00pm Planetarium Show with Tracey DeLaney, Astrophysicist – Christopher Hall 2nd floor

Saturday, October 22, 2022

8:00-9:00am Registration and Continental Breakfast, Lobby – Christopher Hall 1st floor

9:00-9:05am Welcome

Joseph Wiest, West Virginia Wesleyan College

President-Elect, American Association of Physics Teachers - Appalachian Section

9:05-9:10am Keynote Speaker Introduction

Tracey DeLaney

Department of Physics and Engineering, West Virginia Wesleyan College

9:10-10:10am Invited Keynote Speaker

Sarah Burke-Spolaor, Center for Gravitational Waves and Cosmology, West Virginia University

Title: A galaxy-sized detector for the biggest black holes in the universe

Abstract: Binary supermassive black holes are the biggest, meanest binary systems in the Universe. When galaxies merge, these giant binaries can form. During their inspiral and merger, they will produce intense gravitational radiation, which we expect to detect with gravitational-wave observatories like Pulsar Timing Arrays and LISA in the coming decade. Pulsar timing arrays use distributed networks of pulsars to sense these waves as they pass through our galaxy; in effect, they form an observatory on a Galactic scale. This talk will discuss the exciting latest results from the North-American "NANOGrav" pulsar timing array, including an interesting "noise signal" that shows hints of (but is not yet securely) a first detection.

10:10-10:25am Break

10:25-10:40am

John Stewart, West Virginia University

Title: Exploring Factors Influencing the Retention of Physics Majors

Abstract: Exploring Factors Influencing the Retention of Physics Majors

This talk examines the retention of physics majors at a two moderately sized physics departments which struggle with increasing the number of graduates. The two institutions have undergraduate populations with substantially different levels of high school preparation. Survival analysis identifies the point of highest risk for two potential paths out of the major: leaving college and changing majors. Substantial risk of losing majors exists through the first two years of college. The results for changing major while staying in college were very different between the two institutions. Logistic regression is used to explore the factors related to retention in general and through the first two years of college. At the less selective institution, math readiness is a crucial factor predicting retention.

10:40-10:50am

Marek Krasnansky, West Virginia University

Title: WVSU's Experiments for RockSat-C 2022

Abstract: RockSat-C program gives students an opportunity to design and build experiments that are launched to space on a sounding rocket from NASA's Wallops Flight Facility in Virginia. The work of two WVSU students on RockSat-C 2022 will be presented in my talk. The first goal was to find the best design for a Geiger counter to measure radiation levels during a space flight. Four different Geiger-Muller tubes were tested during the flight. The second goal was to build a module to measure physical conditions during a space flight. The module measured acceleration, rotational velocity, magnetic fields, temperature, and pressure. Design of the devices and data collected during the flight will be discussed in this talk.

10:50-11:00am Virtual

Ronald J Willis and Gervase Willis, Department of Engineering & Department of Mechatronics, Blue Ridge Community & Technical College

Title: Autonomous Navigation Assistant (ANA)

Abstract: Space Flight Design Challenge Team: A Prototype Analysis and Document AI

11:00-11:10am

Caleb Hardy, West Virginia Wesleyan College

Title: RockSat

Abstract: The presentation will discuss the payloads flown for the RockSat program from previous years and relating it to what we will be building this year. From our 2021 payload, we were able to get great data on the spin of the rocket through its different stages. Unfortunately, the SD card for our 2022 payload was corrupted, so we had no spin data to compare it to the previous year. This year, we are still interested in the spin of the rocket, however, we want to use the data we collect on the spin of the rocket to rotate a gear motor at the same rpm as the rocket but in the opposite direction.

11:10am-12:00pm Business Meeting**12:00-12:55pm Lunch****1:00-1:15pm**

Maria Babiuc Hamilton, Marshall University

Title: "Online Master Physics Teachers"

Abstract: There is a physics education crisis in U.S., due to the small number, isolation and lack in preparation of middle and high-school physics teachers. This is even more acute, due to the projected increase in STEM jobs, which will drive up the number of high-school students taking physics classes. The solution is to prepare in-service physics and science teachers. Starting this fall, the Physics Department at Marshall University offers a new fully online master's with emphasis in Physics for Teachers. In this talk we will give a brief overview of this program.

1:15-1:30pm

John Lynch, Frostburg State University

Title: Using Excel to sketch E-field lines

Abstract: The Excel spreadsheet program has two simple functions that few people know about. These functions can be used to create a precise grid of values of electric potential within the vicinity of point charges. From this grid, equipotential lines can be readily sketched. From these, E-field lines can be easily drawn.

1:30-1:45pm

Danielle Maldonado, West Virginia University

Title: Adding Self-Regulated Learning Instruction to a Physics Class

Abstract: This talk will present preliminary results of an effort to add explicit self-regulated learning instruction to a college calculus-based introductory physics class. Students received short instructional segments on general self-regulation strategies, the metacognitive and cognitive reasons those strategies were often successful, and specific strategies useful in the college physics environment. Students were encouraged to reflect on the success of their past strategies and to report their planned future study strategies through four surveys which will be given monthly throughout the semester. Students rated which strategies were successful and which they intended to try in the future.

1:45-2:00pm Virtual

Sean McBride, Marshall University

Title: Herd Hours: An alternative to traditional office hours

Abstract: Office hours, a time and place where students receive professor guidance, is an asset available to nearly every college and university student; however, many students do not use office hours. Office hours can be extremely beneficial, so the question exists, how to get students who need help to come to office hours? Herd Hours, an alternative to office hours, successfully addresses this question. Herd Hours is designed with the professor's office hours moved to a large room, students can come individually, or especially in large groups, or herds as the name implies, to work on coursework without a hovering professor. Students are encouraged to use large chalkboards to explain their work and seek validation from peers. Individual work is first encouraged, followed by working with peers, before seeking help from the nearby professor. Overwhelmingly, the data from 248 students in introductory undergraduate physics courses shows that Herd Hours is effective in getting the students the help they need. Over six semesters, 47.6 % of students attended at least once and 31.9 % attended 4 or more sessions. Independent of the students prescore on the Force Concept Inventory, an assessment test on Newtonian mechanics, the individual normalized gains for Herd Hours students increased 2.0 – 13.1 %. Data shows the peak in the individual normalized gain for Herd Hours students is more than double the control group. Results also show the average individual normalized gain for Herd Hours students is nearly double the expected value for traditional lecture-based introductory physics courses.

2:00-2:15pm

Elaine Christman, West Virginia University

Title: Examining the Persistence of Rural and First Generation West Virginia Engineering Students

Abstract: Engineering majors comprise the majority of students taking introductory calculus-based physics classes at West Virginia University, and physics departments may play an important role in the success of engineering students. While many researchers have examined the role of gender in degree attainment of engineering students, significantly less work has been dedicated to studying other factors that may be of importance to West Virginians, including rural upbringing and first-generation college student status. This study applied survival analysis to explore outcomes of students pursuing engineering majors at West Virginia University. Students who attended high school in rural West Virginia locales and those who were first-generation college students displayed qualitatively different patterns of changing major and of departing the university than did continuing-generation, non-rural West Virginia students. This suggests that the most crucial points to provide encouragement to make the decision to continue in engineering may also differ. Logistic regression was used to examine factors, including high school preparation and college course-taking pattern

2:15-2:30pm Break

2:30-2:45pm

Caleb Hardy, West Virginia Wesleyan College

Title: Using Radioisotopes to Power Deep Space Probes

Abstract: The presentation will be focused on the research I did this summer for my internship on how energy produced from radioisotopes can be used to power spacecraft. The first thing that will be discussed is alpha spectroscopy and the different isotopes that I collected data on. I will then go on to talk about induced radioactivity, specifically trying to produce neutrons by using the alpha particles of radioisotopes and striking different materials that will give off a neutron. Lastly, the presentation will relate my previous points to how it can be used to power a thermoelectric generator.

2:45-3:00pm

Eden Reynolds, West Virginia Wesleyan College

Title: Scanning Tunneling Microscopy

Abstract: The purpose of this research was to better understand molecular and atomic physics while connecting with mentors and peers to collaborate and retrieve data from two separate experiments. A Scanning Tunneling Microscope captured images of Graphite's and Gold's atomic structure. A theory before using the Scanning Tunneling Microscope was that the Graphite atomic structure would be hexagonal shaped.

3:00-3:15pm

Eric Reynolds, West Virginia Wesleyan College

Title: The human spectrometer

Abstract: In general physics lab we attempt to demonstrate methods of determining the wavelengths of light emitted by various sources. The basic spectrometer is a go-to for achieving this measurement. I will demonstrate how a student wearing diffraction-grating glasses can immerse themselves in the experiment while achieving reasonable wavelength measurements.

3:15-3:30pm

Malachi Crews, West Virginia Wesleyan College

Title: Rutherford Nitrogen Gas Experiment

Abstract: Most of my past summer of research at West Virginia Wesleyan College was spent trying to gain a better understanding of Nuclear Physics. Specifically, gamma spectroscopy, alpha spectroscopy, creating calibration graphs, positron emissions, and how to build vacuum chambers. I conducted alpha and gamma spectroscopies on just about every isotope that we had here in our nuclear laboratory that was known to emit alpha or gamma particles, as well as studied the positron emission of Na-22. For many of my graphs I would plug the more well-known values into a calibration graph to predict where certain peaks of interest would be located at in my data. I also wanted to recreate the Rutherford Nitrogen Gas Experiment which was the first artificially produced nuclear reaction that involved bombarding Nitrogen Gas with Alpha Particles resulting in the transmutation of Nitrogen-14 to Oxygen-18. To recreate this experiment in our laboratory I had to design and build new vacuum chambers. These vacuum chambers were built throughout the last few weeks of my summer research.

3:30-3:45pm Closing Remarks and Adjournment