SCAAPT Meeting October 23, 2021 **Masks Required**

In-Person: Soka University, Curie Hall **Zoom Option: Link**

9:00am – 9:30am Breakfast and Coffee provided by SCAAPT

Order of Magnitude Question: How many protons are in Saturn?

9:30am Workshop for New Teachers: Momentum and Energy Demonstrations - 1 hour

Bill Layton, James Lincoln

Many of these Bill-Layton-produced collision carts and tracks have been given to Southern California physics teachers and they seem to be well-received. They demonstrate elastic and inelastic collisions and provide real examples of the energy and momentum transfer during collisions. The magnetic repulsion during elastic collisions is a spectacular way to help students understand the transfer of energy from kinetic to potential and then back to kinetic energy again. For teachers who do not yet have this collision cart set and track, several will be available for free takeaway at the end of the meeting. A "new" variation will be demonstrated that converts the track to easy demonstrations of string attached masses often discussed with Newton's laws.

James Lincoln also provides a portion of this workshop. In his half he explains how the Newton's Cradle can explain both momentum and energy conservation and shows some new tricks with it. Additionally, a set of happy and sad balls can demonstrate how different amounts of impulse are transferred whether an object bounces or sticks during a collision. All new physics teacher participants will receive these materials free of charge.

10:30 am QED Playing cards for communicating physics – 15 min

Jason Veatch University of Goettingen - virtual (from Germany +9 hours)

A novel education and outreach project is presented that makes use of playing cards – one of the most ubiquitous toys around the world – to communicate physics concepts and history. A custom deck of cards has been designed to inspire with the famous characters of physics and widely appealing to students and the general public and useful for gameplay, magic, and cardistry. The project has generated significant interest among educators and researchers alike. The process of designing and producing the cards has presented opportunities for unusual collaborations including multiple guest lectures by the speaker (a CERN particle physicist) in high school and university level physics classes around the world.

10:45 am Making Homework More Accessible for Students – 15 min

Felix Hu, Creative Director of OSMO Educational Apps

I am reaching out to get your thoughts on a learning tool that we are developing. As app builders with experience making educational tools and games for kids, we are now making a tool that's faster than Google at giving students the information they need and better for their learning retention. Integrating this tool is as simple as adding QR codes to your homework handouts, completely at your discretion. In this talk, we show a demo and answer questions.

11:00 am SOKA's Nieves Observatory and Science Facilities Tour – 1 hour

Bryan Penprase, et al, Soka University (host)

Soka University has a research-grade telescope which can be remotely operated. Therefore, it can be used effortlessly by classes around southern California . All that is needed is a web browser and an internet connection. I wish to invite interested physics teachers to attend this "open house" for our observatory and will demonstrate our system and continue to collaborate with interested physics teachers and professors. On our website at http://sites.soka.edu/SUO we have tutorials for students and teachers to try out. Later we are going to expand to include some basic Python training for students as well.

Lunch: Corner Bakery 12pm – 12:45 pm **Business Meeting // Show & Tell 12:45 – 1pm**

1:00 pm How Dirac Predicted Anti-matter - 45 min

Lee Loveridge, Los Angeles Pierce College

The combined results of special relativity and quantum mechanics require the existence of anti-particles and field descriptions of both particles and waves, but this was not well understood when Schrodinger, Klein, Gordon, and Dirac were working out the wave equations for particles. In this talk, I will illustrate why anti-particles are a necessity of quantum mechanics and special relativity, describe the struggles this presented for the pioneers of quantum mechanics, and explain how they led to a reluctant prediction of the positron and the eventual development of field theory.

1:45 pm 9 Solar System Myths you might Actually Believe In! - 30 min

James Lincoln, President SCAAPT

In the process of learning about the solar system, we are all subject to forming our own (often incorrect) opinions because there is little opportunity for direct observation. s to questions that no one is around to answer. Some of these myths are well-known and well-published, others are subtle, and you may not have even realized that you believe it them. Yet, the most concerning type of myths are the ones you might be teaching to your students! Together we will find the answers, I welcome suggestions for other myths you may have discovered in this on-going project.

2:15 pm Aerospace physics with units and Ingenuity - 15 min

Philip Blanco Grossmont College

"Dimensional analysis" (which really just means getting your units to match) can be a powerful tool for simplifying complex phenomena, such as the thrust produced by a whirling propeller and the power required to spin it. In this talk, I shall show theoretical predictions and small-scale experimental results that allow students to predict the performance of helicopters and drones flying not just on Earth, but on other worlds.

2:30 pm San Diego State University Physics Department Undergraduate Degree Programs - 15 min

Usha Sinha San Diego State University

The presentation will cover the highlights of the undergraduate degree program at SDSU. This includes an overview of the different degree options, our hands-on teaching labs, elective offerings, and our vibrant Society for Physics students. A survey of the different research areas and the research opportunities for Physics majors will also be presented. We have the requirement of the senior thesis that provides with real research experience that often culminates in a journal publication.

2:45 pm Some Updates in Physics Education and Thinking about the Connection Boxes – 15 min

Joseph Calmer, Beckman High School, LACOE Professor

This talk will talk about some updates in the Physics Classroom in the Year after; focusing on growth, Mental Health, and progress. The connection boxes are connected to the CCSS:M. Have we looked at them? Can they be useful? Learn to ID some of them and look at them as a foundation to build your Physics Classroom. Math is described as the ""Queen of all science"", we should use this status to our benefit and build a class that is rigorous and rooted in Standards (NGSS and CCSS:M).

3:00 pm A Weekly Assignment - 15 min

Larry Stein, University of La Verne

I am a Physics Educator today because I realized in High School that Physics was applicable to a large multitude of life situations, and I want to share that realization with everyone. This “Weekly Assignment” is designed to help students see Physics happening in their lives. It has been used with both High School and College students, and it incidentally challenges students to use/develop their writing skills, as well as their observation and analytic skills.

3:15 pm Weighing the Axion with Muon Haloscopy - 15 min

Noah Bray-Ali Mount Saint Mary's University Los Angeles

Axions in the local dark matter halo of the galaxy collide with virtual photons dressing the electromagnetic vertex of the muon. The collisions shift the muon magnetic moment in a way that scales with the four-dimensional volume of the muon beam and transforms like the axion under discrete space-time symmetries. Correcting for the shift, we resolve the tension between the standard model of particle physics and the results from the first run at Fermilab which measured the muon magnetic moment to better than one part per million. We propose two key tests to be carried out in the next few runs of the experiment that would demonstrate the existence of axions and show that they saturate the energy density of dark matter in the local halo of the galaxy.

3:30 pm Prizes and Adjournment

Show & Tell Sign Ups

Philip Blanco **Katie Mills, et al, USC Stem Center** **Robert Baker**