

**Welcome Address: “Physics is For Everyone”**Paul G. Hewitt, *Conceptual Physics*

With so much to learn, how do educators decide what is most important? Relevance is the key. Information relevant to our everyday lives should be central to what we learn. That’s physics, the study of nature’s rules—all nicely expressed in its laws. Let’s teach physics with that focus. Let’s also celebrate being physics teachers.

**Working for Veritasium**

James Lincoln

In 2021 I was recruited by Derek Muller, of youtube’s top science channel *Veritasium*, to contribute script content and demonstration equipment to the video [Risking my life to Settle a Physics Debate](#). In this video, Derek drives a car that is powered by the wind – yet – travels faster than the wind. The physics seems so impossible that many of us were asked to help explain how it is all possible. In this talk, I provide a backstage pass to see how these videos are made, explain my role in the project, and which explanations were written by me. I also demonstrate my prototype toy version of the “Black Bird” vehicle, built with found materials, that can be replicated in any high school or middle school classroom.

**Top 10 Demonstrations of Impossible Physics**

Many Presenters

Submitted for your approval are the most unbelievable discrepant events in physics demonstrating. In demo after demo, you will confront what you think to be true and compare it with what you cannot deny is happening. Everyone will learn, everyone will be surprised, and everyone will witness new physics that they would never have previously believed to be true.

**Galileo and the Lute**

Frank Thurmond, Univ. of Arkansas Little Rock

A journey into the history of physics. Galileo Galilei was born in 1564, the same year as William Shakespeare! Hence, they heard much of the same “renaissance” music including the lute. Vincenzo Galileo (father) was a professional musician and trained his sons in the same skills. In this talk, we watch how this musical influence impacted Galileo’s physics, we watch him invent the tension-velocity equation (guitar formula), precise time keeping, and hear a live performance by the author on the same traditional instrument!

**100 years of Wavicles**

Papers of Louis de Broglie

In 1924 Prince Louis de Broglie published his doctoral thesis on the wave-particle duality hypothesis. Namely, that the electrons in atoms are standing waves. “De Broglie has lifted a great veil” said the flabbergasted Albert Einstein. On this 100-year anniversary, we peruse Prince de Broglie’s 1924 landmark publication and watch it sweep through the decades as it forever revolutionizes atomic physics.

**The Other Oppenheimer Movie**

Educator’s Panel

The year 1989 saw the release of “Fat Man and Little Boy” starring Paul Newman (Salad Dressing) and Dwight Schultz (Star Trek) as the title characters. (Newman portrayed Leslie Groves and Schultz was J. R Oppenheimer.) This talk contrasts the celebrated “educators’ cult-classic” film with both the 2023 movie (starring Cillian Murphy and Matt Damon) and goes further to compare both casts to the real historical people and events of the Manhattan project.

**A Lost Feynman Story**

Richard Feynman, Recording

The famous Feynman Lectures on Physics have now been released for free on the internet as audio format long plays. Now made public, the lectures contain many funny little stories and jokes. But in this talk, we will listen to clips of what we believe is the best Feynman Lecture and go further to find a lost gem: one of his notorious personal anecdotes. Feynman tells a yet-unreleased amusing story of a physicist performing an informal experiment in his everyday life.

**A New View of the Universe**

James Webb Space Telescope, NASA

The James Webb Space Telescope has been taking new pictures of not just the most distant galaxies, but also our own solar system. All of this with new infrared eyes that boast a new unprecedented clarity. These never-before-seen views we have on our universe are stunning as they reveal new truths about where we are, what we are, and how long it has all been going on. Get to know these new images as part of our 21<sup>st</sup> century scientific and cultural heritage.

**The Earth: *STILL* not flat!**

John Mallinckrodt, Cal Poly Pomona

Proponents of preposterous conspiracy theories have become significantly visible over the past decade and are having an increasingly deleterious effect on the kind of informed and rational public discourse that is essential to a functioning modern democracy. For science faculty it should be a special cause for alarm that proponents of a “Flat Earth” are now beginning to show up in college level classes. In this talk, I will help listeners both 1) understand just *what* “Flat Earthers” claim to believe and 2) be prepared to counter those beliefs with a few simple facts that anyone can verify with easily-performed observations and 3) provide examples for how to incorporate these into class projects or research ideas for students.

**Cosmic Redshift but NO BIG BANG**

Arnie Benn, Quantum Bicycle Society

Hubble redshift has convinced many that the universe is expanding away from a point-like initial singularity, despite how such a construct violates known physical laws. I suggest here that we consider alternative (peer-reviewed) hypotheses that do not violate physical laws. One of these is that photon redshift arises from the fact that photons lose tiny amounts of energy as they traverse extremely large distances through spacetime. This is not a Doppler shift, which is merely a perceived photon energy loss; this is an actual photon energy loss. This discussion must be framed in the context of sub-quantum mechanics, which describes the photonic substructure of all subatomic particles, as well as their spacetime interactions with light and with one another. This, in turn, allows us to finally understand gravity as a consequence not only of sub-quantum particle structure but of photon redshift itself.

**New Experiments for a New AP Physics**Arbor Scientific\* \*sponsored

The 2024-25 academic year will see the release of new AP Physics Exams. Particularly changed will be AP Physics 1 which is receiving a new unit on fluid physics. In this talk, we present new equipment to the community to meet this need. These live demonstrations will both entertain and instruct the PhysicsCon attendees as we show you what we have cooked up for the teachers of America to help them all prepare for their New AP Physics courses.

**Falling Through the Earth**

Alex Klotz, CSULB

How long does it take to fall through a tunnel through the Earth from one side to the other? In this talk, I will go over the history of the problem, the simplest solution, and a more complicated one. I go further to show why the simplest solution is actually better and that there are also some extensions to the latest research into “gravity tunnels,” which actually are a thing.

**ACADEMIC TALKS****Inspiring Creativity and Advancement through DEI**

Praisya Poluan, Edison HS

In this interactive talk, participants will experience how choice and diversity, equity, and inclusion are essential to the advancement of physics. We will discuss the struggles and solutions to condensing hundreds of years of physics history in one school year while also producing college, career, and life ready individuals with strong physics identities. Join us as we build community and pave the way for the physicists of tomorrow (or Monday - we deserve breaks, too!).

**You Don't Have to be Smart to Know and Do Physics**

Larry Stein, University of LaVerne

Physics is descriptive, but more importantly, it is also prescriptive. In this talk, I show that humans and animals use physics, albeit perhaps unwittingly, all the time. Since the (Experimental) Scientific Method is our main way of learning about the world around us, all babies must, of necessity, use the Scientific Method. Science is nothing if not repeatable. Even babies learn that by moving their limbs in certain ways, they can reliably use friction to get from one place to another. I proceed to give several examples of where Physics is used intentionally in everyday life, first by humans, followed by other animals. Then, of course, there's the Physics of Sports, even if you're not good at it.

**Origami Spinners for Physicists**

Albert David Valderrama

The ancient Japanese art of paper folding has found its way into space through satellite design, but it also still has a place in the classroom. Learn to fold a modular origami spinner to engage students of all ages in rotational dynamics, all while practicing meditation and mindfulness. Prior origami skills not required.

**Get Out of Your Seats: Utilizing Engagement Strategies**

Jessica Gutierrez

Learn about a variety of instruction strategies that use movement to engage students in learning high school physics. All attendees will participate in activities themselves and be given resources to bring back to the classroom.