



Wisconsin Association of Physics Teachers (WAPT) Annual Meeting 2022

November 4 and 5, UW-Stevens Point – Stevens Point, WI

Friday November 4:

Location: Laird Room, Dreyfus University Center (DUC)

1015 Reserve St, Stevens Point WI 54481.

5:30 PM: Registration, check-in, and social time.

6:00 PM: Banquet.

6:45 PM: Opening remarks and welcome address, Dr. Cindy McCabe, Asst. Dean, School of Mathematics, Computing, Physics and Astronomy, UW Stevens Point.

7:00 – 8:00 PM: Plenary talk

The James Webb Space Telescope: NASA's Latest Great Observatory

Dr. Aaron Steffen, Dept of Physics & Astronomy, UW Stevens Point.

The James Webb Space Telescope (JWST) is NASA's most recent major space telescope. In my talk I will discuss the JWST from inception to today, highlighting both its amazing capabilities and the science that astronomers hope to accomplish over its lifetime.



Saturday November 5:

- A. Session I, Workshop. Science Building Room B112, 8:30 – 11:30 am.
Models and Analogies for High School Physics Teachers,
Mark Lattery, UW-Oshkosh.

Please RSVP to lattery@uwosh.edu by Thursday, November 3 to receive workshop materials.

Join us for an exploration of models and analogies for the high school physics classroom. Topics include: modeling theory of instruction, modeling method of instruction, and the Hesse theory of analogies. Examples will be drawn from geometric optics and simple harmonic motion (grades 10-12).

- B. Session II, Presentations. ChemBio Building Room CBB 105, 8:30 am – 9:45 am
Chair: Palash Banerjee.

1. 8:30 – 8:45 am: *Conceptual Mathematics for Physics*,
Gary Baier, SPASH.
2. 8:45 – 9:00 am: *Observational Astronomy for Middle School, High School, or College Students using Remote Observatories*,
Sebastian Zamfir, UW Stevens Point.

I will briefly present the possibility of incorporating Observational Astronomy activities into your science curriculum, using Slooh. Slooh's team articulates that "It hasn't been practical for schools to set up their own telescopes, but online telescopes make the study of space accessible to everyone". I have no ties with the Slooh company, nor do I have any gain in promoting their educational or instructional offers. My presentation is just making you aware of the opportunity of being able to control (remotely) telescopes in Chile or Canary Islands and complete standards-aligned learning activities, whether you have a week or a semester to study space, for middle school science, high school physics, high school astronomy, college introductory astronomy, and at home.

3. 9:00 – 9:15 am: *Students' difficulties explaining results of spring constant measurements*,
Nenad Stojilovic, UW Oshkosh.

Students typically do not view a non-ideal behavior of a spring as the source of a systematic error, and they generally do not understand the effect of this error on

the value of the spring constant. In this talk I will discuss how relatively simple experiments involving springs can be used to enhance students' understanding of systematic errors, the average values, and the concept of slope.

4. 9:15 – 9:45 am: *The Science of Learning Physics*,
Jennifer Docktor, UW La Crosse.

I recently co-authored a book with Jose Mestre entitled *The Science of Learning Physics: Cognitive Strategies for Improving Instruction*. In this talk I will summarize some of the research implications and instructional strategies highlighted in our book.

- C. 9:45 – 10:00 am, Short break for coffee and discussions, CBB Lobby.

- D. Session III, Presentations. ChemBio Building Room CBB 105, 10:00 – 11:00 am.
Chair: Gary Baier

1. 10:00 – 10:20 am: *Predicting the Color of Corn Syrup between Polarizers – an Inexpensive Lab Project*,
Jonathan K Patras, Samuel T Dettle, and Peter Cook, UW Superior.

Shining white light through corn syrup between two linear polarizers to produce a variety of vivid colors that change with polarizer rotation is a common demonstration. The explanation (which involves the visible light spectrum, polarization, polarizers, chirality, optical activity, rotary dispersion and human perception of light) is surprisingly complicated given the simple setup. As an inexpensive upper level lab project, the optical rotary dispersion of corn syrup is characterized using *scattered* laser light. Then the white light transmission spectrum for a given length of corn syrup and relative polarizer angle can be simulated and subsequently reduced to a single RGB color.

2. 10:20 – 10:30 am: *The Virtual Mystery Tube, an HTML5 Simulator for remote activity*,
Steven Sahyun, UW Whitewater.

This talk describes an HTML5 Simulator of the classic "Mystery Tube" used to introduce students to the idea of developing models to represent the world. The "Mystery Tube" is used as one of the first hands-on activities students encounter in the Next Gen Physics and Everyday Thinking (NextGen PET) guided inquiry course. The "Mystery Tube" simulator was developed so that remote and on-line

students could participate in an activity that would have otherwise only had an apparatus available in-class.

3. 10:30 – 10:45 am: *Computational Physics Projects Solved with Coding Forces and with Simple Assumptions*,
Brad Hinaus, UW-Stevens Point.

In our 300 level computational physics classes at UWSP, students are given projects to compute the motions of objects that have non-constant forces in direction, time, and or magnitude, such as drag, Coriolis, or the Magnus force. Students solve the projects by coding the full forces into a program. To analyze their data for output, students make the simplifying assumption. Interestingly, this simplifying assumption matched the full code output over a wide range of inputs. Examples will be shown for hitting a golf ball with spin, throwing a curve ball, and focusing electrons.

4. 10:45 – 11:00 am: *Course based Undergraduate Research within Interdisciplinary Travel Study Courses: Physics and Geology of Iceland*,
Ozgur Yavuzcetin, UW-Whitewater.

Some of the academic high-impact practices, or HIPs are mentored undergraduate research and international travel study courses. International travel study courses are great opportunities for students to gain various experiences and can provide them opportunities to work in interdisciplinary teams of research. Our travel-study course to Iceland involves students from various disciplines to work on their science projects. I will talk about some of the benefits of these courses specifically for physics majors.

- E. 11:00 – 11:10 am, Short break for coffee and discussions, CBB lobby.
- F. Session IV, Presentations. ChemBio Building Room CBB 105, 11:15 – 12:15 pm.
Chair: Mick Veum.
 1. 11:10 – 11:30 am: *Observations regarding a 112-Years Old Physics textbook*,
Alan Scott, UW-Stout.

The first edition of the textbook *Physics* by Charles Mann and George Twiss was published in 1905 with a revised edition in 1910. This pre-dates Rutherford's planetary model of the atom. Key observations will be identified and discussed.

2. 11:30 – 11:50 am: *Teaching Quantum Mechanics for the Age of Quantum Information*,
Maryam Farzaneh, UW Stevens Point.

Traditional teaching of quantum mechanics at the undergraduate level usually starts with wave mechanics and solving the Schrödinger Equation for continuous systems. Although this approach is essential for understanding atomic physics, its mathematical complexity is a barrier for student understanding of the basics and postulates of quantum mechanics. In this talk, I will convey my experience teaching quantum mechanics based on the spin-first approach (as developed by David McIntyre at Oregon State University). This is a mathematically straight forward approach and focuses on teaching the theory of measurement using a simple, discrete physical system. This naturally leads to introducing students to the basics of quantum information and concepts of quantum entanglement, quantum gates and circuits, and quantum teleportation. A simplified version can even be used at the high school level as an introduction to quantum information.

3. 11:50 am – 12:10 pm: *Glowscript Programming for Demos, Simulations, and Teaching*,
Daniel Sinkovits, UW Stout.

Glowscript (aka Web VPython) is a Python-based library for creating interactive 3D graphics in a web browser. It is simple enough for beginners to learn the basics, but it is powerful enough for some visually impressive simulations, or even games. I have used Glowscript to create demos, my own PhET-style simulations to mimic labs, and a series of computational projects that run parallel to University Physics I and II.

4. 12:10 – 12:30 pm: *Tech is always changing, and I am always learning*,
Ken Menningen, UW Stevens Point.

The demise of Flash interactive applets has hampered my teaching, and maybe yours, too. I will share a workaround solution that permits me (and my students) to use Flash applets when no HTML5 replacement is available. I will also share a recent video that changed the way I think about electric circuits. It did not change what I teach about Ohm's law and electric power, but it sharpened my presentation of those topics, and might sharpen yours, too.

G. Lunch: 12:30 pm, CBB lobby.

H. WAPT business meeting: Room CBB 105, 12:45 – 2:00 pm.