Michigan Section of the American Association of Physics Teachers

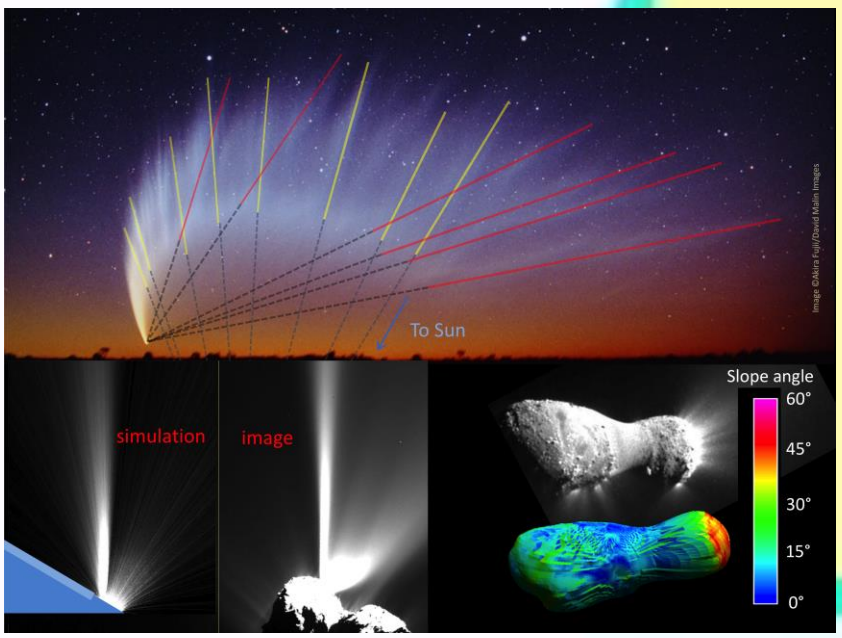
Spring 2017 Meeting
Announcement and Program Schedule

Lawrence Technological University, Southfield, MI
April 8, 2017

Keynote Address

We are pleased to welcome Jordan Steckloff, Ph.D as our keynote speaker. Dr. Steckloff is currently an Associate Research Scientist at the Planetary Science Institute as well as a Postdoctoral Research Associate at the Massachusetts Institute of Technology.

Dr. Steckloff's work studies the dynamical, physical, and structural evolution of cometary bodies in the Solar System. He is also interested in the geophysical processes that alter the surface of Pluto and reorient its rotational axis. Dr. Steckloff will share with us some of his planetary insights from two recent articles he published in the prestigious journal *Nature*.



Dr. Jordan Steckloff received his Bachelor of Science degree from the University of Michigan with a triple major in Physics, Economics, and German. He later received his Masters and Doctoral degrees in Physics from Purdue University before joining the Planetary Science Institute in 2016.

Door Prizes!

We have some door prizes to be distributed during the afternoon business session. You will want to be there for the drawing!

Program Overview

Location: Lawrence Technological University, 21000 West Ten Mile Road, Southfield, MI, 48075.
. Main Campus map: https://www.ltu.edu/map/

Parking: Please park (free) in Parking Lot D. Directions to Main Campus: https://www.ltu.edu/sitemap/directions.asp

Registration: Registration cost is $10 per meeting. Students and first-time attendees may attend *free* of charge.

Lunch: Lunch is $10 per person. Please pay during Registration and you will receive a voucher redeemable at the LTU Cafeteria. A portion of the lunch fee funds our pre-meeting breakfast.

Program Schedule – Saturday, April 8th

7:30 – 8:00 am **Registration / Morning Refreshments**
Meeting fee: $10.00 (FREE for students and first-time attendees)
Location: Lobby outside Auditorium, S321 Science Building

8:00 – 8:15 am **Call to Order and Welcome**
David Shane, Lansing Community College
Scott Schneider, Lawrence Technological University
Location: Auditorium, S321 Science Building

8:15 – 9:30 am **Contributed Presentations**
Location: Auditorium, S321 Science Building

8:15 - 8:30
An effective and sustainable approach to teach technical writing in physics laboratory
Changgong Zhou, Lawrence Technological University

8:30 - 8:45
TinkerVention as a STEAM Idea
Taoufik Nadji, Interlochen Arts Academy

8:45 - 9:00
Using Images to Evaluate the Physics of Special Effects
James Gell, Plymouth High School

9:00 – 9:15
Developing Habits of Experts with our Physics Students
Janelle Lie, Plymouth High School

9:15 – 9:30
How to Roast a Chicken Without Using a Calculator
Larry Tarini, University of Michigan - Flint

9:30 – 9:45 **Break**

9:45 –11:15 **Contributed Presentations**
Location: Auditorium, S321 Science Building

9:45 - 10:00
Physics in a Classical Education
Paul Hosmer, Hillsdale College

10:00 - 10:15
Give an example of . . .
Michael Faleski, Delta College

10:15 - 10:30
Experimenting with the mass-luminosity relation and stellar lifetimes
Michael C. LoPresto, Henry Ford College

10:30 - 10:45
Analyzing Hubble Space Telescope Data in the Introductory Astronomy Course
Carrie Swift, University of Michigan – Dearborn

10:45 – 11:00
Using Exoplanet Radial Velocity Detections to Teach Simple Harmonic Motion
Jordan Steckloff, Planetary Science Institute, Rebecca Lindell, Purdue University

11:00 - 11:15
What I Learned Teaching a Science Course for Elementary Education Majors
David Shane, Lansing Community College

11:30 – 1:00 pm **Lunch**
Location: LTU Cafeteria

1:00 – 2:00 pm **<u>Keynote Address</u>:**
Breaking the Ice: How Sublimation Torques Alter Comet Activity and Structure
Dr. Jordan Steckloff
Associate Research Scientist, Planetary Science Institute
Postdoctoral Research Associate, Massachusetts Institute of Technology
Location: Auditorium, S321 Science Building

To quote David Levy: “comets are like cats: they have tails, and they do precisely what they want.” They have strange bilobate nuclei, undergo outbursts (rapid, unpredictable brightening events), and form long striated dust features in their tails that somehow align with the Sun rather than the nucleus. Additionally, their dynamics appear to require some mysterious mechanism for reactivating their sublimative activity. In this talk, I describe how all of these features are the result of ice sublimation, the process that defines these irregularly shaped bodies.

2:00 – 2:15 pm **Poster Session**
Location: Lobby outside Auditorium, S321 Science Building

2:15 – 2:45 pm **Puzzlers! And Door Prizes!**
Location: Auditorium, S321 Science Building

2:45 – 3:15 pm **MIAAPT Business Meeting**
Location: Auditorium, S321 Science Building

3:15 –4:00 pm **Afternoon Workshop Session**

Workshop #1

Bringing the 2017 Eclipse into your Physics or Astronomy Classroom
Bradley Ambrose, Grand Valley State University
Location: S203 Science Building

This workshop introduces participants to an ongoing project that seeks to connect undergraduate science instruction to the theme of eclipses. The goal of the project is to develop innovative modular, research-based instructional materials for use in a variety of physics and astronomy courses. Workshop participants will gain firsthand experience with selected materials and learn about the underlying research in astronomy and physics education. This effort, part of a collaboration with the NASA Heliophysics Education Consortium, is led by Ramon Lopez (U. Texas-Arlington), Janelle Bailey (Temple/AAPT), and Rebecca Vieyra (AAPT).

Workshop #2

Fundamental Labs for Exploring Electricity and Magnetism
Don Pata, Grosse Pointe North High School
Location: S211 Science Building

There are fundamental relationships between electricity and magnetism that are well described in textbooks but how many of us actually have students do these labs and develop these rules by themselves? In this workshop participants will put their hands on the materials and develop two of these fundamental relationships. They will experience some of the inquiry methodologies described in the Modeling Method for Teaching Physics.

Abstracts for Contributed Presentations

An effective and sustainable approach to teach technical writing in physics laboratory
Changgong Zhou, Lawrence Technological University

Writing lab reports has always been considered an important component of introductory physics laboratory. With consideration of effectiveness and scope of writing, sustainability of writing and grading, we implemented a new approach of teaching technical writing. This presentation will report the planning and implementation of the new approach. Students' feedback will also be presented.

TinkerVention as a STEAM Idea
Taoufik Nadji, Interlochen Arts Academy

The presenter will share his new implementation of a project-oriented set of activities in his physics classes. The activities involve students tinkering and inventing gadgets (called TinkerVentions) in groups to improve their STEAM skills and to apply concepts learned during the coverage of major physics units.

Using Images to Evaluate the Physics of Special Effects
James Gell, Plymouth High School

Students encounter special effects in online videos, films, television shows, and commercials on a regular basis. These provide a context for students to apply their physics skills to evaluating what they are being shown. These activities require students to recognize the physics to evaluate, make measurements/estimations, make calculations using those measurements, evaluate uncertainty, present their results, and respond to questions and critique of their assessment – all the elements of a good laboratory experience.

Developing Habits of Experts with our Physics Students
Janelle Lie, Plymouth High School

This interactive presentation will take a look at Kathleen Cushman's *Habits of Experts*, and how they have been implemented in a high school physics classroom. Incorporating strategies such as modeling, collaborative learning, and self-reflection has challenged our students to acknowledge and develop the habits necessary to "get good" at physics. Not only do these habits align with our new NGSS standards, but they are skills our students will use beyond the classroom.

How to Roast a Chicken without Using a Calculator
Larry Tarini, University of Michigan - Flint

Except for a few South Pacific islands with high rates of smoking and obesity, the United States is the only country that continues to use Fahrenheit units to measure temperature. Here's how to avoid food poisoning if you have no calculator and the oven temperatures in your roast chicken recipe are written in Celsius. The technique applies equally well if you are baking a batch of Vegan granola.

Physics in a Classical Education
Paul Hosmer, Hillsdale College

Classical education, as represented by such educators as Susan Wise Bauer (The Well Educated Mind) and the Barney Charter School Initiative at Hillsdale College, is a growing movement in K-12 education. This form of education emphasizes the traditional liberal arts, the Western Tradition, and the classical trivium and quadrivium. Does physics have a place in this movement? If so, what should it look like? What makes a physics class uniquely "classical"? Is this desirable or even possible? In this talk I will suggest aspects of a physics course that might make it conform to the classical education ideal.

Give an example of . . .
Michael Faleski, Delta College

Students are faced with many different types of problems in the introductory physics sequence. They have to learn whether to use constant acceleration kinematics, linear momentum conservation, mechanical energy conservation, a combination of these, or something completely different. It is difficult for students to learn how to recognize when to apply which physics because it takes practice, and hence instructors give homework. Can the script be flipped, so to speak? In this presentation, we'll talk about using "Venn Diagrams" and reversing the process whereby students need to come up with their own examples of different kinds of physics.

Experimenting with the mass-luminosity relation and stellar lifetimes
Michael C. LoPresto, Henry Ford College

Meaningful quantitative experiments that demonstrate the actual process of science that are relevant, interesting and engaging can be hard to come by for general education college introductory astronomy courses taught at a lower mathematical level. If the mathematical component of an experiment is too complex, students can easily become lost in the procedure and will end up simply trying to follow it by rote and learn little or nothing. What follows is a simple experiment in which students gather and plot numerical data and participate in a straightforward quantitative analysis of the data to verify the mass-luminosity relation between stars on the main sequence of the Hertzsprung-Russell diagram and their projected lifetimes. The experiment has been used successfully for the laboratory component of an introductory descriptive astronomy course.

Analyzing Hubble Space Telescope Data in the Introductory Astronomy Course
Carrie Swift, University of Michigan – Dearborn

We present a new set of activities to bring the power of the Hubble Space Telescope (HST) to the introductory classroom. We have taken advantage of the Hubble Legacy Archive (a remarkable public utility serving 25+ years of HST data free of charge), to develop a suite of short astronomical team-projects using real HST data.

We are developing a web-based interface to these "Data Investigations," to allow instructors at any institution to use them and contribute to their development. Having deployed them in ten introductory astronomy courses at UM-Dearborn (40-100 students each), we are interested in beta-testing with local educators.

Using Exoplanet Radial Velocity Detections to Teach Simple Harmonic Motion
Jordan Steckloff, Planetary Science Institute

All planets and stars orbit about their mutual center of mass (barycenter). However, current technologies cannot generally resolve exoplanetary systems. Nevertheless, the orbital motion of the host star induces a detectable Doppler shift that approximates a mass undergoing simple harmonic motion along the observer's line of sight. Moreover, a system with multiple exoplanets replicates a system of coupled simple harmonic oscillators. We describe how the mass and orbital radius of the orbiting planets can be determined from measurements of the harmonic velocity of the star.

What I Learned Teaching a Science Course for Elementary Education Majors
David Shane, Lansing Community College

This semester I found myself teaching an 'Integrated Science for Elementary Educators' course for the first time, which has me seeing the work of teaching Physics from another perspective. I'll share how the course is structured and some of the activities we do, along with what I found to be good, bad, or otherwise just interesting.

Abstracts for Contributed Posters

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MIAAPT Mission Statement: The Michigan Section of the American Association of Physics Teachers is dedicated to promoting excellence in physics education in the state of Michigan and to supporting physics educators statewide. This organization shall endeavor to advance the knowledge of physics, to improve the teaching of physics, and to interest an increasing number of young people in making a career of physics.