



Michigan Section of the American
Association of Physics Teachers

Fall 2015 Meeting Announcement and Program Schedule

Interlochen Arts Academy, Interlochen, MI
October 3, 2015

Keynote Address

We are pleased to welcome Dr. Holly Gilbert as our featured speaker. Dr. Holly Gilbert is Deputy Division Director of the Heliophysics Science Division at NASA's Goddard Space Flight Center. She obtained a BS in physics from the University of Colorado, Boulder and her PhD in theoretical astrophysics from the University of Oslo in Norway. Prior to joining NASA, Holly was a Research Scientist at Rice University and an Associate Scientist at the High Altitude Observatory at the National Center for Atmospheric Research.

Prior to her life as a solar physicist, Holly attended Interlochen Arts Academy as a cello major for her last two years of high school.



As a solar physicist for over 18 years, Holly has extensive experience studying the solar atmosphere and phenomena associated with coronal mass ejections (CMEs), such as prominences and global waves. In her research she has utilized both ground- and space-based data to gain a better understanding of solar dynamical processes. An ongoing primary focus of her research is determining the nature of prominence support, formation, and evolution and how this relates to CMEs. Her research in this area is leading to a greater understanding of the magnetic environment that controls solar eruptions (sometimes referred to as “solar storms”).

Door Prizes!

We have some door prizes donated by Pasco, Interlochen Arts Academy, and others to be distributed during the afternoon business session. You will want to be there for the drawing!

Program Overview

Location: Interlochen Arts Academy is located at 4000 Highway M-137, Interlochen, MI 49643. For directions or a campus map, see: <http://www.interlochen.org/interlochen-campus> .

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

Parking: Please proceed through the main entrance of the school gate and park in lots F, G, and H.

Lunch: Lunch at the IAA cafeteria will be \$5 per person, and includes a choice of hot lunch, deli style, salad bar, or a combination thereof. Anyone arriving Friday night may dine at the cafeteria but might prefer local restaurants Hofbrau or Buds (or anything in Traverse City).

Hotels: Interlochen Arts Academy has kindly saved 10 rooms from their on campus hotel for MIAAPT. These rooms may be reserved by calling 231-276-7570 and mentioning the MIAAPT meeting. They will be released two weeks before our meeting. There is one other hotel in Interlochen and many in nearby Traverse City, of course.

Program Schedule – Saturday, October 3rd

7:30 – 8:00 am Registration / Morning Refreshments
Meeting fee: \$10.00 (FREE for students and first-time attendees)
Location: (Follow signs, near Dow Rotunda)

8:00 – 8:15 am Call to Order and Welcome
Les Latham, Port Huron Northern High School
Dr. Mary Ellen Newport, Director, R.B. Annis Math and Science Division
Location: Dow Rotunda

8:15 – 8:45 am Jazz Ensemble Performance
Location: Dow Rotunda

8:45 – 10:30 am Contributed Presentations
Location: Dow Rotunda

8:45 - 9:00

Two Demonstrators of Rotational Inertia using a Torsional Pendulum and Rotational Inertia Apparatus

Stephen Rea, Plymouth H.S. (Retired)

9:00 - 9:15

Conversation v. Compliance: Strategies for engaging learners with instructor feedback
Joshua P. Veazey, Grand Valley State University

9:15 - 9:30

Rolling with and without slipping
Michael C. Faleski, Delta College

9:30 - 9:45

Low Cost 3D Printers in Physics Class

Steve Dickie, Divine Child High School

9:45 - 10:00

Student Reasoning in Chemistry: A Work in Progress

Lauren A. DeVries and Christopher M. Nakamura, Saginaw Valley State University

10:00 - 10:15

Hearing the Music in the Spectrum of Hydrogen

Michael C. LoPresto, Henry Ford College

10:15-10:30

Increased Student Gain with Reduced Instructor Pain

Alan Grafe, University of Michigan-Flint

10:30 – 10:45 Break

10:45 –12:15 Morning Workshops Session

Workshop #1

Redesigning your High School Physics Curriculum to Avoid the “Physics Meltdown” and Honor Students Intuitive Ideas

Alexander Robinson, Thornapple Kellogg High School

Location: TBA

Students enter high school physics classrooms with underdeveloped math skills and well over a decade of experience interacting with moving objects. The traditional order of the introductory mechanics curriculum (kinematics, force, momentum, energy) frontloads challenging math and starts off by emphasizing students’ “misconceptions” about force, rather than their productive intuitive ideas about energy and momentum. Over the past three years, we have been engaged in curriculum design research, flipping the traditional order of concepts to avoid the “physics meltdown” and honor students’ intuitive ideas. In this workshop, we will 1) share our strategies for re-conceptualizing an existing curriculum (including potential pitfalls of this approach) and 2) engage participants in analysis of typical student ideas and strategies for addressing those ideas.

Workshop #2

When the Arts meet Physics

Taoufik Nadji, Interlochen Arts Academy

Location: TBA

The presenter will discuss/share how he has been incorporating various arts media to introduce Physics concepts and encourage deeper reflections, better discussions, and richer writing within the Physics curriculum.

12:15 – 1:15 pm Lunch

1:15 – 2:15 pm **Keynote Address:**

Partly Sunny with a Chance of Space Weather

Dr. Holly Gilbert, Chief, Solar Physics Lab, Heliosphysics Space Division

NASA Goddard Space Flight Center

Location: Dow Rotunda

Our closest star has been an object of mystery and inspiration for millennium, but over the last 50+ years, solar scientists have made great strides in understanding the inner workings of what makes the Sun tick. The layers of the solar atmosphere lead to dynamic behavior and act as the birthplace of space weather. NASA has a fleet of spacecraft dedicated to studying the Sun and its domain- the heliosphere, including its effects on Earth. I will take you on a journey through the Sun's varying moods, focusing on coronal mass ejections and associated activity, and discuss the implications for Earth in the past, present, and future.

2:15 – 2:30 pm **Poster Session**

Location: TBA

2:30 – 3:00 pm **Puzzlers! And Door Prizes!**

Location: Dow Rotunda

3:00 – 3:30 pm **MIAAPT Business Meeting**

Location: Dow Rotunda

3:30 – 5:30 pm **Afternoon Workshops Session**

Workshop #1

Teaching a General Education Sound and Light Course for Music and Art Students

Michael C. LoPresto, Henry Ford College

Location: TBA

All students are required to take at least one science course as part of their general education requirements. Offering a course on sound for music students and one on light for art students in an effort to expose them to science in a way that is relevant to them is nothing new, but this workshop will describe a course developed and taught at HFC over the last decade in which the two are *combined* into one four-credit lab science course. Challenges involved and mistakes made along the way will be discussed and hopefully, the main attraction will be an introduction materials developed; *all of which can be shared with anyone who is interested*. These include: 6-chapter eBooks, *Sound Science* and *Light Science* - unpublished, despite an offer, so they can be made available to students for free. Both grew from course notes over the majority of the 10 years the course has been taught, have been finished only recently and are constantly subject to revision. Each is complete with end of chapter questions and internet links; *Sound Experiments*, a 15-experiment laboratory manual, also unpublished, on the science of sound based on experiments developed for the sound portion of the course; and several experiments on light & color developed especially for the light portion of the course.

Workshop #2

Make and Take

Steve Dickie and Jim Gell

Location: TBA

Make apparatus for labs, demonstrations, or just as student engagement tools that are easy and inexpensive to make. You will have as much fun making these as you will playing with them, and you get to take them home with you!

Abstracts for Contributed Presentations

Two Demonstrators of Rotational Inertia using a Torsional Pendulum and Rotational Inertia Apparatus.

Stephen Rea, Plymouth H.S. (Retired)

The first part of the talk is a demonstration of conservation of mechanical energy using a rotational inertia apparatus. This will reveal a unique conceptual problem for your students. The second part introduces a new device for teaching the harmonic motion of a torsional pendulum.

Conversation v. Compliance: Strategies for engaging learners with instructor feedback.

Joshua P. Veazey, Grand Valley State University

For students of physics, receiving feedback on work from experts in the field is essential. However, in traditional assessments students tend to focus on the points awarded for correct answers and rarely internalize instructor comments that are scribbled in the margins--if they even read them at all. Instructor homework solutions posted online may only receive cursory glances. In this talk, I will discuss examples of assessments constructed such that the acts of students engaging with instructor feedback or solutions, and reflecting on how to improve their work, are integral to completing the assignment. In some cases, this facilitates back-and-forth iterations of comments between student and instructor, such that grading becomes more like a conversation than a cold, one-sided evaluation. I will discuss these strategies primarily in the context of large-enrollment introductory college courses, but where beneficial, they could readily be adapted to upper-level undergraduate or high school courses.

Rolling with and without slipping.

Michael C. Faleski, Delta College

Rotational motion seems to make less intuitive sense than linear motion. The surprise of students participating in demonstrations of balancing bicycle tires and gyroscopes shows just that these kinds of motion are non-intuitive. One of the "simpler" topics covered in many physics classes is rolling without slipping as there is rotation combined with some translation. Upon careful inspection, though, there are many surprising results in this class of problem that appear to be overlooked in the introductory texts. In this presentation, we will look at some potentially surprising results for both rolling without slipping and rolling with slipping inspired by a standard textbook problem in most books.

Low Cost 3D Printers in Physics Class.

Steve Dickie, Divine Child High School

If you lack a full shop and/or the skills to use one, then 3D printers might just be the ultimate device for creating lab and demo apparatuses. Using free software it is possible to make some very useful devices with very little skill. Additionally, because it is so easy to print out a whole collection of parts that vary slightly from each other, 3D printers can also be used to foster model based thinking.

Student Reasoning in Chemistry: A Work in Progress.

Lauren A. DeVries and Christopher M. Nakamura, Saginaw Valley State University

A useful framework for studying reasoning that has been applied in Chemistry education identifies reasoning that is largely algorithmic and reasoning that is largely conceptual. The algorithmic approach focuses on executing an internalized procedure, while the conceptual approach focuses on conceptual understanding and metacognitive evaluation. The approaches highlight contrasting views of science. In our project we observe how students answer simple reasoning questions. Participants are students who have completed or enrolled in second semester general chemistry at Saginaw Valley State University. Participants are interviewed one-on-one. They are asked to answer conceptual dichotomous classification questions about chemistry. Students are asked to classify scenarios as possible or impossible and provide explanations of their reasoning. Interviews are audio recorded, and transcribed. Transcriptions are coded for correctness, and reasoning approach. As we conduct interviews we are searching for emergent themes in the responses useful for understanding how students reason with basic chemistry ideas. Recent progress will be presented.

Hearing the Music in the Spectrum of Hydrogen.

Michael C. LoPresto, Henry Ford College

Demonstrating that the pitch and loudness of musical sounds are related to the frequency and intensity of a sound wave is simple and students are easily able to draw the analogies with the color and brightness of light. When considering an entire spectrum, the presence of multiple frequencies and wavelengths of different intensities is perceived by the ear as sound quality, or musical timbre, while the perception of the eye is the tone or hue of a color. The analogy between the two can be shown with a demonstration in which the emission spectrum of hydrogen is considered and actually played as a musical chord.

Increased Student Gain with Reduced Instructor Pain.

Alan Grafe, University of Michigan-Flint

A new instructor who has only been exposed to traditional lecture methods may find the prospect of adopting other, more effective teaching strategies daunting, especially if they are constrained to traditional lecture/laboratory spaces. What may not be so obvious is that an instructor need not perform a wholesale restructuring of their course. Based on personal experiences, this presentation will outline an incremental strategy for adopting more effective strategies while reducing the likelihood that the instructor becomes overwhelmed at any particular step.

Abstracts for Contributed Posters

Experimenting with Musical Instruments.

Michael C. LoPresto, Henry Ford College

Standing waves on strings and in tubes are the basis of the operation of many musical instruments. The poster shows the results of several simple experiments in which these principles are verified by measurements made of both the physical dimensions of string, woodwind and brass instruments and the frequencies of the musical notes produced when the instruments are played.

Rolling with and without slipping.

Michael C. Faleski, Delta College

One of the “simpler” topics covered in many physics classes is rolling without slipping as there is rotation combined with some translation. Upon careful inspection, though, there are many surprising results in this class of problem that appear to be overlooked in the introductory texts. In this poster, we will look at some potentially surprising results for both rolling without slipping and rolling with slipping inspired by a standard textbook problem. In addition, we consider quantities associated with energy in these problems.

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.