



Michigan Section of the American
Association of Physics Teachers

Fall 2016 Meeting Announcement and Program Schedule

Lansing Community College, Lansing, MI
October 15, 2016

Keynote Address

We are pleased to welcome Barbara Oakley, PhD, PE as our keynote speaker. Dr. Oakley is a Professor of Engineering at Oakland University in Rochester, Michigan, a Visiting Scholar at the University of California, San Diego, and Coursera's inaugural "Innovation Instructor." Her work focuses on the complex relationship between neuroscience and social behavior. Dr. Oakley's research has been described as "revolutionary" in the *Wall Street Journal*—she has published in outlets as varied as the *Proceedings of the National Academy of Sciences*, the *Wall Street Journal*, and *The New York Times*. She has won numerous teaching awards, including the American Society of Engineering Education's Chester F. Carlson Award for technical innovation in engineering education. Her book *A Mind for Numbers: How to Excel at Math and Science (Even If You Flunked Algebra)*, (Penguin, 2014) is a *New York Times* best-selling science book.



Dr. Oakley has adventured widely through her lifetime. She rose from the ranks of Private to Captain in the U.S. Army, during which time she was recognized as a Distinguished Military Scholar. She also worked as a communications expert at the South Pole Station in Antarctica, and has served as a Russian translator on board Soviet trawlers on the Bering Sea. Dr. Oakley is an elected Fellow of the American Institute for Medical and Biological Engineering.

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: Lansing Community College is located at 411 North Grand Avenue, Lansing, MI 48933.
Main Campus map: <http://www.lcc.edu/maps/main/>

Parking: Please park (free) in the Gannon Ramp. Directions to Main Campus:
<http://www.lcc.edu/parking/directions.aspx>

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

Lunch: Lunch will be \$10 per person, subs and chips from Jersey Giant in the Gannon Commons. A portion of the proceeds helps fund our complimentary breakfast.

Program Schedule – Saturday, October 15th

7:30 – 8:00 am Registration / Morning Refreshments

Meeting fee: \$10.00 (FREE for students and first-time attendees)
Location: outside Arts and Science 407 (follow signs)

8:00 – 8:15 am Call to Order and Welcome

David Shane, Lansing Community College
Elaine Pogoncheff, Dean of Arts and Sciences, Lansing Community College
Location: Arts and Science 407, adjacent to registration

8:15 – 9:30 am Contributed Presentations

Location: Arts and Science 407

8:15 - 8:30

International Young Physicists' Tournament (IYPT)

Ojan Damavandi, Andrei Klishin, and Chrisy Du, University of Michigan - Ann Arbor

8:30 - 8:45

Engineering in the High School Classroom - Michigan Science Standards

Jim Gell, Plymouth High School

8:45 - 9:00

Modeling in Physical Science - A New Approach for New Standards

Robert Peters, Caro Community Schools

9:00 – 9:15

Classroom Design Informs Physics Curriculum & Vice Versa

Taoufik Nadji, Interlochen Arts Academy

9:15 - 9:30

To Cancel or Not to Cancel: That is the Question

Don Pata, Grosse Pointe North High School

9:30 – 9:45 Break

9:45 –11:15

Contributed Presentations

Location: Arts and Science 407

9:45 - 10:00

Teaching Physics Through the Founding Fathers

Paul Hosmer, Hillsdale College

10:00 - 10:15

Supporting the Integration of Computation into Physics Courses

Danny Caballero, Michigan State University

10:15 - 10:30

Developing an Empirically Grounded Framework to Assess Interdisciplinarity of Student Explanations of Everyday Phenomena

Mashood Kalarattu Kandiyil, Michigan State University

10:30 – 10:45

Doing real physics in high school: hyper-velocity stars

Vance J. Nannini, Divine Child High School

10:45 - 11:00

Finding Earth-like Planets in Habitable Zones

Hector Ochoa, Henry Ford College

11:00 - 11:15

Finding Earth-like Planets in Habitable Zones Laboratory Activity

Michael C. LoPresto, Henry Ford College

11:30 – 1:00 pm Lunch

Location: Gannon Commons

1:00 – 2:00 pm Keynote Address:

Learning How to Learn

Dr. Barbara Oakley, Professor of Engineering, Oakland University

Location: Arts and Sciences 407

Most of us are unaware of best practices in learning—particularly in the STEM disciplines. That’s not surprising. We have never studied it explicitly. Instead, we use a rag bag of methods picked up at school and work, often including practices that research have shown to be ineffective. In this talk Dr. Barbara Oakley walks us through how to learn effectively, drawing on her extensive experience as an engineering professor and research and her work as co-lead on Coursera–UC San Diego’s *Learning How to Learn*, the world’s most popular MOOC (massive open online course), with nearly 1.6 million registered students.

- The study techniques that help—and those that don’t
- Why recall and chunking work
- Using the brain’s different learning modes to best effect
- Procrastination—aka “the pain in your brain”—and the Pomodoro technique

2:00 – 2:15 pm **Poster Session**
Location: outside Arts and Science 407

2:15 – 2:45 pm **Puzzlers! And Door Prizes!**
Location: Arts and Science 407

2:45 – 3:15 pm **MIAAPT Business Meeting**
Location: Arts and Science 407

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

Workshop #1

Models from E & M
Don Pata, Grosse Pointe North High School
Location: Arts and Science 413

When teaching Electricity and Magnetism (E&M), often the M gets left off or rushed through due to time constraints. The participants will do one or two of the foundational labs and experience the model development phase of the modeling methodology.

Abstracts for Contributed Presentations

International Young Physicists' Tournament (IYPT)
Ojan Damavandi, University of Michigan, Ann Arbor

This presentation will introduce a new outreach program focused on open-ended physics research by high school students and public debates about the solutions. We are a group of physics graduate and undergraduate students conducting the national tournament US IYPT (<http://iypt.us>) and have been sending national teams to the international tournament for two years. In this talk, we will explain the format of the tournament and the reasons why we think it is a great opportunity for high school students to develop their scientific and critical thinking skills. Co-presenters: Andrei Klishin and Chrisy Du, both PhD students at U of M.

Engineering in the High School Classroom - Michigan Science Standards
Jim Gell, Plymouth High School

Teachers use engineering-related activities to engage students in activities that connect the curriculum to the world outside the classroom. The Michigan Science Standards bring new requirements and challenges to science teachers and their students. This presentation will outline the new requirements and look at some examples of what students are expected to be able to do.

Modeling in Physical Science - A New Approach for New Standards

Robert Peters, Caro Community Schools

Modeling Instruction is an actively engaging pedagogy that puts student learning at the forefront. The American Modeling Teachers Association has created new Modeling units designed under contract from Oakland Schools and Genesee ISD. The new units are designed as a first course in High School Science which address the NGSS Discipline Core Ideas in Physical Science. Energy is a common thread among all of the sciences, and the new Physical Science units put energy first. The energy concept is used as a hub that all of the other units ultimately relate back to.

Classroom Design Informs Physics Curriculum & Vice Versa

Taoufik Nadji, Interlochen Arts Academy

The presenter will share how his contribution to the design of his new Physics classroom would inform his curriculum. In addition, the presenter hopes that such experience may help instructors as they contemplate remodeling and moving into new learning space.

To Cancel or Not to Cancel: That is the Question

Don Pata, Grosse Pointe North High School

In physics we often need to convert between units like centimeters to meters and seconds to hours, etc. In the past we've taught students to use "dimensional analysis" as a tool to do so. But are we doing more harm than good? Are we instilling a conceptual understanding of the process? Is there a better way?

Teaching Physics Through the Founding Fathers

Paul Hosmer, Hillsdale College

As citizens of the Enlightenment, the Founding Fathers were scientifically literate, used analogies from physics in their political debates, and expected their audiences to understand. Franklin was a famous scientist. Jefferson used Newton's "Principia" in proposals as Secretary of State. Adams employed Newton's Laws in a debate against unicameral legislatures. These stories can engage students interested in political science and history to learn the physics behind the politics. I will discuss how I am using examples taken from I. Bernard Cohen's text "Science and the Founding Fathers" in several courses to teach non-science students about Newton's Laws and electricity.

Supporting the Integration of Computation into Physics Courses

Danny Caballero, Michigan State University

During the past several decades, computers have made inroads into science and engineering practice as useful instruments. More recently, computation has become indispensable, interrelated to both theory and experiment as a third approach to solving scientific and engineering problems. By comparison, the effect on undergraduate education has been large in a few enclaves, spotty in others, and in some cases nearly nil. The impact of this situation upon recent graduates with physics bachelor degrees has been researched by the AIP for a decade. Its results increasingly indicate that the failure of curricula to respond to changes in science and engineering practice is a significant problem. In this talk, I briefly present evidence of the challenges that lay before us and the attempts to respond to these challenges through research and faculty professional development. This work is supported by the National Science Foundation (DUE-1431776, DUE-1504786, and DUE-1524128).

Developing an Empirically Grounded Framework to Assess Interdisciplinarity of Student Explanations of Everyday Phenomena

Mashood Kalarattu Kandiyil, Michigan State University

Interdisciplinary thinking and reconciliation is integral to developing a coherent understanding of science. Projects like NEXUS are significant advancements in this regard and have created a need for new assessment tools. This paper discusses the development of an empirically grounded framework to assess the interdisciplinarity of students' explanations of everyday phenomena. As a preliminary analysis, we examine interview transcripts from two undergraduate students explaining the solidification of liquid egg white upon boiling. The extent to which students invoke different disciplines is considered as a criterion to assess the interdisciplinarity of their explanations. We carry this out by mapping the vocabulary and knowledge elements involved in student explanations to content presentations in introductory level physics, chemistry and biology textbooks.

Doing real physics in high school: hyper-velocity stars

Vance J. Nannini, Divine Child High School

Black holes, hypervelocity stars, and the classic gravitational force three-body problem: tackling real physics problems in the high school classroom. Recent discoveries of hypervelocity stars and investigations into their nature provide an opportunity for students to set-up a gravitational force three-body problem that brings to life the mystery of black holes and binary stars (and something physicists actually work on).

Finding Earth-like Planets in Habitable Zones

Hector Ochoa, Henry Ford College

Since its launch in 2009, the NASA Kepler spacecraft has been using the transit detection method to look for extra solar planets in our galaxy. Of particular interest are candidates for Earth-like planets, those that are similar in size to Earth that orbit within the habitable zones of their stars, the range of distances from the star in which temperatures and other conditions may allow life to exist on a planet. Over two thousand planets have been detected of which, according to NASA, a small portion are in orbit within their stars' "goldilocks" zone. Much of the data collected has been made public. Using the Stefan-Boltzmann radiation law and considering albedo and the greenhouse effect, the habitable zone of the star can be estimated and then it can be determined if any of its planets are similar in size to Earth and have orbits that are within the zone. Analysis of the data showed only about 1% of the over two thousand planets to be potentially Earth-like, a number of which are in accord with NASA's results.

Finding Earth-like Planets in Habitable Zones Laboratory Activity

Michael C. LoPresto, Henry Ford College

A presentation of an introductory astronomy laboratory activity based on the research done in the directed study on Finding Earth-like Planets in Habitable Zones. Each student is given a page or two of the original data and instructed to sort the data based on planets' types; Earth-like, Super Earth, Ice Giant, Gas Giant, and Larger and stellar spectral types, G, F, K, and M of the stars they orbit. Then, using a given range of habitable zones for the temperature range of each spectral type of star, the student determines how many Earth-like planets and/or Super Earths in their data set are within their stars' habitable zones. Data for the entire class is then compiled to see how many of each different type of planet have been found and the total number of Earth-like planets and/or Super Earths within habitable zones. The results are then compared with the official NASA results.

Abstracts for Contributed Posters

A Reference Data Set For Testing Portal Image To DRR Registration Algorithms

Afua Dankwa, Oakland University

In this study we create and statistically characterize a reference data set consisting of expert placed landmark points (LMP) on Mega voltage portal images (MVPI) and digitally reconstructed radiograph (DRR) image pairs from radiation therapy (RT) patient set-up. This reference set will be used in future studies to test automated portal alignment for patient set-up. We will compare the errors obtained when automated patient set-up are used with the uncertainty associated with the with the landmark point selection performed by the expert to evaluate which portal alignment has the least error.

Finding Earth-like Planets in Habitable Zones

Michael C. LoPresto, Henry Ford College

A poster reporting on the research and results of the directed study on Finding Earth-like planets in Habitable Zones.

Comparison of Scientific Practice in Transformed and Traditional Lab Contexts

Sarah Boyer, Michigan State University

MSU is in the process of transforming the format of their algebra-based physics lab course. This project used video data to compare and contrast students' engagement with the scientific practice of analyzing and interpreting data in the two lab settings. Students in the transformed lab section, which emphasized design and collaboration, engaged in more discussion and were more likely to utilize multiple sources of prior knowledge in their analysis.

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.