



Michigan Section of the American Association of Physics Teachers

2010 Spring Meeting April 24, 2010 VanderWerf Hall, Hope College Holland, MI

7:45 - 8:20 **Registration/Refreshments (VWF Lobby)**
Meeting fee \$10 payable at the door (includes MIAAPT Membership)

8:20 – 8:30 **Meeting call to order and opening comments (VWF 102)**
Drew Isola, MIAAPT President
Welcome by Moses Lee, Dean of Natural Sciences, Hope College

Morning Session I

8:30 – 10:42 **Oral Presentations** (arranged from submitted abstracts) **(VWF 102)**

8:30-8:42 Observational approach to the concept of image: the PCK involved
David Schuster, Rex Taibu, Chaiphath Plybour, William Mamudi and Betty Adams, Western Michigan University

8:42-8:54 Theoretical approach to the concept of image: the PCK involved
Rex Taibu, David Schuster, Chaiphath Plybour, Betty Adams and William Mamudi, Western Michigan University

8:54-9:06 Multiplying resources through partnerships - the example of JINA and MST
Zach A. Constan, NSCL, Michigan State University

9:06-9:18 Preparing Physics Teachers for High Needs Schools: Oakland University
Mark Olson, Oakland University

9:18-9:30 Weekly Online Checklists: Trying To Keep Everyone On Task
Philip Edward Kaldon, Western Michigan University

9:30-9:42 ComPADRE.org: Where Educators and Scientist Join to Support Learning.
Beth Kubitskey, Eastern Michigan University

9:42-9:54 Teaching Relativistic Acceleration Without (much) Mathematics - An intuitive and visual approach
Robert Hipple, Lansing Community College

9:54-10:06 An Astronomical Misconceptions Survey
Michael LoPresto, Henry Ford Community College

10:06-10:18 Use of Google Earth in Teaching Physical Geology Laboratories
Brian Kirchner, Henry Ford Community College

10:18-10:30 Introductory Physics: Is Our Success Their Success?
Michael Tanoff, Kalamazoo College

10:30-10:42 Solar Irradiance
Kandiah "Bala" Balachandran, Kalamazoo Valley Community College

10:42 – 11:00 **Break**

Morning Session II: Invited Talk

11:00 – 12:00 **Physics boot camp for teachers – Lessons Learned: (VWF 102)**

Mark Greenman, Albert Einstein Distinguished Educator, NSF

In this talk Mark will share the findings from a study of two cohorts of 25 teachers who participated in a 60-hour Massachusetts Department of Elementary and Secondary Education (DESE) physics summer content institute either during the summer of 2008 or summer of 2009. The study methodology used a pre- and post-test measure of participants' conceptual understanding of ideas in mechanics. The institute instructional pedagogy modeled active learning using the RealTime Physics Mechanics laboratory curriculum and microcomputer-based Interactive Lecture Demonstrations.

Lunch

12:00 – 12:50 **Two Lunch options are available for purchase:**

- Box lunches can ONLY be ordered in advance using this link [Box Lunch Order Form \(http://bit.ly/cXVMD4\)](http://bit.ly/cXVMD4)
- Lunch can be purchased the day of the meeting at the Phelps Cafeteria, a pleasant 5 minute walk across campus.

Solar Cooking Demonstration in VanAndel Plaza outside VanderWerf Hall
(weather permitting)

Nuclear Science Resource Kits (funded by APS and AIP) on display. These will soon be available for teachers to sign out and use in their classrooms.

12:50 – 1:20 **MIAAPT Business Meeting, Elections & Announcements (VWF 102)**

Drew Isola, MIAAPT President

Election of high school representative as 2nd VP

Section Officer's Report – Al Gibson

Afternoon Sessions - Concurrent

1:30 – 2:30 **Galileoscope Workshop (VanZoren 151)**

Al Gibson, PTRA

Build from a kit and then take home your own high quality Galileoscope. These telescopes were designed by the AAS for the International Year of Astronomy. Cost is \$20 per kit payable at the workshop. If you order this kit on your own it normally costs \$30 + shipping. More information about these telescopes is available at www.galileoscope.org

2:30 – 3:30 **Astronomical Misconceptions Workshop (VanZoren 151)**

Michael LoPresto, Henry Ford Community College

Both true-false and multiple-choice versions of a *Misconceptions Survey*, developed and implemented at HCC over the last two years will be reported on and shared with advice on implementation and discussion of attempts to dispel some of the more troublesome misconceptions identified. Discussion will also include attendees being asked to share "misconception-stories" they may have and how they dealt with them.

3:30 – 4:30 Dark Matter Workshop (VanZoren 151)

Al Gibson, PTRA

Al will present the PTRA/AAPT Dark Matter workshop designed by the Perimeter Institute of Canada. This workshop will introduce you to a classroom-tested teaching resource on dark matter that explains this elusive substance in terms of Newton's theory of universal gravitation and uniform circular motion. A DVD and Teachers Kit will be given to all participants. Cost of the workshop is \$5.00 payable at the workshop

Afternoon Sessions - Concurrent

1:30 – 3:00 Laser Light Workshop (VanZoren 152)

Monica Plisch, APS and Heide Doss, APS Education Consultant

Through hands-on activities, participants will explore the properties of laser light and then use these properties for interesting applications, including the speckle pattern on human skin and measuring the diameter of hair using diffraction. Also, participants will work through the PhET simulation of laser operation. Each participant will receive a free kit of materials and a student and teacher manual.

3:00 – 4:00 The Quest for the Nobel Prize – The Standard Model & Quarks (VanZoren 152)

Mark Greenman, Albert Einstein Distinguished Educator, NSF

Audience: High School, Freshman College Physics. Your students use a card game to learn about the formation of common Baryons and Mesons. Participants are guided by rules of color and charge to combine quarks into Hadrons. This is a student centered fun activity that teaches basic concepts behind the Standard Model and rules for Hadron formation. Templates for all game pieces and game cards will be shared with participants.

4:00 – 4:30 Hope College Accelerator Lab Tour

Cathy Mader, Hope College Physics Dept

The Hope College Ion Beam Analysis Laboratory provides the capability to study a wide range of research projects ranging from materials analysis, environmental chemistry, electrochemistry, biochemistry, paleontology and forensic science. The specific applications of Particle-Induced X-ray Emission (PIXE) spectrometry, Rutherford Back Scattering (RBS) analysis and Proton Elastic Scattering Analysis (PESA) are used to explore new areas of interdisciplinary research. Here are some recent examples of uses of the accelerator:

<http://www.hope.edu/academic/physics/facilities/accelerator/Brochure.htm#RecentExamples>

Maps and directions to Hope College can be found at <http://www.hope.edu/pr/map.html>. Free parking will be available on campus the day of the meeting in all lots in the vicinity of VanderWerf Hall and Schaap Science Center.

Lodging is available on campus for overnight guests at the Haworth Inn & Conference Center.

<http://www.haworthinn.com/>

Abstracts

Observational approach to the concept of image: the PCK involved

*David Schuster, Rex Taibu, Chaiphath Plybour, William Mamudi and Betty Adams,
Western Michigan University*

What is the essence of the concept of image in optics, and its relation to underlying principles? Consequently, how do we design instruction to best promote learners' understanding of the concept? Physics knowledge is not enough; a teacher needs Physics Knowledge for Teaching (PKT) in order to develop an approach effective for learners. This falls under what Shulman called Pedagogical Content Knowledge (PCK). Consciously figuring out good 'ways to go' in teaching and 'ways to think' for learners is a challenge. Despite what some textbooks imply, the concept of image is more than an intersection point on a standardized ray diagram, and likewise more than just 'what you see in a mirror'. In two presentations we demonstrate simple observational and theoretical approaches to teaching the concept of image, while simultaneously making PCK visible by discussing why we do things that way. In this first talk we demonstrate and discuss an observational approach to image.

Theoretical approach to the concept of image: the PCK involved

*Rex Taibu, David Schuster, Chaiphath Plybour, Betty Adams and William Mamudi
Western Michigan University*

This is the second of two successive presentations about the pedagogical content knowledge (PCK) involved in designing instruction to promote learners' conceptual understanding of the concept of image. In this presentation we demonstrate a simple 'theoretical' approach to the concept via ray construction, to complement the observational approach, and discuss why we do it this way.

Multiplying resources through partnerships - the example of JINA and MST

Zach A. Constan, NSCL, Michigan State University

Two outreach programs at Michigan State University (the Joint Institute for Nuclear Astrophysics, or JINA, and the Mathematics, Science and Technology program, or MST) recently joined forces to initiate a pilot outreach program. Using this example, the presenter will demonstrate how cooperation has furthered the goals of both organizations and maximized their use of resources. Results from the pilot program will be shared, followed by an overview of the ways that professors, high school teachers, graduate students, university staff, and middle school students worked together.

Preparing Physics Teachers for High Needs Schools: Oakland University

Mark Olson, Oakland University

A new effort at Oakland University to prepare science and mathematics teachers for high-needs schools will be described with particular attention to the question: What should a program that prepares physics teachers for high needs schools look like? That is, how might preparation to teach in high needs schools differ from a "regular" teacher education program? A unique feature of the 13-month certification program will be mentoring support throughout the program that extends into the first two years of teaching in the classroom. The potential of internet-based social networking supports will be explored in addition to more traditional approaches.

Weekly Online Checklists: Trying To Keep Everyone On Task

Philip Edward Kaldon, Western Michigan University

One would think that coming to class every day, taking notes and reading the textbook would keep students on track for quizzes and exams. But there's always a lot of questions about "What is going to be on the exam?" and sometimes bewilderment as to when assignments are due or what's been covered since the last exam. So in January I decided to create online checklists each week, full of reminders, nudges, lists of topics and self-surveys of expectations. Early results suggest that the checklists are good for me and good for those who try them -- far more students are looking at them than mention it. Once again, the cardinal rule of the Internet is: Lurkers vastly outnumber active participants!

ComPADRE.org: Where Educators and Scientist Join to Support Learning.

Beth Kubitskey, Eastern Michigan University

In this presentation I will share some of the resources of ComPADRE, how to use it as a teacher and student, and ultimately the plans to make ComPADRE more user-friendly. ComPADRE is a digital library containing a network of free resources for faculty, students and teachers of physics and astronomy (<http://www.compadre.org/>) created through a partnership of the American Association of Physics Teachers (AAPT), the American Astronomical Society (AAS), the American Institute of Physics/Society of Physics Students (AIP/SPS), and the American Physical Society (APS). ComPADRE includes a variety of resources, including: Simulations, animations, and images illustrating physical systems and processes; Student tutorials, activities, and labs designed to enhance student learning; Results of physics education research that describe best practices in science education; Content support for teachers new to physics, or new to a particular topic in physics; Databases of research opportunities for students and teachers; Topical collections of resources organized for teaching standard physics concepts; Physics education conference web sites with abstracts, presentations, and papers.

Teaching Relativistic Acceleration Without (much) Mathematics - An intuitive and visual approach

Robert Hipple, Lansing Community College

The relativity of simultaneity is difficult for students to visualize. We introduce a series of mental models which illustrate this important concept in a visual and intuitive manner. These models are used to introduce the relativity of simultaneity and acceleration in a non-mathematical and accessible way.

An Astronomical Misconceptions Survey

Michael LoPresto, Henry Ford Community College

Misconceptions that students bring with them to the introductory science classroom are especially prevalent in astronomy. One way to identify and possibly dispel some of these misconceptions is through the use of a *Misconceptions Survey*. A short report on the development, implementation and some early results of the use of such a survey will be given.

Use of Google Earth in Teaching Physical Geology Laboratories

Brian Kirchner, Henry Ford Community College

Geology requires 3-D visualization that students often find difficult. I have developed labs that use the free Google Earth application and the College's wireless internet. Students "visit" geological features in 3-D and view them from any perspective using onscreen zoom/pan/tilt controls. Learning efficiency has improved compared with presenting the same information in 2-D paper format. Student feedback has been enthusiastic. The controls are intuitive, and many students are already familiar with the program. Lab scores have improved significantly since the introduction of Google Earth-based labs.

Introductory Physics: Is Our Success Their Success?

Michael Tanoff, Kalamazoo College

One instrument for measuring learning in the introductory physics classroom is a diagnostic exam testing conceptual understanding of Newtonian mechanics or E&M fundamentals (for example). Level of success may be inferred from the difference in the class' performance on identical exams administered at the beginning of a course and again at the end of a course. However, student grades are typically assigned not on the amount of material a student has *learned*, but rather on an absolute measure of what a student *knows*, which are *different* functions of the student's initial knowledge state entering the course. Inconsistencies between apparent student learning (upon which instructor success may be based) and the assignment of student grades will be highlighted in a presentation that will pose more questions than it will answer.

Solar Irradiance

Kandiah "Bala" Balachandran, Kalamazoo Valley Community College

Solar radiation received at ground level anywhere on Earth depends on the time of day, the latitude, and of course the absorption and scattering by the column of air above the ground. It seems to be a good idea to introduce students to the vast amount of solar radiation we receive daily to the total energy usage of the World and particularly the U.S. Data gathered and published by the Department of Energy is presented together with a simplified integration procedure to compute the irradiance in Kalamazoo, MI using spherical polar coordinates. This would be a good exercise in Calculus and Engineering Physics classes and serves to introduce students to the abundance of Solar Energy on Earth. In addition to a description of the mathematical problem, the talk will be complemented by a demonstration of solar cooking (weather permitting – omelettes and pancakes are the most convenient and I will bring the supplies).