# Program

## Michigan Section
## American Association of Physics Teachers

## 2006 Fall Meeting
## Saturday, October 14, 2006
## University of Michigan, Dearborn
## Science Learning and Research Center

8:15 - 8:45 **Registration** –*Science Learning and Research Center*
***Continental Breakfast at time of registration***

8:45 - 9:00 **Meeting call to order and opening comments**
Kathy Mirakovits, Portage High School, *Michigan AAPT President*

## Paper Session I

9:00 – 9:15 ***Diffusion of Educational Innovations via Co-Teaching***
Charles Henderson, Western Michigan University

9:15 – 9:30 ***Refining an inquiry-based approach to teach intermediate mechanics***
Bradley S. Ambrose, Grand Valley State University

9:30 – 9:45 ***The Experience of Implementing Tutorials in Upper Division Mechanics***
Carrie Swift, University of Michigan – Dearborn

9:45 – 10:00 ***Probeware on a budget – Sneaky uses for free software***
Steve Dickie, Divine Child High School

10:00 – 10:15 ***Colorful Connections***
Michael C. Faleski, Delta College

10:15 – 10:30 ***Research Experience for Undergraduates***
Michelle Fritz, University of Michigan undergraduate physics major

## Poster Session

10:30 – 11:00 ***First Semester Introductory Physics Labs at the University of Michigan***
Carl Akerlof, University of Michigan – Ann Arbor

## Invited Talk

11:00 – 12:00 ***The Goals of Physics Courses and Scientific Abilities***
Dr. Eugenia Etkina, Rutgers, The State University of New Jersey

## Lunch

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| 12:00 – 1:00 | Lunch |
| 1:00 – 2:00 | MIAAPT Business Meeting |
| 2:00 – 2:15 | Break |

## Paper Session II

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| 2:15 – 2:30 | ***ADT Results Reflect Course Goals and Show Room for Improvement***<br>Michael C. LoPresto, Henry Ford Community College |
| 2:30 – 2:45 | ***A Continued Assessment: Pre-service Teachers' Conceptions of Energy***<br>Patricia Hughey and Mary Brown, Lansing Community College |
| 2:45 – 3:00 | ***Cooperative Group Assessment in Kinematics and Thermodynamics***<br>Steve Rea, Plymouth High School |
| 3:00 – 3:15 | ***Physics Sudoku***<br>Philip Edward Kaldon, Western Michigan University |
| 3:15 – 4:00 | ***Physics of Cell Phones and Wireless Communications Project***<br>Mark Davids, Grosse Pointe South High School<br>Rick Forrest, Rochester High School<br>Don Pata, Grosse Pointe North High School |
| 4:00 PM | Meeting Adjourns – We'll see you March 17, 2007 in Grand Rapids for the Spring MIAAPT Meeting |

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**Registration:** MIAAPT $10.00/meeting and may be paid at the time of registration or by mail to **Keith Bozin, MIAAPT Treasurer, 23565 Outwood St., Southfield, MI 48033**
Registration for one meeting a year maintains your membership.

**Lunch** Lunch will be made available for a cost of ~$ 6.00/per person, payable at registration.

**Maps & Directions** http://www.umd.umich.edu/maps_directions/

**Parking** *Free!* - Parking in the A lot, the C lot, or the parking structure.

**Questions?** Contact Program Chair, Michael Faleski michaelfaleski@delta.edu or phone (989-686-9495), or our host, Paul Zitzewitz pwz@umd.umich.edu

***Thanks Paul!***

***** Please pass this information on to anyone who you think might be interested. Students can attend the meeting at no charge*****

## Abstracts

### *Invited Talk: The Goals of Physics Courses and Scientific Abilities*

Dr. Eugenia Etkina, Rutgers, The State University of New Jersey

Hundreds of thousands of high school and college students take introductory physics courses each year. What are the goals of these courses? In most courses, the goal is to help students acquire conceptual and quantitative understanding of major physics principles and to use this understanding to solve problems.

There could be other goals for our introductory courses (and in fact, for all courses in physics). According to many national studies and reports, our students should develop abilities to: solve complex problems, design experiments, test concepts, analyze data, construct conceptual models, and work with other people. How can we help students acquire all of these abilities in our introductory physics courses?

In my talk I will describe a project that helps answer this question. I will give examples of laboratory exercises and classroom activities that provide feedback to the students and help them develop these abilities. I will discuss and demonstrate new assessment instruments that help instructors evaluate student abilities and help students self-assess their work. Finally, I will present data on student development of these abilities in our courses.

### *Diffusion of Educational Innovations via Co-Teaching*

Charles Henderson, Physics Department and Mallinson Institute for Science Education
Andrea Beach, Department of Teaching, Learning, and Leadership
Michael Famiano, Physics Department

Western Michigan University

Physics Education Research (PER) is currently facing significant difficulties in disseminating research-based knowledge and instructional strategies to other faculty. Co-teaching is a promising and cost-effective alternative to traditional professional development that may be applicable in many situations. This talk will discuss the rationale for co-teaching and our initial experience with co-teaching. A new instructor (MF) co-taught with an instructor experienced in PER-based reforms (CH). The pair worked within the scaffolding of the course structure typically used by the experienced instructor and met regularly to discuss instructional decisions. An outsider (AB) conducted interviews and class observations with each instructor. Classroom observations show an immediate use of PER-based instructional practices by the new instructor. Interviews show a significant shift in the new instructor's beliefs about teaching and intentions towards future use of the PER-based instructional approaches.

### *Refining an inquiry-based approach to teach intermediate mechanics*

Bradley S. Ambrose, Grand Valley State University

In ongoing research being conducted at GVSU, I have been probing the conceptual understanding and reasoning skills of advanced undergraduates as they make the transition from introductory calculus-based physics to their first course in upper-level mechanics. [1] The results thus far are consistent with findings from other investigations in upper division physics courses, which indicate that persistent difficulties with fundamental concepts are typically not addressed with lecture instruction at the advanced level. With support from NSF (CCLI grants DUE-0441426 and DUE-0442388) Michael Wittmann (U. of Maine) and I are collaboratively producing inquiry-based tutorials for teaching intermediate mechanics. The philosophy and format of the tutorials closely follow those pioneered at the University of Washington. [2] In this talk I will present a brief overview of the project as well as discuss some recent progress while on sabbatical leave last year.

Notes:

1. B.S. Ambrose, "Investigating student understanding in intermediate mechanics: Identifying the need for a tutorial approach to instruction," Am. J. Phys. **72** (4), 453-459 (2004).
2. L.C. McDermott, P.S. Shaffer, and the Physics Education Group at the University of Washington, *Tutorials in Introductory Physics* (Prentice-Hall, Upper Saddle River, NH, 2002).

## *The Experience of Implementing Tutorials in Upper Division Mechanics*

Carrie Swift, University of Michigan – Dearborn

A desire to implement active learning techniques into UM-Dearborn's upper division Classical Mechanics course led to the Tutorials for Intermediate Mechanics developed by B. Ambrose (GVSU) and Michael Wittmann (U. Maine). I will discuss the challenges to the instructor in the first use of this innovation, especially in class time management, and the successes in improved student learning, and in improved communication between students and the instructor that resulted. I will make recommendations to others contemplating the implementation of these tools.

## *Probeware on a budget – Sneaky uses for free software*

Steve Dickie, Divine Child High School

You can actually outfit a computer with probeware capable of doing a dozen different labs or demos for under $10. If you can attach a solar cell to a cheap set of dollar store headphones you have all the technical skills you need. All you need to make it works is a sound card with a microphone jack and you can find g, determine the relationship between the period and length of pendulum, or create your own inertial balance.

## *Colorful Connections*

Michael C. Faleski, Delta College

Resistors and capacitors are connected in series and parallel in all introductory physics books. Identifying the connections is not always easy for students, as the diagrams can often be tricky or purposefully misleading. A simple way to motivate the relationships about voltage and charge/current for simple simple and to identify the types of connections in the circuits is to use color. I will present a technique of colorizing a circuit to identify the underlying connections of the circuit's elements.

## *Research Experience for Undergraduates*

Michelle Fritz, University of Michigan undergraduate physics major

The NSF funds a number of Research Programs for Undergraduates (REUs) in various sciences, including physics and astronomy. These programs are at many different Universities and are available to students at different levels ranging from high school to graduate school. This past summer I participated in an REU program at Oakland University, and my research program involved performing theoretical calculations to determine electrostriction effects on the heart during defibrillation. Before completion of this program I was required to write a paper on my research and give two presentations, leaving me with valuable research experience and a better knowledge of what is it takes to be successful in the field of physics. Students who are encouraged to participate in REU programs and are accepted into them will gain the skills and experience required to increase their performance in their future research and let them know early on whether or not they want to pursue a career in research.

## *ADT Results Reflect Course Goals and Show Room for Improvement*

Michael C. LoPresto, Henry Ford Community College

Three years of administering the Astronomy Diagnostic Test (ADT) to introductory astronomy students at Henry Ford Community College has shown gains comparable to national averages. Results also accurately reflect on the course goals, showing more and fewer gains in topics have been covered in more and less detail. Also evident in the results are topics for which improvement of instruction is needed. These factors as well as the ease with which it can be administered are evidence of the usefulness of the ADT as an assessment instrument for introductory astronomy.

## *A Continued Assessment: Pre-service Teachers' Conceptions of Energy*

Patricia Hughey and Mary Brown, Lansing Community College

Assessment of pre-service teachers' conceptions of energy continues with each semester students being asked to respond in writing to two questions. The questions were given prior to instruction, and post instruction. Instruction was modified to explicitly address responses and to engage the pre-service teachers in discussing alternative conceptions. Prior instruction responses suggest confusion with similar physics concepts, such as power, force and electricity. Post instructional responses still suggest memorization of instruction statements, without conceptual understanding. Improvement has been made on confusion with energy, force and power.

## *Cooperative Group Assessment in Kinematics and Thermodynamics*

Steve Rea, Plymouth High School

Over the last fifteen years I have incorporated a number of very successful cooperative group activities into my teaching of Physics. Although designed to help the weaker students, the response form the stronger students in class has been unexpectedly positive. The key has been an interdependence that motivates the stronger student to teach and weaker student to learn. Several activities and their strategies will be presented.

## *Physics Sudoku*

Philip Edward Kaldon, Western Michigan University

Sudoku isn't just a 9x9 grid with the numbers 1-9 nine times. You can also do Sudoku with letters... or variables. Not so much a new way of teaching Physics, but a way to have a little fun with your students -- plus an amusing link between Physics Sudoku and Newton's "Philosophiae Naturalis Principia Mathematica".

## *Physics of Cell Phones and Wireless Communications Project*

Mark Davids, Grosse Pointe South High School
Rick Forrest, Rochester High School
Don Pata, Grosse Pointe North High School

Over 200 million Americans use cell phones, but hardly any have a clue about "how they work." Engineers at Motorola, Cingular, and the University of Michigan have helped us to understand the basic physics. Over the past 2 years we have designed a 3-week, student-centered, inquiry-based program to answer the basic questions. We will share information about this unique program including a few demos and student activities.