Michigan Section of the American Association of Physics Teachers
Program

2007 Spring Meeting
Saturday, March 17, 2007

Grand Rapids Community College
Calkins Science Building Auditorium

8:00 - 8:30 **Registration** –*Calkins Science Building – by the auditorium*
Continental Breakfast at time of registration

8:30 - 8:45 **Meeting call to order and opening comments**
Kathy Mirakovits, Portage Northern HS, *Michigan AAPT President*
Dr. Rick Olsen, Grand Rapids Community College

Morning Session I - Concurrent

8:45 – 9:45 **Workshop:** ***Seeing the Invisible!*** (Appropriate for 7th -12th science teachers)
Mandy Frantti, NASA Astrophysics Educator Ambassador

Oral Presentations:

8:45 – 9:00 ***IT'S DYNAMIC!***
Inquiry and direct instructional approaches to conceptual dynamics.
David Schuster, Betty Adams, and Adriana Undreiu,
Western Michigan University

9:00 – 9:15 ***When one instructor's interactive classroom activity is another's lecture***
Charles Henderson, Western Michigan University
with Melissa Dancy, University of North Carolina at Charlotte

9:15 – 9:30 ***Teamwork in Calc1 and UniversityPhysics1 – A trial run…***
Scott Schneider, Lawrence Technological University

9:30 – 9:45 ***Demonstration vignettes in the laboratory***
Ramon O. Torres-Isea, University of Michigan at Ann Arbor

Morning Session II

9:50 – 10:05 ***Introduction to Physics of the Universe in AP Physics Classrooms***
Stephanie Allen, Undergrad Student at Hope College (Physics/Math Ed.)

10:05 – 10:35 ***Cracker-barrel Discussion of AAPT***
Dr. Harvey Leff, President of the American Association of Physics Teachers; Professor Emeritus at California State Polytechnic Univ., Pomona

Break

Invited Talk

11:00 – 12:00 ***What is Entropy?***
Dr. Harvey Leff, President of the American Association of Physics Teachers; Professor Emeritus at California State Polytechnic Univ., Pomona

Lunch

12:00 – 1:00 Lunch

Afternoon Session I

1:00 – 1:45 MIAAPT Business Meeting

1:45 – 2:00 ***"But It's the Same Thing"***
Philip Edward Kaldon, Western Michigan University

2:00 – 2:15 ***Using what we teach***
Scott F. Schultz, Delta College

2:30 – 2:45 ***Conceptual difficulties about frequency: Helping students understand 1D and 2D oscillations***
Bradley S. Ambrose, Grand Valley State University

Afternoon Session II - Workshops

2:45 – 3:45 ***GAMMA RAY BURSTS: WOW!*** (Appropriate for 7th -12th science teachers)
Mandy Frantti, NASA Astrophysics Educator Ambassador

2:45 – 4:45 ***Tutorials in Intermediate Mechanics***
Bradley S. Ambrose and Natalie Beyer – Grand Valley State University

~4:45 PM **Meeting Adjourns** – We'll see you in October, 2007 in Detroit for the NSTA meeting with MIAAPT

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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.
***We are offering free membership to MIAAPT for 6 months for any new member.**

Lunch Lunch will be in the cafeteria and will cost ~$7.00

Maps & Directions Go to the MIAAPT website www.miaapt.org for links and information.

Parking Guest Parking Passes for the Student Lot will be available at the registration.

Questions? Contact Program Chair, Michael Faleski michaelfaleski@delta.edu or phone (989-686-9495)

Thank You: To our hosts at Grand Rapids CC and to **Jared Johnson**, who worked tirelessly organizing everything for us at GRCC.

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

Abstracts: Invited Talk / Workshops

Invited Talk (11:00 – 12:00): What is Entropy?

Dr. Harvey Leff, President of the American Association of Physics Teachers; Professor Emeritus at California State Polytechnic Univ., Pomona

Thermodynamic entropy was introduced in 1865 by Rudolf Clausius. In 1877, Boltzmann discovered a remarkable definition of entropy in the context of statistical mechanics. Although both have enormous value and have withstood the test of time, they have failed as introductory teaching tools. Neither offers a satisfying elementary clarification of the physical significance and meaning of thermodynamic entropy. Further, most introductory physics textbooks miss the essence of entropy and, more generally, of thermodynamics itself. I shall begin with a discussion of why pure mechanics morphs into thermodynamics, as a physical system becomes less "ideal" and more "real." I shall then present a largely qualitative physical picture of entropy, with examples that are understandable at the elementary level and beyond. Space and time, two staples of physics, play fundamental roles. The proposed view shows why entropy's symbol S is remarkably (and fortuitously!) appropriate, and enables a meaningful answer to the title question, "What is entropy?"

Workshop (8:45-9:45 AM): Seeing the Invisible! (Appropriate for 7-12 physics/science teachers)

Mandy Frantti, NASA Astrophysics Educator Ambassador

What's out there in our universe? NASA has much to share. Participants will engage in a captivating hands-on activity, observing different wavelengths of "light" or electromagnetic energy and what can be used to "block" it. Most wavelengths can't be seen with the eyes, so how scientists detect it and how that information is being used will be the focus of the session. Examine ultraviolet, infrared, radio, and find out about the most exciting of all -- gamma rays and the distant universe! The activities can be done in a middle or high school classroom. (Brought to you by NASA using a GEMS guide for teachers.)

Workshop (2:45 – 3:45 PM): GAMMA RAY BURSTS: WOW! (Appropriate for 7th -12th physics/science teachers)

Mandy Frantti, NASA Astrophysics Educator Ambassador

Participants will examine the amazing and powerful gamma-ray bursts--the highest energy explosions observed in the universe--with hands-on activities developed by NASA. Presenter will also provide participants with background information and an overview of what scientists are doing now with gamma-ray research. NASA materials provided.

Workshop (2:45 – 4:45 PM): Tutorials in Intermediate Mechanics

Bradley S. Ambrose and Natalie Beyer, Grand Valley State University

Ongoing research in physics education has demonstrated that physics majors often do not develop a working knowledge of basic concepts in mechanics, even after standard instruction in upper-level mechanics courses.[1] This workshop will focus on *Intermediate Mechanics Tutorials (IMT)*, a suite of research-based materials developed by Ambrose and co-PI Michael C. Wittmann (U. Maine). These materials, modeled after *Tutorials in Introductory Physics*[2] and *Activity-Based Tutorials*,[3] form the focus of activities that are intended to supplement traditional lectures. The tutorials are designed to address persistent student difficulties and to guide students to make appropriate connections between the physics and mathematics. Workshop participants will learn about recent results from the research and obtain firsthand experience with selected tutorials. Because intermediate mechanics courses vary in format and content from institution to institution, we will also discuss how *IMT* can be tailored appropriately. A copy of all *IMT* materials, which include conceptual, derivation, and computer-based tutorials, will be granted to each participant.

1. B.S. Ambrose, "Investigating student understanding in intermediate mechanics: Identifying the need for a tutorial approach to instruction," Am. J. Phys. **72,** 453 – 459 (2004).
2. *Tutorials in Introductory Physics,* L.C. McDermott, P.S. Shaffer, and the Physics Education Group at the University of Washington (Prentice Hall, 2002).
3. *Activity-Based Tutorials, Volume 1: Introductory Physics,* M.C. Wittmann, R.N. Steinberg, and E.F. Redish (Wiley, 2004).

* Supported by NSF grants DUE-0441426 and DUE-0442388.

Abstracts: Morning Session

IT'S DYNAMIC! Inquiry and direct instructional approaches to conceptual dynamics

David Schuster, Betty Adams and Adriana Undreiu, Western Michigan University

We have developed a unit on conceptual dynamics, and produced sets of lessons in contrasting instructional designs, for research comparison of efficacy. The 'guided scientific inquiry' approach develops physics concepts and laws as science-in-the-making, whereas the 'direct' didactic approach presents them as already-made-science. Each lesson set reflects best practice for that mode in an appropriate learning cycle, including content, activities, application and assessment. We present an overview of the conceptual dynamics design, illustrate the contrasting approaches to Newton's second law, and discuss the forthcoming NSF-funded experimental comparison study.

When one instructor's interactive classroom activity is another's lecture

Charles Henderson, Western Michigan University
Melissa Dancy, University of North Carolina at Charlotte

The continued success of Physics Education Research (PER) requires that researchers and curriculum developers effectively communicate with traditional physics instructors about teaching and learning. As part of an ongoing interview study of non-PER faculty we have identified several communication difficulties between these two groups. This talk will focus on different ways that each group uses the word "interactive".

Teamwork in Calc1 and University Physics1 - A trial run ...

Scott Schneider - Lawrence Technological University

We will present details about our initial phase of adding teamwork to Calculus and Physics classes. We will discuss the forming of the teams, breaking the ice with the new teams, and checking the team process during the term. Some preliminary results from Fall 2006 will be presented and we will discuss possible changes for Spring 2007.

Demonstration Vignettes in the Laboratory

Ramon O. Torres-Isea, The University of Michigan at Ann Arbor

Quick, appealing, and unexpected experimental demonstrations have been used to enhance the intermediate laboratory experience of our students. The demonstrations have been carried out by several instructors in a laboratory class serving sophomore and junior Physics majors and non-majors for over five years. The demonstration topics are generally selected to focus on one or more goals: (1) to emphasize concepts addressed in the scheduled experiment, (2) to expose students to related phenomena, (3) to correct misunderstandings in previous experiments, and (4) to give students a sense of the excitement, and mystery, of experimental physics. Many of the demos are based on wave optics with simple apparatus such as laser pointers and polarizing materials. Performance assessment tools and course evaluations by our students show very positive results.

Introduction to Physics of the Universe in AP Physics Classrooms

Stephanie Allen, Undergraduate Student at Hope College (Physics and Math Education)

Often students have difficulty understanding the connections that must be made between old and new concepts. This curriculum is designed to lead AP Physics students through this process with gamma ray bursts. Students will participate in various discussions, demonstrations, exercises and activities that lead them through universe basics, life cycles of stars, black holes, the electromagnetic spectrum and they will learn about various NASA observatories. Ultimately, this will result in a better understanding of how astrophysicists have come to understand the gamma ray burst. This series of lessons was created to be used for the three to four weeks after the AP Physics exam. The curriculum was developed through gathering resources from various scientific organizations, developing new ideas and speaking with scientists at NASA Goddard Space Flight Center. The result is a manual of lesson plans, activities and answer keys for teachers to use in their own classrooms.

Cracker-barrel Discussion of AAPT

Dr. Harvey Leff, President of the American Association of Physics Teachers; Professor Emeritus at California State Polytechnic Univ., Pomona

This session will include a discussion with 10 minutes of facts about AAPT, its history, present status, and future plans -- and to then open the floor to questions and comments -- hopefully promoting a healthy discussion!

Abstracts: Afternoon Session

"But It's The Same Thing"

Philip Edward Kaldon, Western Michigan University

We all ask our students to perform various tasks. When we are disappointed with the results or when we are grading and take off points, how often have you had the student claim that what they wrote or drew or calculated was "the same thing" as you wanted. It's one thing if the student is just bucking for points -- the real problem is how often our students truly believe that what they've done IS "the same thing". There is clearly a disconnect in language, math and drawing between our expectations and "the same thing." Examples and some suggestions.

Using What We Teach

Scott F. Schultz, Delta College

Many of us use graphs as a means to introduce one dimensional motion. We explore the ideas of position, velocity and acceleration through these graphs and then … we don't use them any more. We move into the equations of motion, and might even pride ourselves if we derive the equations from the graphs. But then we are aggravated when our students use what we commonly call the plug and chug method to solve problems. Why not use what we teach the students to solve problems?

Conceptual difficulties about frequency: Helping students understand 1-D and 2-D oscillations

Bradley S. Ambrose, Grand Valley State University

The study of oscillations is not only fundamental in classical mechanics but lies at the heart of numerous applications. Results from research conducted in the context of junior-level mechanics courses suggest the presence of specific conceptual and reasoning difficulties, many of which seem to be based on fundamental concepts. Evidence from pretests (ungraded quizzes) and written exams will be presented to illustrate difficulties that students encounter in understanding conceptual underpinnings and in relating concepts to graphical representations (*e.g.*, motion graphs). This work has guided the development of inquiry-based classroom activities for intermediate mechanics (modeled after *Tutorials in Introductory Physics*[1]) that will be highlighted in a workshop offered later this afternoon. (Supported by NSF grants DUE-0441426 and DUE-0442388.)

1. *Tutorials in Introductory Physics*, L.C. McDermott, P.S. Shaffer, and the Physics Education Group at the University of Washington (Prentice Hall, 2002).