AAPT Meeting

A joint meeting of the New York, New Jersey, and New England Sections of the American Association of Physics Teachers

Fall 2013, Marist College, Poughkeepsie, NY

Time	DN 225	DN 236 A	DN 112	DN 107
8:30	Welcoming Remarks			
8:45 – 9:15	Floyd Holt - Captivating the imagination of our students for the Future of America	Gary Garber - InterLACE (Interactive Learning and Collaboration Environment)		
9:15 - 9:30	Cindy Schwarz - e-book publishing	John Johnston - Something old, something new		
9:30 – 9:45		Andrew Duffy - The Learning Assistant program at Boston University		
9:45 - 10:00	Break			
10-10:30	Norman Chonacky - Computational Physics: If you believe it is a paradigm shift then what can you do in response?			
10:30 – 11:00	Shawn Reeves Seeing the Invisible		Schober, et. al. - A Modeling Approach to Accelerated Motion -plus- Slow Acceleration Apparatus Make-n-Take (Part I) $10/$30	Maiullo and Bilash Free
11:00 - 12				

12:00 - 1:00	LUNCH			POSTERS
1:00 - 1:15	Joe Zawicki - Lessons from our Students, Generating our Next Steps	Zenobia Lojewska - How to engage students in a physics course using video analysis?	Schober, et. al. - A Modeling Approach to Accelerated Motion -plus- Slow Acceleration Apparatus Make-n-Take	Steve Henning - PTRA Workshop
1:15 - 1:30		MAJ Pete Chapman and MAJ Kevin Blaine - The USMA Sophomore Core Interdisciplinary Effort		
1:30 – 1:45	Jenny Magnes - Contemplative learning techniques in introductory physics	MAJ Pete Exline, MAJ Kevin Blaine, and MAJ Eric Marshall - Multi-discipline Integration: From Leveraging Pre-Requisite Knowledge to Interdisciplinary Thinking		
1:45 – 2:00		MAJ Tyler Jones - The Enduring Laboratory: Revisiting an Activity to Explore New Physics		
2:00 – 2:15				
2:15 – 2:30	Austine Scales - The wonders of graphene			
2:30 – 3:00	Eric Myers - Peppercorn model of the solar system			
3:00 - 3:15	Closing Remarks			
3:30	Campus Solar System Walk			

Abstracts

Chonacky (talk)**:** Computational science has made a bold entry into the traditional scientific disciplines and most technological enterprises during the past decades. Although characteristically crossdisciplinary in its realizations (*e.g.* the human genome was elucidated by artful combination of biochemistry with engineering process automation and applied mathematical analysis), many physics-trained personnel played roles in developing the scheme and servicing its technological needs at all levels. Many of these persons have had BS level physics degrees.

A recent look at the computational physics education practices among undergraduate departments indicates how very restricted they are.[1] An AIP survey confirmed a significant gap between how we educate our undergraduates with respect to computation and what they are called upon to do after graduation.[2]

This talk will describe a possible path for remediating this disconnection. This path is based upon research identifying likely barriers for faculty who wish to begin integrating computation into their undergraduate courses.[3] I will describe what we have done to date and, time permitting and audience willing, describe some computational exercise examples. Mostly, I will appreciate reactions, comments, and/or original ideas from the audience.

1 . Fuller, R. G. (2006). "Numerical computations in U.S. undergraduate physics courses." Comput. Sci. Eng 8(5): 16-21.
2 . Ivie, R. and K. Stowe (2002). The Early Careers of Physics Bachelors. College Park, MD 20740-3843, American Institute of Physics:
3 . Chonacky, N. and D. Winch (2008). "Integrating computation into the undergraduate curriculum: A vision and guidelines for future development." American Journal of Physics 76(4&5): 327-333.

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Duffy (talk)**:** Learning Assistants are undergraduates who are trained in pedagogy and who assist with instruction. The program began at UC-Boulder, and we are now in the third year of implementation at Boston University (BU). This talk will give an overview of the program, and will present specific details about how we use Learning Assistants in Physics at BU. One outcome is a positive impact on the recruitment of future physics teachers, which helps support our efforts at BU under our PhysTEC grant. In addition, Boston University will be hosting a regional Learning Assistant (LA) workshop on February 7-8, 2014, for those who are interested in establishing their own LA program, and we will provide further information about that.

Andrew Duffy
Department of Physics
Boston University

Garber (talk)**: InterLACE (Interactive Learning and Collaboration Environment)** is an educational research project at Tufts University conducted by the Center for Engineering Education and Outreach (CEEO) and funded by the National Science Foundation (NSF grant No. 1119321). The goal is to develop a software tool kit and complementary innovative activities to support collaborative inquiry learning in high school classrooms. The first of these tools provides a persistent public workspace in which students can visualize, discuss, and debate fellow classmates' ideas. It acts as a kind of group memory that enables students to "build a common visual representation of the problem at hand in order to contribute to the construction of a shared understanding" (Dillenbourg, 2006). Our ultimate goal is to shift the organization of the classroom from teacher focused instruction to learner-centered collaborative inquiry.

Gary Garber
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Holt (talk)**:** Creating the **"**Classroom of the Future"

Thomas Jefferson said that "for a Democracy to survive the masses would have to be well educated". It has also been stated that in the future we will be "defined by our Innovation". However according to some reports America is currently ranked at 26th in the world in Education and 19th in Math and Science. No matter how accurate these statistics are many would agree that our current System is often antiquated and in need of revision.

These problems are inexorably intertwined….and there are no simple solutions. It then comes as no surprise that many of our students are disenfranchised from the schools…. but what are the solutions? Most of us would subscribe to the fact that Teacher Training is the key; but I also believe that we need to recapture the imaginations of today's children who are among the most sophisticated on the planet.

It is for these reasons that we created the "Classroom of the Future"….a project that has ultimately evolved into the American Science and Technology Center with its primary function being to revolutionize the way we teach (and learn).

I will elucidate some of the positive and negative experiences from this experiment and my career….and how it has manifested itself in the American Sci-Tech's plan for a National Television/Web series and Educational materials to reach a National and International audience.

A discussion of the role of problem solving and individualized instruction (via High Technology) as well as online learning methods such as Kahn Academy will ensue. If time permits I am planning to incorporate or at least discuss several high profile demonstrations followed by an element of interactive audience participation.

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Johnston (talk + demo)**:** Demos and apparatus you can build, with free instructions. Some apparatus will be for sale, cash only. Please stop by my exhibit during the poster session.
John B. Johnston
The Faraday Center

Lojewska (talk)**:** Numerous studies have documented students' difficulties in learning kinematics concepts in introductory physics courses and also in grasping these concepts even after taking a traditional introductory physics course. The focus of today's presentation is digital video motion analysis as a teaching tool in an introductory physics course geared towards Physical Education, Exercise Science and Athletic Training majors.
Dr. Zenobia Lojewska
Mathematics, Physics, Computer Science Department
Springfield College

Magnes (talk)**:** Research has shown that formal and deductive logic cannot be taught. In other words semantic knowledge is useless without the procedural knowledge. Traditional instructions can be vastly enhanced by giving students the opportunity to learn about their cognition: metacognition. Examples include wrappers of various types and more traditional contemplative techniques.
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Myers (talk)**:** The peppercorn model is a scale model of the solar system which demonstrates at the same time both the sizes of the planets and the distances between them, on a linear scale. In the peppercorn model the Earth is roughly the size of a small peppercorn 26 yards from a bowling ball representing the Sun, and Pluto is a grain of salt over 1000 yards away. I will demonstrate the model and describe nearby locations where it can be "performed", and I will discuss the relative merits of the model as an "event" or as an installation. I will show portable stations I've constructed which can be set up along the path, so that visitors do not have to count paces between the planets. I will also introduce another scale model of the solar system, based on the time of flight of light from the sun.
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Reeves (talk)**:** Faraday's lines & infrared pictures In reading and partially repeating the lab-work of Michael Faraday, specifically on lines of force, students may learn by example how models may be set up, poked, and possibly solidified or rejected. Skills that students learn in questioning electric and magnetic fields, using tools like iron filings, may be useful when questioning the nature of light, using tools like an infrared camera, or vice versa. The presenter will list multiple resources for learning history and using equipment, invite comments based on experience, and discuss where we might explore further.

Shawn Reeves
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Schober (workshop)**:** Come join us for a brief introduction to modeling physics instruction, recognized by US DOE as an Exemplary and Promising Science Program since 2001. True to the name we will model the process of using the tools of science to develop some foundational physics ideas with a simple low-tech hands-on lab activity that ties together physics concepts through multiple representations. Participants are encouraged to bring their own laptop, iPad, etc with graphing software in order to analyze the lab activities and to link to electronic resources. We will also build a Rex Rice-designed apparatus that yields an acceleration gradual enough to be tracked by hand.

Cost: $10 to participate and take home one apparatus; $30 to take home a class set of eight apparatus.

Scales (talk)**:** Graphene is a single atomic layer of carbon atoms bound in a hexagonal lattice. It was first produced experimentally in 2004 by a team of researchers from Manchester, UK, and Chernogolovka, Russia, through mechanical exfoliation. This event started the “graphene revolution,” which spread quickly around the world attracting the attention of scientists and engineers alike. Graphene’s discovery was awarded the Physics Nobel Prize in 2010 and the number of publications and patents related to it is still sharply increasing. This talk will give an overview of graphene’s surprising electrical, optical and mechanical properties that arise due to its two-dimensional structure.

Graphene’s electrons, moving in the periodic lattice potential of the two-dimensional crystal, form energy bands where the mass of electrons are effectively changed. In a strong magnetic field, the cyclotron orbits of electrons are quantized and Landau levels form. These levels are highly degenerate. In 1976, Hofstadter showed that for a two-dimensional electronic system, the interplay between these two quantization effects can lead to a fractal-type energy spectrum known as “Hofstadter’s Butterfly.” The talk presents results that indicate that the Hofstadter Butterfly appears in graphene’s energy spectrum as well.

Austine Scales
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Zawicki (talk)**:** The aggregate responses of students to the June 2013 NYS Regents exam will be presented and discussed. Exam items will be related to state standards in New England, New Jersey and New York. Implications for instruction and the impending adoption of the Next Generation Science Standards, as well as reading in the content areas will be discussed.

Joe Zawicki
SUNY Buffalo State College