Chicago Section of the American Association of Physics Teachers
(abstracts submitted after deadline are not included in Program)

Using Physics Education Research to Guide Instruction

Saturday, April 1st 2006 at Chicago State University
9501 S. King Drive, Chicago IL 60628
Morning: Business and Health Sciences Building (rm 102)
Afternoon: Williams Science Center

At a glance:

8:30 to 9:00	Welcome and Registration *(talks will begin at 9:00 AM)*	BHS 102
9:00 to 10:00	Contributed Talks I	
10:00 to 10:50	Plenary Talk	
10:50 to 11:00	Break	
11:00 to 12:15	Contributed Talks II	
12:15 to 12:30	Take Fives	
12:30 to 1:30	Lunch, Business Meeting, and Student Poster Session	
	1:30: walk over to Williams Science Center	
1:45 to 3:00	Afternoon Workshops	
	Problem Solving in Physics	WSC-113
	Tasks Inspired by Physics Education Research	WSC-202
	Modeling in HS Physics	WSC-108

BHS: Business and Health Science Building
WSC: Williams Science Center

Detailed Program:

Contributed Talks: Part I

9:00 AM: **Cosmic Rays in the High School Classroom**

Charlotte Wood-Harrington, woodharr@yahoo.com, Brooks College Prep

Brooks College Prep has had a Cosmic Ray Detector thanks to a NSF-DOE sponsored program QuarkNet. Different groups of Brooks's students have been involved in different parts of the program for the past 3 years. They have assisted in the installation of the equipment, building equipment for other schools and have been conducting their own research this year. Three students participated this past summer in a workshop at UIC and Fermi Labs. Use of the Cosmic Ray Detector and the QuarkNet program has impacted Brooks's student science learning. Students are being exposed to sub-atomic particles, equipment maintenance, data collection and analysis. Students are collaborating with themselves, teachers, professors, and other working scientists.

9:15 AM: **Nocturnal Cosmic Ray Variation**

Melissa Munoz, Justin Doggett, Blessing Williams, Kirby Gibson, melissamunoz13@yahoo.com, Brooks College Prep

Students at Brooks College Prep have been collecting data on cosmic rays for the past 5 months. The authors used NSF and DOE grant detectors. They compared cosmic rate to time of day and time of year. They found no statistically significant variation in the data.

9:30 AM: **Active Physics Currriculum**

Sushma Sharma,sushma.cps@gmail.com, Entrepreneurship H.S at south shore campus

Talk will comprise of overview of the Active Physics curriculum which was developed by Dr. Arthur Eisenkraft along with leading physicists and science educators and is taking the lead in the "Physics First" movement across the nation. It takes a whole new approach in teaching physics. Keeping the National Science Education standards in mind, it includes thematic science units the students can relate to like Communication, Home, Medicine, Predictions, Sports, Transportation and Light Up My Life, etc. Each unit concentrates on different physics topics and the challenge is designed to show students' real world applications of the scientific principles. Presentation will include personal experience as a field tester of the Active Physics curriculum.

9:45 AM: **The Physics Van Invserice Institute**

Gloria A. Pritikin and Steve Farr, scigal311@sbcglobal.net, Chicago State University and Bogan HS

The Physics Van Inservice Institute is a partnership between Chicago State University, the University of Ilinois - Chicago and Chicago Public Schools . The program supports physics teachers at both public and private schools in the chicago area by providing equipment, training, and assistance (if it is requested) across greater Chicago. This program, completing its third full year, anti cipates working with its next cohort of teachers in July 2006. The Physics Van delivers and picks up the equipment necessary for each van module so that teams of two or three students complete each activity . A description of some lab equ ipment, several modules, and photos of students using van activites , as well as the populations we serve will be presented. Preliminary information regarding the Summer 2006 program will be available.

11:00 AM: **Team Based Learning/Problem Based Learning in the High School Environment: A Lack of Data**

Carl E. Martikean, cmartikean@pths209.org, Proviso Mathematics and Science Academy

Team Based Learning/ Problem Based Learning are models that let students work on realistic cases or problems. For high school students, the guided inquiry and equipment offered through the PhysicsVan gives the students the insights and skills needed so that authentic assessments can be used. The results are that students learn content with less stress on the teacher.

Plenary Talk

10:00 AM: **Physics Education Research at the University of Illinois**

Gary E. Gladding, geg@uiuc.edu, University of Illinois - Urbana Champaign

In 1995, the Department of Physics at the University of Illinois embarked on a program to systematically reform all of the introductory courses in the calculus-based sequence. By the Spring Semester of 2000, all 2600 students taking introductory courses (both calculus-based and algebra-based sequences) were participating in reformed classes (see: http://www.physics.uiuc.edu/Research/PER/Course_Revisions.html).. One outcome of this project was the creation of a Physics Education Research Group. In this talk, I will describe the current activities of our group.

Contributed Talks: Part II

11:15 AM: **Supersymmetric quantum mechanics, Dirac delta function and more**

Maciej Karcz and Matthew Gonderinger, maciej.karcz@gmail.com, Loyola University - Chicago

Supersymmetric quantum mechanics (SUSYQM) provides an alternative to explicitly solving the Schrodinger equation of quantum mechanics. Using the method of SUSYQM and the Rosen-Morse II potential we solve the Dirac Delta potential problem by algebraic means.

11:30 AM: **Use of the PRS studnet response system in general education physics and astronomy classes: Part I**

Ray Burnstein, burnsteinr@iit.edu, Illinois Institute of Technology

A wide overview of wireless keypads will be presented ranging from their usefulness in the classroom to the hardware itself. The ability of these devices to convert a classroom/lecture of passive audience into a group of more active learners will be discussed. This can be done while still preserving much of the traditional lecture format. We also will summarize the variety of commercial wireless keypads that are currently in use and those that will soon become available.

11:45 AM: **Use of the PRS studnet response system in general education physics and astronomy classes: Part II**

Paul Dolan, Mahmoud Khalili, Richard Delzenero, Ilya Gulkarov, P-Dolan@neiu.edu, Northeastern Illinois University

For the past three years, NEIU has been using an automated student response method, in particular the "PRS" system in general education Astronomy lectures, and this year also began using this system in the 'conceptual physics' lecture. Each student is required to obtain a PRS 'clicker', and of course to bring it to class. The system allows students to respond to multiple choice questions posed by the instructor, and gives immediate and anonymous feedback on student knowledge and learning. The questions may be either pre-prepared questions, or ones that arise during class.

We will briefly discuss our experience with this system, and then present a sample lesson, with PRS questions included. 'Clickers' will be available to allow the audience to interactively answer the questions posed during the lesson. We will also provide several handouts on the effective use of the student response system, and PRS in particular.

Student Poster Session 12:15 PM

Supersymmetry and the Quantum Hamilton-Jacobi Formalism

Yevgeny Binder and Stephen Snyder, SSnyde2@luc.edu, Loyola University Chicago

Using a method devised by our advisors to connect Supersymmetric Quantum Mechanics with the Quantum Hamilton-Jacobi Formalism, we have been investigating two physically relevant systems: The Rosen-Morse II and the Morse potentials. The combination of these approaches to quantum mechanics has allowed us to obtain both the spectrum and the eigenfunctions of these potentials much more easily than by directly solving the Schroedinger Equation.

Physics Education Research at CSU: from the high school to the college physics classroom

Louis Issac, Lorne Nash, Tim Vanderleest, and Mel Sabella, msabella@csu.edu, Chicago State University

The Physics Program at CSU has been involved in two major research and development projects with the goal of improving student understanding of physics at the high school and the college level. In this poster we describe the two projects and provide examples of the reseach showing how these instructional appraoches are affecting student understanding of challenging physics concepts.

Support from this project comes from with support from the National Science Foundation CCLI grant - *#0410068,* the Illinois Board of Higher Education-Teacher Quality Enhancement Grant*,* and the American Physical Society-Physics on the Road Program (WYP 2005)

Angle of Repose for Monodisperse particles, as a function of shape: Symmetry vs. Asymmetry

Denisa S. Melichian, Anna Jewula, David Benjaih, Paul J. Dolan, Jr.
Northeastern Illinois University

A granular material is any collection of weakly interacting, usually solid, particles. Among the properties typically used to characterize a granular material is the Angle of Repose, the maximum stable angle formed by a free standing pile of the material. The angle of repose can depend on all of the material properties, in particular surface properties, including elasticity, density, surface texture, static charging, particle shape, interstitial gas or liquid, and whether or not the collection is 'monodisperse' (all particles are the same size, shape, density, …). Most of the prior basic research on granular materials has concentrated on small collections of spherical particles, since these materials are readily available, relatively easy to handle, uniform, and the experiments are more easily modeled mathematically. In order to study the angle of repose as ONLY a function of particle shape, we have chosen to work with non-spherical particles of one type of material (Barilla pasta), which comes in (at least) 20 different shapes, ranging from highly symmetric, to ones having no symmetry at all; however, all the particles are made of the same material, so the issue of surface texture is largely moot. Additionally, the particles are large enough, and of such a material, that static charging and interstitial gas does not seem to be an issue.
We will present our results thus far on 'large' piles (~10,000 pieces) of symmetric and non-symmetric particles, and discuss the trends in the data, as well as future directions for this work.
Support for the project was provided by the NEIU Granular Research Community grant.

A new Measurement Technique for Craters in Granular Materials

Todd P. Abramson, Joseph G. Hermanek, Paul J. Dolan, Jr.
Department of Physics
Northeastern Illinois University, Chicago, IL 60625

Cratering is an important issue in granular materials: applications range from the obvious system of craters on celestial bodies, to the detection of lost particles that have fallen into a container, to the basic physical questions of why and how a crater of a particular size & shape is formed. A crater occurs when a large, or high energy, intruder particle impacts the surface of a granular material. The type of crater formed, while in general circular, can depend on such things as the initial momentum of the intruder, the relative size of the intruder as compared to the granules, and whether the granular material is 'loose' (randomly packed) or has been compacted. Among the properties of the crater that can be measured are its diameter, the height of the crater wall, the dynamics of the granules during the crater formation, and the final location of the intruder. We have chosen to concentrate on the latter question, the final location of the intruder. Previous work has measured the position of this particle with crude, mechanical means; these other methods are not only potential destructive to the crater formed, but the measurement itself is likely to change the position of the particle. We have developed a new, capacitive, measurement method to locate the intruder particle. We will present our technique, and report on our progress in perfecting the measurement.

Support for the project was provided by the NEIU Granular Research Community grant.

And others

Workshops 1:45 PM in Williams Science

Problem Solving in Physics

Charles Henderson (Charles.Henderson@wmich.edu), Western Michigan University

Problem solving is a nearly universal component of physics instruction. Students are expected to learn physics by watching the teacher solve problems and solving problems on their own. Learning is typically assessed by having students solve problems on tests. Problem solving is also seen by many physics teachers to be an important learning goal in itself. Because of the importance of problem solving, it is valuable for teachers to examine their teaching practices related to problem solving (such as the types of problems assigned, the way student solutions are graded, and the structure of instructor solutions) and the assumptions that underlie these practices. The goal of this workshop is to help teacher articulate and examine their practices and assumptions. Examples of a range of possible practices will be used to anchor the interactive discussion.

Tasks Inspired by Physics Education Research

Curtis J Hieggelke (curth@jjc.edu), Joliet Junior College
and
David P Maloney (maloney@ipfw.edu), Indiana University -Purdue University Fort Wayne

This workshop will feature materials from a collection of new instructional materials for the topics and concepts in electrostatics and magnetism. These materials employ various TIPER (Tasks Inspired by Physics Education Research) formats that include: Ranking Tasks; Working Backwards Tasks; What, if anything, is Wrong Tasks; Qualitative Reasoning Tasks; Bar Chart Tasks; Conflicting Contentions Tasks; Linked Multiple Choice Tasks; Changing Representations Tasks; and other types of alternative task formats. The tasks are arranged into sets of issues or questions that provide ways of asking the same or connected questions in different ways. TIPERs can be readily deployed in an active learning mode as well as in a traditional lecture mode. They require little student learning to handle the task format, and these tasks can be used as tools for assessment. They are designed to provide small incremental changes as they are implemented, so teachers should find them fairly easy to incorporate them into their classes. Participants will be provided copies of published materials and a CD on TIPERs

Teaching High School Physics using Modeling Instruction

Yohan Tabora (JTabora@northsideprep.org), Nathan Harada (NHarada@northsideprep.org), and Brad Noren (mrnoren@yahoo.com), Chicago Public Schools

The Modeling Instruction Method for Physics is a guided-inquiry physics program based out of Arizona State University which revolves around a small, coherent set of scientific models that comprise the core content of physics. Students learn basic conceptual tools (graphical, mathematical, etc.) to accurately describe physical phenomena. (www.modeling.asu.edu)