Fall meeting of the SACS-AAPT and the NC-AAPT

October 13-14, 2000

Abstracts

Invited talk

A Star's Life: The Explosive Story

Christina Lacey, University of South Carolina, Columbia, SC 29208, (803) 777-6089, lacey@nuc003.psc.sc.edu

A star is the primary member of a solar system, for example, our star, the Sun, provides the heat and light which allow life to flourish on Earth. Stars are also the most basic building blocks of galaxies; there are billions of stars in each galaxy, including our own Galaxy, the Milky Way. However, not all stars are created equal, stars similar to our own Sun live a steady and long life. On the other hand, the most massive stars live fast and die young. In its death throes, a massive stars explodes in a tremendous outpouring of energy and material as the star rips itself apart in an explosion called a supernova. A supernova is one of the most powerful explosions to occur within a normal galaxy. In this talk I will discuss how massive stars are formed, live, and die and how the cycle is completed when the stellar material that was thrown into space by the force of the supernova explosion, travels through space and becomes the catalyst for a whole new generation of star formation.

Contributed talks

Use of Problem-Based Learning in Physics Classes

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Problem-Based Learning, Case-Based Learning, and Service Learning are pedagogical teaching techniques which address the application of physics to real world problems. In Problem-Based Learning, students working in small groups, identify what they know, and more importantly what they do not know and learn to solve a real world problem. A few professors at Samford University and University of Delaware have successfully applied Problem-Based Learning in their physics classes and have reported a positive impact in the learning process of their students. I have used a few problems similar

to problems suggested by Dr. Barbara Dutch of University of Delaware in my physics classes. The pro- and cons- of using the Problem- Based Learning in the classroom will be presented.

Using Physlets and Just-in-Time Teaching to Enhance Ranking-Task Exercises

Mario Belloni, Davidson College, Davidson, NC 28036, (704) 894-2320, mabelloni@davidson.edu

Over the past few months, we have used Physlets---small Java-based interactive physics applets---in conjunction with the Just-in-Time Teaching (JiTT) approach to present Ranking Task Exercises (RTEs) to our introductory physics students. RTEs are conceptual questions that require students to rank variations of a physical situation according to some stated criteria (like velocity, acceleration or work). Unlike the standard Ranking Task Exercises, which involve static paper drawings, our new RTEs involve Physlet animations, which students can access over the web. Examples of such Physlet-based Ranking Task Exercises will be presented. Additional information regarding Physlet-based curricular material can be found at http://webphysics.davidson.edu/physletprob/

Machines in Motion: Braking Distance Activity

Chuck Stone, Forsyth Technical Community College, 2100 Silas Creek Parkway, Winston-Salem, NC 27103, (336) 734-7266, Fax: (336) 761-2399, cstone@forsyth.cc.nc.us

In drivers' education courses and motorcycle riding training classes, instructors often warn students that a vehicle's braking distance increases with the square of the vehicle's velocity. For example, an automobile traveling 50 mph takes four times as far to stop as one traveling 25 mph. In this activity, physics students use the Work-Energy Theorem and the Coefficient-of-Friction Model to verify this claim. Students then perform a hands-on, braking distance activity to substantiate their analysis. This presentation will describe the braking distance model and present student results obtained with an automobile, bicycle, and motorcycle.

Developing Physics Alliances for South Carolina and Georgia

Don Franklin, Battery Creek High School, Blue Dolphin Drive, Beaufort SC 29902, (843) 525-4220, DGFrank1@aol.com

In order to best serve our students in South Carolina and Georgia, we need to expand some of our current physics alliances, reorganize some, and start some! Using some of the methods discussed at our Summer AAPT Meeting, I hope to help every area in our region start a plan to contact and dialog with every teacher who teaches physics.

Using international, national, and regional contests to promote physics in your school

Don Franklin, Battery Creek High School, Blue Dolphin Drive, Beaufort SC 29902, (843) 525-4220, DGFrank1@aol.com

There are many opportunities for our students to compete. I will explain the advantages of becoming involved in: International Young Physicists Tournament, National Engineering Design Challenge, and Science Bowl. The first two involve preparation for known questions and the last is a quiz bowl contest. Students who take the time to prepare for these events learn team skills, and get a chance to represent their school at various levels of competition.

Physics 101/102 = Fizika Phun-01/Phun-02

Mikhail M. Agrest, College of Charleston, 87 Droos Way, Charleston, SC 29414, (843) 556-2997, agrestm@cofc.edu

"Tune in your mind on the wavelength broadcasting: 'Love your Teacher,' and you will learn a lot from this class and you will enjoy it" - exclaimed my Physics Professor at the beginning of his first lecture. And we did learn a lot and we did enjoy it.

How to make students learn more and easier in your class? There is no direct answer to this rhetorical question. The author offers to you his approach.

Some people are visual learners; some are audio learners. The success of the learning process depends a lot on how much one can employ all senses: vision, hearing, sense of touch, sense of smell, sense of taste, and of course, the 6-th sense - sense of Humor.

"To study (Physics) while having Phun" and " To have Phun while studing (Physics) " are the slogans, I offer my students. To entertain students isn't our goal, but we all use funny stories and jokes to help students remember the concepts as well as some concrete details. In my presentation I would like to share some of my favorite stories with my colleagues and encourage them to share theirs.

Exploring Interdisciplinary Linkages in Introductory Physics Courses

J. B. Sharma, Gainesville College, P.O Box 1358, Gainesville, GA 30503, (770) 718-3812, jsharma@hermes.gc.peachnet.edu

The 'Learning Communities' project at Gainesville College aims to introduce students to linkages between the disciplines in core curriculum courses. Calculus based physics courses at GC have been 'linked' with calculus courses such that students in both courses can see the rich conceptual linkages between these disciplines. This 'linkage' has been enabled by a 'virtual classroom' using WebCT, guest lectures, joint projects and a joint seminar. Linkages with disciplines other than mathematics are planned for the future, and details of this project will be discussed.

The Use of CAPA in Physics Classes at USC and in SC High Schools

Gary Blanpied, University of South Carolina, Columbia, SC 29208, (803) 777-2599, blanpied@mail.psc.sc.edu

CAPA (a Computer Assisted Personal Approach) is used for homework and tests in introductory physics at USC. In addition, we are offering CAPA to physics classes in 20 high schools in South Carolina. A standard set of 488 problems covering the 32 chapters of the algebra-based text by Jones and Childers form the bulk of the offerings. One AP-C class uses 465 problems from the Halliday, Resnick and Walker text. We would like to expand this to include all high schools in South Carolina and to provide an integrated, standards-based set of problems for high school mathematics and physical science.

Half-life of Popcorn

D. Ferdon and W. Hayes, Greenville Tecnnical College, PO Box 5616, Greenville, SC 29606, (864) 250-8551, ferdondwf@gvltec.edu

Radioactive decay and half-life are very important in introductory courses such as Astronomy and Physical Science. Students find these topics very difficult to understand. Drawing an analogy to popcorn is useful and effective for qualitatively grasping these concepts. Can the popcorn analogy be extended to have semi-quantitative validity and be included as a laboratory exercise? We have investigated this possibility and will present our results.

An interactive multimedia laboratory manual for introductory physics

John C. Riley, University of South Carolina Spartanburg, Spartanburg, SC 29xxx, (864) -------, jriley@gw.uscs.edu

The author will demonstrate his multimedia lab manual for an introductory level physics course for science majors. The manual features authoring in Macromedia Director with content including digital video, QuickTime Virtual Reality object movies and 3D animation. Details will be shown on the creation of subtitled, indexed QuickTime movies illustrating the use of spreadsheets and graphing in Microsoft Excel.

Vibrational Spectroscopy of Food Colors

V. Anantha Narayanan, Savannah State University, P. O. Box 20473, Savannah, GA 31404, (912) 303-1648, savanantha@hotmail.com

A systematic vibrational spectral study of the representative food colors approved by Food and Drug Administration (FDA) has been undertaken using FTR, FTIR, and SERS methods. Intensity of the spectra against concentration and Limits of Detection (LOD) by SERS methods have been studied.

Remote Control of Experiments and the Internet

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The internet can be used to conduct online interactive "experiments". These "experiments" may be computer simulations which provided calculated results, or actual hardware that is remotely controlled via. the internet. There is a growing interest in remotely controlling experimental hardware via. the internet. Such experiments can serve a valuable teaching resources. Experiments may serve as classroom demonstrations, or be used to conduct actual research. Technology exists for the control of experiments in remote or hostile environments. The online interactive chaotic pendulum being developed at Mercer University will be presented as an example of this technology.

Of Bats and Bruises: Forensics and Physics

Mary Creason, Duke University, Box 90305, Durham, NC 27708-0305, (919) 668-2659, mary@phy.duke.edu

Duke University has been offering a course "Physics of Forensics" for non-science majors to investigate physics using case studies presented by students in discussion and courtroom format. Students mastery of principals in physics is demonstrated as they become "expert witnessess" and educate the jury of their peers by interpreting data to support conclusions. A sample case will be presented with student materials and instructor notes. The case involves the current controversy of high-performance aluminum bats in college baseball.

How to have your blackboard cake and eat it too

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Some feel that the advantages of cooperative learning indicate that the standard lecture format should be avoided. It is almost an axiom of a single-minded cooperative learning approach that "less is more;" that it is acceptable to cover much less material if some of it can be covered more effectively. On the other hand, almost none of the topics in an introductory physics class can be omitted without seriously shortchanging the students. This talk takes the point of view that the real issue in effective teaching is the extent to which a classroom experience keeps the topic of the day alive as an active issue in the student's mind and that it is possible to lecture and, at the same time, keep the students involved in a active learning posture.

Specifically, the talk presents a modest aspect of blackboard management that turns two classroom negatives into a plus.

Retire Into Teaching???

Emile A. Bernard, University of North Carolina at Wilmington, 601 S. College Road, Wilmington, NC 28403-3297, (910) 962-7619, bernarde@uncwil.edu

After a 30-year career with the U.S. Department of Energy and its National Laboratories, Dr. Bernard retired and pursued a math and physics teaching career. Prompted in part by the American Association for the Advancement of Science's Project 2061 call for post-retirement science teachers, he accepted a Physics and Mathematics Instructor position at Piedmont Community College in Roxboro North Carolina. After two years at Piedmont he accepted a Visiting Professor position in physics at the University of North Carolina at Wilmington. The transition from the laboratories into teaching was a real "eye-opener" to say the least. Now into his fourth year of teaching the question remains, who is learning more, the students or the Professor? It was found that old and familiar teaching methods are not the way to teach today. New teaching concepts were learned at several National Science Foundation-funded workshops. Finding the time to implement these concepts, complete course preparations, fulfill institutional requirements and still "enjoy" retirement has been and continues to be a major challenge. Nevertheless, the teaching experience has been most rewarding. Sharing these experiences will hopefully be of interest to fellow scientists who, like myself, are considering or will consider post-retirement teaching.

Workshops

The Universe on a Desktop:Observational Astronomy Simulations in the Instructional Laboratory

P.Richard. Cooper, Laurence.A. Marschall, Glenn.A. Snyder, Gettysburg College, Gettysburg, PA 17325, (717) 337-6019, dcooper@gettysburg.edu

Though the value of hands-on learning has long been recognized by educators, it is difficult to design laboratories in astronomy classes that present realistic astrophysical techniques to undergraduate students. Unlike most other sciences, astronomy is largely observational, not experimental, and making useful observations involves expensive equipment over time

scales inconvenient for pedagogy. In recent years, however, astronomy has gone almost completely digital, and the advent of large on-line data bases and fast personal computers has made it possible to realistically simulate the experience of research astrophysics in the laboratory.

Since 1992, Project CLEA (Contemporary Laboratory Experiences in Astronomy) has been developing such computer-based exercises aimed primarily at the introductory astronomy laboratory. These exercises simulate important techniques of astronomical research using digital data and Windows-based software. Each of the 9 exercises developed to date consists of software, technical guides for teachers, and student manuals for the exercises. CLEA software is used at many institutions in all the United States and over 60 countries world-wide, in a variety of settings from middle school to upper-class astronomy classes. We will describe and demonstrate some of the CLEA materials and talk about our design philosophy. Plans for future development will be presented.

Attendees will receive a CD with all current software and several student manuals that will be used in the workshop. All other documentation is included on the CD. These programs may be used for educational purposes at no charge. They run under Windows 95/98/NT. They have been used in some colleges under emulation software on Macs.

Project CLEA is supported by grants from Gettysburg College and the National Science Foundation

Revealing the physics in disposable cameras

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Used disposable cameras are often available just for the asking at your neighborhood camera store. They are outstanding examples of modern engineering and have many parts and functions that make use of basic physics. Most of these cameras are made of multiple parts that simply snap together and can be easily taken apart to reveal the innermost secrets of camera operation. The lenses can be removed and checked, the viewfinders examined and explained, and the shutter operated. The flash circuits can be made to work, but caution is advised because the capacitors produce a nasty burn if discharged across body parts. We will take apart some cameras and examine them for interesting applications of physics.