SACS-AAPT Fall 2009 Meeting Program

Augusta State University

October 16 – 17, 2009

Friday October 16 (Location: JSAC Ballroom & Science Hall Atrium)

5:00 pm – 6:30 pm Registration and Student Poster Presentation (Science Hall Atrium)

6:30 pm – 7:30 pm Banquet Dinner (JSAC Ballroom)

7:30 pm – 7:35 pm Welcome Note:
Dr. Samuel Sullivan, Professor of Physics & Vice President of Academic Affairs (VPAA), Augusta State University (JSAC Ballroom)

7:35 pm – 8:30 pm Keynote Address:
Dr. David J. Griffiths, Professor of Physics, Reed College (JSAC Ballroom)

8:30pm – 10:00 pm Faculty Social, Maxwell Alumni House

Saturday October 17 (Location: Science Hall and University Hall)

7:30 am – 8:00 am Registration, Coffee and Refreshments (Science Hall Atrium)

8:00 am – 9:30 am Contributed talks (Session I) (Science Hall, W1002)

9:30 am – 10:00 am Coffee Break (Science Hall Atrium)

10:00 am – 11:00 am Contributed talks (Session II) (Science Hall, W1002)

11:00 am – 11:15 am Coffee Break (Science Hall Atrium)

11:15 am – 12:00 pm Contributed talks (Session III) (Science Hall, W1002)

12:00 pm – 12:40 pm Lunch (JSAC Ballroom)

12:40 pm – 1:00 pm SACS-AAPT Business Meeting (Science Hall, W1002)

1:00 pm – 3:15 pm Workshops (University Hall UH 129, Science Hall W1049&1051)

Emergency Contact Information:
Dept. of Chemistry & Physics 706.737.1541 or Dr. Tom Colbert, Assistant Program Chair, 706-513-9758.

Friday October 16, 2009

SACS-AAPT Fall 09 Posters

Science Hall Atrium

5:00 pm to 6:30 pm

1. Performance of 5000 students in introductory mechanics

Marcos Caballero, Michael Schatz, School of Physics, Georgia Institute of Technology Keith Bujak, Richard Catrambone, Jack Marr, School of Psychology, Georgia Institute of Technology Matthew Kohlmyer, Department of Physics, North Carolina State University

We present the performance of nearly 5000 students on a standardized assessment of force and motion (Force Concept Inventory) for two fundamentally different physics curricula; a traditional course based on the Knight text and a reform course based on the text of Chabay and Sherwood, Matter and Interactions (M&I). The traditional course is a standard physics curriculum with particular emphasis on constant force motion. The M&I course is a modern approach to physics instruction with computer modeling and an emphasis on the generality and dynamics of Newton's Second Law. We find poorer performance for students who have taken the M&I course as compared to students taking the standard course. This under-performance is consistent despite the superior performance by M&I students on common exam problems in other areas of mechanics. We offer explanations for this consistent under-performance in the realm of force and motion as well as some results from recent work to comb!

2. Chaos

Philip Javernick and Trinanjan Datta, Augusta State University

In this poster we highlight the difference between periodic and chaotic motion. We study the phase space of a simple pendulum and that of a damped spring-mass system. We also investigate the sensitivity to initial conditions which characterize a chaotic system.

3. Motion of magnetotactic bacteria

Timothy Kurtz and Trinanjan Datta, Augusta State University

We investigate the motion of magnetotactic bacteria in the presence of an external magnetic field. We explore the cases when the net torque acting on the bacteria is both zero and non-zero. Using Mathematica, we perform numerical simulations of the model bacteria system to investigate the various types of motion. In the absence of an external torque we find that the system can exhibit both a synchronous and an asynchronous motion. In the presence of a net external torque the system can exhibit oscillatory motion.

4. Animating motion on Google Earth using Python

Juan Llanes, Georgia Institute of Technology

Saturday October 17, 2009

SACS-AAPT Fall 09 Contributed Talks and Workshop Program

Science Hall W1002

8:00 am to 12:00 pm

Contributed Talks – Session I

8:00 am – 8:15 am

1. Using physics to teach liberal arts students about climate change, sustainability, energy and the environment

Hauke Busch, Augusta State University

It has become more and more apparent that today's graduates require an environmental component to their liberal arts education. We will show how a regular physical science course can be augmented to not only teach the students basic physics principals but also how to apply them to current issues of concern like climate change, population growth, sustainability, and renewable energy sources. This new class not only educates the next generation of educators it also provides a new needed science course to our changing educational curriculum.

8:15 am – 8:30 am

2. A Fun Way to Teach the Concept of Tension and Newton's 2nd Law

K. C. Chan and Arun Saha, Albany State University

Tension is often too abstract a concept for beginner physics students. When a weight is suspended by a string, the tension in the string may vary from greater than, less than or equal to the weight depending on whether the acceleration is up, down or zero respectively. If the acceleration varies rapidly in time, the tension can go beyond the tolerance limit of the string and causing it to snap. This is at best demonstrated by dropping a 1-kg weight tethered to a force transducer's cantilever tip by a string with fixed length L_o. When the falling weight falls more than the length of the string, the deceleration becomes so overwhelming that it snaps the string, which in turns induces a violent vibration of the cantilever. The cantilever then undergoes a damped vibration. By comparing this dynamic case to a stationary case side by side, the student can immediately realize the increase in tension in the string is caused by the deceleration of the falling weight. The added fun of this experiment/demonstration is to witness the damped vibration as a byproduct. The maximum tension and vibration can easily be recorded and analyzed by a data acquisition program.

8:30 am – 8:45 am

3. Recruiting, Retaining, and Transferring STEM Students Through the MESA Program

Dr. Kouok Law, Georgia Perimeter College

In the Fall of 2007, the USG Board of Regents started funding the MESA Program at Georgia Perimeter College. It is now a successful and fully running program that helped 142 educationally disadvantaged students last academic year. The USG Board of Regents is now preparing the next stage of its STEM initiative: to spread the most efficient of the programs that have been tested. This presentation will show why and how the MESA Program works. Attendants will see the main components of the program, and will understand how student confidence is patiently fostered in the MESA Center.

8:45 am – 9:00 am

4. Using clicker in an algebra-based introductory physics course

Pengfei Li, Savannah State University

At Savannah State University (SSU), a Historical Black College and University (HBCU), an in-class response system (clicker) was used in an algebra-based physics introductory course. Two types of clicker questions: “easy-hard-hard” series and “rapid fire” series were designed to improve students’ interaction in class and help students understand physics concepts. Students like using clickers and feel more engaged in lectures after using them. In this talk, the preliminary results of this study will be discussed.

9:00 am – 9:15 am

5. Using Easy Java Simulations (EJS) and Existing Simulations to Develop Physics Simulations

Taha Mzoughi, Kennesaw State University

In teaching physics, we often need some tool to help illustrate the concepts further and to help students understand and learn the topics covered. Simulations, when available, can be an ideal medium for that role. Unfortunately, it is sometimes difficult to find simulations that address the topic in a format that is compatible with our teaching strategy. Other times, it is difficult to find simulations addressing the concept altogether. Fortunately, the Open Source Physics Project [1] and Easy Java Simulations [2] have developed tools to help physicists easily develop their own simulations. Furthermore, physicists can rely on the wealth of simulations that were already developed to get ideas and code to use in developing their own. More importantly, often, developers don’t need to spend time writing Java code to develop their own effective simulation. Several example simulations that were developed based on the open source paradigm and using little program changes will be illustrated.

[1] W. Christian, Open Source Physics: A User's Guide with Examples (Addison Wesley, New York, 2007) [2] W. Christian and F. Esquembre, Phys. Teach. 45 (10), 475 (2007)

9:15 am – 9:30 am

6. Integrating Lecture and Laboratory in Introductory Physics at the College of Coastal Georgia

Ntungwa Maasha, College of Coastal Georgia

Educational research indicates that effective learning of introductory physics is enhanced by active engagement of the learner. To implement some of the best practices in teaching introductory physics at the College of Coastal Georgia it was decided to integrate lecture and laboratory activities. In this paper I discuss the steps we took to transition from teaching the introductory calculus-based physics course where the laboratory and lecture sessions were done separately to teaching the course by integrating lecture and laboratory.

COFFEE BREAK 9:30 am – 9:45 am (Science Hall Atrium)

Contributed Talks – Session II

9:45 am – 10:00 am
1. Advanced Science Research in the Secondary Classroom
Dan Funsch, Alleluia School, Augusta, GA

Our high school has developed a program which incorporates full year student research projects. High school seniors engage in research on a wide variety of scientific topics. The presenter will provide a brief introduction to the program and explain how it was implemented.

10:00 am – 10:15 am
2. Hit Like a Girl: Physics and Roller Derby
Teresa Burns, Coastal Carolina University

Roller derby's modern revival is a hard-hitting aggressive sport dominated by women. In analyzing its play, one can easily identify many principles of Newtonian mechanics at work: force and acceleration in the sprints, momentum conservation in the hits, circular motion and centripetal acceleration as the skaters corner the turns. Roller derby can then be used a teaching tool: as an exemplar of physics principles using women playing a physical contact sport. Here, a physical science lab activity based on the sport of roller derby is presented. Student reaction is also discussed.

10:15 am – 10:30 am
3. Temperature Changes in Food—An Upper-Level Project
Michael Burns-Kaurin, Spelman College

In the Advanced Experiments, Theory, and Modeling capstone course for physics majors at Spelman College, students work on projects that bring together principles and techniques from the intermediate-level theory and laboratory courses. In one of these projects, while heating or cooling food students measure the temperature change of the food as a function of time and position. The students also work through the theory of the heat equation by looking at successively more complex situations, solve the equation, and create a computer simulation to describe their data.

10:30 am – 10:45 am
4. Understanding How Our Mind Works: A Teachers Observations Re Human Perception
Henry Gurr, Professor Emeritus, University South Carolina Aiken

In order to design and build an airplane, we apply statics, dynamics, aerodynamics, and materials science, etc. Similarly, in order to teach we need an applicable science. This talk will outline some of my observations concerning regularities in human perception. Application to teaching and learning in class (and lab) will be included. The observations discussed, may contribute to an eventual "applied science of teaching & learning".

10:45 am – 11:00 am
5. Paleocontact Hypothesis. Semi Centennial Influence
Mikhail M. Agrest**,** College of Charleston, Charleston

Some Hypothesis looked absurd initially, seemed to be less realistic than the most provocative fiction but being proved later became reality. The mystery of the origination of a hypothesis is waiting for their researches.

The Paleocontact Hypothesis was born 50 years ago in the heart of the top secret classified Soviet Nuclear Project. This hypothesis has not been proved right, neither was it proved wrong in

the course of its Semi Centennial life. It touched everyone and didn't leave indifferent practically anyone. It inspired numerous scientists in various disciplines and motivated them to perform successful interdisciplinary research.

While the Soviet officials declared war on this Hypothesis as being not scientific and so harmful for the society, it was making money selling the publication of translated (without notification of the author) in dozens of languages all over the world. Igor Kurchatov, Iosif Shklovsky and some other world renowned soviet scientists as well as Erich von Däniken in Europe and Carl Sagan in the US were among the greatest followers of the Hypothesis.

The author of this presentation lived at the very site of the origination of this Hypothesis and will present some original rare documents on the history of the Hypothesis.

COFFEE BREAK 11:00 am – 11:15 am (Science Hall Atrium)

Contributed Talks – Session III

11:15 am – 11:30 am

1. Lunar Oxygen Production and Metals Extraction

Matt Marone, Mercer University

Although there is no atmosphere on the Moon, there is a large supply of oxygen. This oxygen is tied up as oxides making up the lunar regolith. In addition to oxygen, important metals such as aluminum and iron can be extracted from lunar regolith. Any plans for lunar colonization must include methods for extracting such vital materials from lunar resources. I will discuss several experiments that illustrate how this can be accomplished. We have developed ionic liquid acids that can dissolve lunar material well below the melting point. Using electrochemical techniques we can extract oxygen and metals. Our process is recyclable and does not require importing large quantities of chemicals from Earth.

11:30 am – 11:45 am

2. Planning the Intensity Modulated Radiotherapy (IMRT) to cancer patients in the Introductory Modern Physics Laboratory

Tatiana A. Krivosheev, Clayton State University

We present our experience of using the Intensity Modulated Radiation Treatment (IMRT) planning system in the Introductory Modern Physics Laboratory. Students create radiation treatment plans using Hyperion treatment planning system based on CT information for prostate cancer case. Students are introduced to several concepts commonly used in discussion of radiation treatment such as dose volume histograms (DVH), mean doses delivered to primary target volume (PTV) and organs at risk (OAR), and normal tissue complication probabilities (NTCP's). The latter ones are used to predict and evaluate the severity of radiation-induced complications.

11:45 am – 12:00 pm

3. Doped Pre-forms as laser media

Paige Ouzts, Lander University

This project is a collaborative effort among faculty, undergraduates and graduate students at Lander, Furman, and Clemson. Pre-forms are fiber optical cables that have not been stretched into cable form. The pre-forms have cores that are doped with rare Earth metals such as erbium and ytterbium. In this project we take the pre-forms and optically pump them with varying wavelength lasers. The output wavelength from the pre-form is monitored. The output wavelength is different than the input due to the fluorescing. If the pumping laser is the correct wavelength and adequate power, the dopant experiences a population inversion and becomes a laser medium. With proper alignment and optics the system can be optimized to laser. This could create lasers at wavelengths that are currently challenging and expensive to create.

Workshop Program

1:00 pm – 3:15 pm

1. Real-World Kinematics and Dynamics with Animations on Google Earth

J.B. Sharma Gainesville State College and Juan Llanes, Georgia Institute of Technology
Location: University Hall UH 129

A GPS unit can capture the 3-D time varying position vector of real-world moving object and this contains the kinematics of the motion. If the mass of the moving object is known, the dynamics and energetic of the motion can be inferred. This technology can help connect the ideas learned in the mechanics classroom to the experiential domain of the real-world student-centered motion. The curricular integration of this technology and case studies of student projects will be discussed. A software tool for animating the motion on Google Earth with dynamic vector diagrams has been developed will be presented along with a discussion of applications for teaching/learning.

2. Changeringing on Church Bells

Ron Edge, University of South Carolina
Location: Science Hall E1049

A ring of eight bells cast by the Whitechapel foundry in London was recently installed in the tower of the Church of the Good Shepherd near the campus. After a short discussion of the physics and mathematics of the exercise of changeringing we shall visit the tower (or you can go directly). Parking is available in the rear of the church which is toward town on Walton Way.
A peal consists of 5040 (7!) changes on seven bells, no two changes being the same. Each ell is mouth up and turns over completely at each change. I recommend reading a detective story called “The nine tailors” by D.L.Sayers to comprehend.

3. Teaching Nuclear Physics Using DVD Teacher Kits.

Don Franklin
Location: Science Hall E1051

Nuclear Energy is always in the back of the textbook. Try to make it to the end and then have the time to teach the material can be very difficult. My proposal is to make it part of current events. When something happens to bring up the topic, or the conversations are about energy and pollution, that is a good time to teach Nuclear Physics. If you are going to miss a class or two, this lesson plan can be easily adapted.

The DVD’s are called: *Alphas, Betas, Gammas, Oh My!*
Nuclear is Hot!
Nuclear Energy and the Use of Nuclear Materials